Public Policy and Poverty Reduction in the Arab Region

Edited by:
Ali Abdel Gadir Ali
Shenggen Fan

First published in 2007 by
The Arab Planning Institute
P.O.Box: 5834 Safat 13059
State of Kuwait

Tel.: (965) 4843130 – 4844061 – 48487754
Fax: (965) 4842935

E-mail: api@api.rog.kw
Web site: http//www.arab-api.org

Cover photos from left to right:
(c)Panos/Mark Henley, (c)Panos/Penny Tweedie , (c)Panos/Trygve Bolstad,
(c)Panos/Chris Stowers, (c)Panos/Eric Miller, (c)Panos/Caroline Penn

ISBN: 99906-80-17-5
Depository Number : 2007/112

Contents

Contributors iv
Foreword v
Acknowledgements vii

Chapter One :
Introduction 1
Ali Abdel Gadir Ali and Shenggen Fan

Chapter Two :
Poverty in the Arab Region: A Selective Review 13
Ali Abdel Gadir Ali

Chapter Three :
Impact of Public Policies on Poverty, Income Distribution and Growth 51
Belkacem Laabas and Imed Limam

Chapter Four :
Impacts of Public Policy on Poverty in Arab Countries: Review of the CGE Literature 79
Mustafa Babiker

Chapter Five :
Public Spending, Growth, and Poverty Reduction in Egypt: A Multi-level Analysis 117
Shenggen Fan , Perrihan Al-Riffai , Moataz El-Said , Bingxin Yu , and Ahmed Kamaly

Chapter Six :
Public Expenditure, Economic Growth and Poverty in Morocco: Moving Towards a Multi-Levels Analysis 169
Touhami Abdelkhalek and Marc Rockmore

Chapter Seven :
Public Policy and Poverty Reduction in Sudan, 1971-2002 217
Hatim Ameer Mahran

Chapter Eight :
Public Spending, Pro-poor Growth and Poverty Reduction in Tunisia: A Multi-level Analysis 259
Sami Bibi and Rim Chatti

Chapter Nine :
Harnessing Public Spending for Poverty Reduction in Yemen 315
Mohamed Abdelbasset Chemingui

Chapter Ten :
Public Policy and Poverty in the Arab Region : Major Findings and Lessons Learned 361
Ali Abdel Gadir Ali, Leah Horowitz , and Shenggen Fan

Contributors

Editors:

***Ali Abdel Gadir Ali**, Deputy Director General, Arab Planning Institute (API), Kuwait.*

***Shenggen Fan**, International Food Policy Research Institute (IFPRI), Washington, United States of America.*

Other Contributors:

***Belkacem Labbas**, Economic Expert, Arab Planning Institute(API), Kuwait.*

***Imed Limam**, Arab Fund for Social and Economics Development, Kuwait.*

***Mustafa Babiker**, Saudi Aramco, Dhahran , Kingdom of Saudi Arabia .*

***Perrihan Al-Riffai**, International Food Policy Research Institute (IFPRI), Washington, United States of America.*

***Moataz El-Said**, International Monetary Fund (IMF), Washington D.C., United States of America.*

***Bingxin Yu**, International Food Policy Research Institute (IFPRI), Washington, United States of America.*

***Ahmed Kamaly**, American University In Cairo, Department of Economics.*

***Touhame Abdelkhalek**, professor at the Institut National de Statistique et d'Economie Appliquee in Morocco.and Marc Rockmore is a Research Analyst at the Interational Food Policy Research Institute.*

***Hatim Ameer Mahran**, Department of Economics University of Gezira, Sudan .*

***Sami Bibi**, Faculte des Sciences Economiques et de Gestion de Tunis (FSEGT), Campus Universitaire, Tunisia.*

***Rim Chatti,** Faculte des Sciences Economiques et de Gestion de Tunis (FSEGT), Campus Universitaire, Tunisia.*

***Mohamed Abdelbasset Chemingui**, , United Nations Economic Commission for Africa (UNECA), Ethiopia.*

Foreword

Poverty in the Arab region garners little international attention because poverty rates there are far lower than in other regions like South Asia or Sub-Saharan Africa. However, high aggregate wealth hides significant pockets of hardship. The least-developed countries in the Arab region witnessed large increases in the proportion of their populations living below the poverty line in the last decade and some, like Yemen and Sudan, are among the poorest in the world. As a whole, the region has seen little decrease in absolute poverty measures since the early 1990s. Moreover, it had one of the lowest per capita GDP growth rates in the 1990s and early part of this decade, which translated into slow progress in human development compared to other developing countries.

Many governments in the Arab region have outlined strategic plans and earmarked financial resources for achieving significant poverty-reduction goals. Governments can use a diverse set of interventions to achieve these objectives, including regulations, taxes, and trade, monetary, and spending policies.

The International Food Policy Research Institute (IFPRI) and the Arab Planning Institute (API) collaborated on this book, *Public Policy and Poverty Reduction in the Arab Countries,* in an effort to provide policymakers in the region with empirical analyses of the effects of public policy on poverty reduction in their countries. This book focuses specifically on public spending, which is a concrete demonstration of societal goals and public policy commitments. Governments can use public spending to achieve both economic growth and equity—the two components of poverty reduction—but the ideal investment strategy to maximize these goals will be country-specific.

The collaboration between IFPRI and API is an example of best practice in partnership and networking. During the past decade, IFPRI has conducted a number of studies examining public spending and its impact on growth and poverty reduction in many countries and regions. These studies have been valuable to developing country policymakers, often pushing them to rethink their priorities in allocating public resources. However, the relationship between public investment and poverty in the Arab countries had not been examined.

Fortunately, API has been studying poverty in the Arab countries since 2000, aiming to establish the basic facts on the spread, depth, and severity of poverty in the Arab countries. The Institute also conducts training courses on development management, including issues related to poverty and its correlates, for mid-level Arab planners and economic managers and provides consultancy services to Arab governments.

Through these activities, API has a unique advantage in communicating research results to Arab policymakers.

The fruit of this collaboration is the current volume of studies on public policy and poverty in the Arab countries, which includes five country case studies and three regional background papers. We believe that the results reported in the volume will be useful to policymakers and researchers in the region, as well as to those in developing countries more broadly. While we recognize that more work remains to be done to understand the impact of public spending on poverty alleviation in the Arab region, we sincerely believe that our collaboration has established a launching pad for future work on the subject.

Essa Al-Ghazali
Director General
Arab Planning Institute
Kuwait

Joachim von Braun
Director General
International Food Policy Research Institute
U.S.A

Acknowledgements

The editors of this volume are grateful to the participants in the dissemination workshop held in Cairo (26-27 September, 2005) which provided a unique forum of interaction between the authors of the papers and Arab policy makers. Special thanks go to Dr. Osman Mohamed Osman, at the time Egypt's Minister of Planning, and to Dr. Ahmed Al-Dersh, the ex-Egyptian Minister of Planning. During the workshop both contributed substantially to a better understanding of how to use research results to inform policy making in the Arab countries. We also want to thank Professor Sherman Robinson, Dr. Hans Lofgren, and Dr. Moatez El-Said, who were involved in the early formulation of the collaborative project; and all of our contributors, who in addition to their work on their country case studies, interacted effectively with each others in the context of the methodology workshops organized under the project. We are also grateful to Professor Jean-Yves Duclos who served as the international advisor for the project and who read, and commented on, all of the papers in this volume. At API we had high quality logistical support from Ms. Hanadi Eldib, Ms. Sanaa Al-Bittar and Mr. Karim Darwich; while at IFPRI we enjoyed the support of Ms. Alma Alcaraz-Bernardo, who looked after the financial aspects of the project, and Ms. Diana Flores, who guided us on copy right issues and the design of the cover page. For this generous, and high quality, logistical support we are grateful to all of them. Finally, we wish to acknowledge the financial support of European Commission through IFPRI and API.

Chapter One

Introduction

Ali Abdel Gadir Ali and Shenggen Fan

I. Introduction

The percentage of the world's poor living below $1 per day fell by nearly a half in the last two decades of the 20th century. However, reduction in global poverty has been uneven across and within regions of the developing world. While the dramatic progress made in East Asia -- especially China -- is well-known, poverty indicators elsewhere have proven more fixed. This asymmetrical development story also holds true for the Arab countries.

This region garners little international attention for poverty because its poverty rates are far lower than other regions like South Asia or sub-Saharan Africa, but high aggregate wealth hides significant pockets of hardship. The least-developed countries in the Arab region witnessed large increases in the proportion of their populations living below the poverty line in the last decade and some, like Yemen and Sudan are among the poorest in the world. As a whole, the region has seen little decrease in absolute poverty measures since the early 1990s. Moreover, the Arab region had one of the lowest per capita GDP growth rates in the 1990s and early part of this decade, which translated into slow progress in human development compared to other developing countries.

Fortunately, poverty reduction is now widely recognized as the overarching objective of development by both the international community and Arab country governments. The Millennium Development Goals (MDGs), adopted by world leaders at the Millennium Summit of the United Nations in September 2000 embody this recognition. Under the first Millennium Development Goal, leaders have agreed to halve the proportion of people living on less than a dollar a day by 2015. In fact, the first seven goals are poverty-related.[1] The World Bank and IMF also appear to be embracing a broader development agenda, moving beyond structural adjustment and its uniform application of neoclassical theory to all countries toward a more holistic Comprehensive Development Framework. Their adoption of the Poverty Reduction Strategy process (PRSP) as a key consideration in the

[1] They deal respectively with eradication of extreme poverty and hunger; achieving universal primary education; promoting gender equality and empowering women; reducing child mortality; improving maternal health; combating HIV/AIDS, malaria and other diseases; and, ensuring environmental sustainability.

disbursement of debt relief and concessional financing also signals a commitment to a poverty-oriented development process.

Many governments in the Arab region have adopted their own poverty reduction strategies or similar concept papers to outline strategic plans and to earmark financial resources for achieving significant poverty reduction goals. At the regional level, the League of Arab States (LAS) drafted an Arab poverty reduction strategy, which was adopted by the Council of Arab Ministers for Social Affairs in November 2006. The members of LAS also reiterated their commitment to the MDGs in the Arab Declaration adopted in June, 2005. The New Partnership for Africa's Development (NEPAD), adopted by African Heads of State and Government in 2001, is an African-owned vision and strategic framework for Africa's renewal. Four of the Arab countries included in this study -- Egypt, Morocco, Tunisia, and Sudan – are members of NEPAD.

As national governments and their development partners outline strategic plans for reducing poverty, they require a nuanced understanding of the specific mechanisms through which public policy interventions can contribute to poverty reduction. In fact, the role of the state in achieving social welfare is a perennial debate. However, most economists agree that the role of the government is to maximize efficiency by correcting market failures while also taking measures to provide non-market goods like equity and poverty-reduction. Governments can use a diverse set of interventions to achieve these objectives such as regulations, taxes, and trade, monetary, and spending policies. This book is concerned with one realm of government policy – that of public spending – because it is one of the most effective instruments that governments can use to achieve development goals.

Governments wishing to improve the welfare of their citizens can spend their financial resources in many ways. Investments in such things as research and development, education, and infrastructure (e.g. roads, electricity, telecommunications, and water) may facilitate economic growth over the long-term, but may ignore those traditionally left out of the growth process. Spending on health, social security programs, and cash transfers to the poor may meet the immediate needs of the populace, while neglecting productive investments. The reduction of poverty over time requires both economic growth and equity (i.e. improvement in the distribution of income and consumption), so prioritizing government investment to maximize both of these objectives is essential.

Over the last decade, researchers at the International Food Policy Research Institute (IFPRI) and elsewhere have examined the impact of various types of public spending on growth and poverty reduction in many places.[2] These types of studies provide developing country

---

[2] See, for example, Fan, S., and Rao, (2003), Fan, S., Zhang, L., and X. Zhang, (2002), Fan,

policymakers with the empirical evidence they need to create priorities for their public resources and to increase the efficiency of public interventions. But to date, few such studies have examined the effects of government spending policies in Arab countries despite the fact that poverty and inequality are significant public policy problems in the Arab region. In an effort to fill this knowledge gap, the objective of this book is to examine the channels through which public expenditures in Arab countries affect development indicators in both the short- and long-run, and to identify how priorities can be set to maximize the social development impact of limited public resources. Since the majority of the region's poor live in rural areas, it pays particular attention to the types of public spending that affect the rural poor.

The remainder of this chapter provides an overview of the book. Section (II) presents a brief background on poverty and public expenditure in the Arab region. Section (III) presents a conceptual framework of the effects of government spending on growth and poverty reduction. Section (IV) outlines the contents of the book.

II. Poverty and Public Expenditure in the Arab Region

Many outside observers assume that the great wealth of the Oil Economies, which boast an average per capita GDP of $10,350 (USD), makes poverty irrelevant across the entire Arab region. In fact, countries in the region display an enormous spread in wealth and economic activity, depending on the structure of their economies. While Diversified Economies are home to nearly half of the region's population (46.5%), they only constitute 26.6% of the region's GDP. Conversely, 11.5% of the population lives in Oil Economies, but they enjoy 46.5% of aggregate GDP. Even more strikingly, per capita GDP ranges from an average of $10,350 (USD) in the Oil Economies to just $430 (USD) in the Primary Export Economies. The three Mixed Oil Economies are home to about a quarter of the region's population and a quarter of its wealth.[3]

According to international estimates of poverty reported by Chen and Ravallion (2004), the Arab region had the lowest incidence of poverty among developing regions in 2001: with an absolute poverty line of $1.08 per person per day, only 2.4% of the total population of Arab countries were living in poverty. Yet estimates of individual country poverty rates vary widely, from about 4.7% in Tunisia to 41.8% in Yemen. Using country-specific poverty lines, the overall head-count ratio for the Arab

---

S., Hazel, P., and S. Thorat, (1999).

[3] *Diversified Economies* were considered here to be Egypt, Jordan, Lebanon, Morocco, Syria, Tunisia. *Primary Export Economies* were Djibouti, Mauritania, Sudan, and Yemen. *Oil Economies* were Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and UAE. *Mixed Oil Economies* were Algeria, Libya, and Iraq.

region has been estimated at 26.7%, an order of magnitude higher than the international estimate (see Ali in this volume). This figure better captures the poverty trends observed on the ground over the last decade. Some Arab countries are also characterized by high levels of income inequality, although the literature has been less conclusive on this fact for the region as a whole.[4]

Unlike inequality, there is no disagreement that unemployment is a huge challenge in almost all Arab countries. Slow or negative growth rates and rapid population growth have affected employment across the region and most countries suffer from double-digit unemployment rates, with much higher joblessness in "regional hotspots" like Algeria, Iraq, and the Palestinian territory. Generating productive and gainful employment for those openly unemployed today, as well as for those newly entering the labor force is critical to addressing poverty issues in the region, especially in environments where formal safety nets are ineffective. The World Bank has argued that close to 100 million new jobs will need to be created by 2020 (World Bank, 2004). Clearly, jumpstarting the growth process will be central to this endeavor.

Unfortunately, government expenditure in the Arab region has been skewed toward less efficient forms of social sector and education spending, and defense, at the expense of investments that may have more effectively stimulated the growth process. Arab country governments have historically shown a strong commitment to social welfare, which may partially explain the low absolute poverty rates in the region. In the decades after Independence, many countries established comprehensive social protection programs, which included combinations of cash and in-kind transfers, consumption subsidies of basic goods and services, and even pensions, disability, and health insurance. Yet, some countries focused their social spending on universal consumer subsidies long after they were shown to be costly and inequitable. In addition, a number of Arab countries use public sector employment as a blunt tool for social insurance, spending large sums on the public wage bill. For example, the public sector employs more than a third of the total employed labor force in Jordan and Egypt. In Morocco, public sector wages represent 50-55% of the government's current expenses, and almost 12% of GDP (Adams and Page, 2003; Touhami and Rockmore, this volume).

Arab countries also spend more on education than other countries at comparable income levels. Table 1, which shows the composition of total

[4] Adams and Page (2003) portray the Arab region as having "one of the most equal income distributions in the world." The 2002 Arab Human Development Report cites other studies that are less sanguine. It suggests that income inequalities in countries such as Egypt, Iraq, and Jordan increased in the last two decades. Insufficient data may lie at the crux of the problem. As the UN report points out, "analysis of income-inequality issues in the Arab region is frustrated by lack of comprehensive and comparable data sets as well as by the reluctance of some official sources to share primary survey data with researchers."

government expenditure for Egypt, Morocco, and Tunisia, reflects this trend in these countries. Education is the largest single line item in each of these countries, and makes up more than a fifth of total spending in recent years. However, it has been suggested that despite high levels of investment, the educational systems of Arab countries do not perform well. One IMF study pointed to emphasis on quantity rather than quality teachers, lagging education technology, inflated administrative bureaucracies, and a spending bias toward higher, rather than primary education (Ahmed and Davoodi, 2003).

Table (1)
Composition of Total Expenditure (percent)

Country	Year	Agriculture	Education	Health	T&C	Social Security	Defense	Others	Total
Egypt	1980	4.35	7.25	2.08	0.99	8,35	8.92	68.07	100.0
	1990	4.73	14.00	2.81	2.88	12.89	11.47	51.22	100.0
	2000	6.85	19.87	4.58	3.15	3.05	9.85	52.65	100.0
	2004	7.06	21.28	5.59	2.35	1.42	10.45	51.86	100.0
Morocco	1980	6.46	17.30	3.38	9.06	5.15	17.94	40.71	100.0
	1990	4.98	18.19	3.00	5.92	5.41	12.83	49.66	100.0
	2000	3.50	18.26	3.37	3.41	10.15	13.13	47.81	100.0
	2004	2.76	20.78	4.01	1.23	12.84	12.87	45.51	100.0
Tunisia	1980	14.52	17.05	7.20	4.83	7.45	12.21	36.74	100.0
	1990	8.00	17.03	6.12	2.75	14.19	5.82	46.09	100.0
	2000	5.76	23.42	19.36	2.36	15.86	5.17	28.08	100.0
	2004	8.11	26.47	7.07	3.35	24.46	6.49	24.05	100.0

Notes: T&C stands for transportation and communication
a Includes agriculture, forestry, fishing, and hunting.
b Includes fuel and energy; mining, manufacturing, and construction; general administration.
Sources: Calculated using data from International Monetary Fund's Government Finance Statistics (various issues).
2004 values for Egypt are extrapolated.

Countries in the region continue to devote a large fraction of their budgets to military spending. While defense spending in the three countries included in Table 1 has declined over the past 25 years, it still constitutes a significant portion of the budget, especially in Egypt and Morocco. Military spending in the region as a whole accounted for nearly 20% of government spending in the 1990s. In contrast, Arab governments have spent little on productive investments such as in infrastructure or agriculture. The countries in Table 1 have never spent more than 9% of their budgets on agriculture, except for Tunisia in the 1980s.

Most Arab countries have large public sectors, especially compared to other developing regions. In the 1970s, government expenditure in the Arab region averaged about 42 percent of GDP, some 12 points above the rest of the developing countries. This ratio has been declining since then due to both structural reforms and fluctuating oil revenues, but it remained high relative to international standards at the beginning of this decade (Abed and Davoodi, 2003). Yet in light of disappointing growth performance and the need to generate substantial new employment opportunities, Arab governments may want to reorient their spending priorities so that they can better achieve their growth and poverty reduction goals. The next section considers this process of priority setting.

III. Conceptual Framework: Effects of Government Spending on Growth and Poverty Reduction

Since public resources are limited and thus have opportunity costs, setting priorities is critical. In this book, we treat the government as a social planner who sets priorities for the optimal allocation of resources by maximizing a weighted social welfare function defined over, for example, per capita income, income distribution, or the poverty rate.[5]

Policymakers must set their priorities among the many classifications of government spending. The IMF and World Bank often divide total spending into three broad categories: economic spending, social spending and other spending. Economic spending covers sectors of agriculture and infrastructure (energy, transport, telecommunication, etc) while social spending includes health, education, nutrition, and social safety nets. Social spending can be further classified into social services (like education and health), social insurance (pensions and unemployment insurance), social assistance (cash and in-kind transfers to the poor or certain social groups), and employment generating program. Other spending includes general administration and defense.

Government spending can also be divided into those expenditures whose welfare goals are meant to be realized in the long- or short-term. Investments that build human and physical capital, such as infrastructure, education, and technology, fall into the first category as they generally facilitate economic growth over the long-term, contributing to poverty reduction through rising aggregate incomes over time. This type of investment can also contribute to poverty reduction in the short-run by increasing demand for labor, intermediate inputs, and other factors of production. On the other hand, social safety net or welfare spending often has an immediate impact on income and poverty through direct transfers, but the latter could also have long-term impact if the transfer is conditional on households or communities building human

5 This is similar to the approach used by Deacon (1978), Dunne and Smith (1984), Hayes and Grosskopf (1984), and Trimidas (1999).

and physical capital. Taking both of the above classification frameworks into account, Figure 1.1 maps the components and determinants of public spending and the channels through which it affects income poverty.

IFPRI's previous work on the returns to public investment in various regions has revealed a number of consistent themes, some of which may be instructive for the Arab countries. First, the returns to public investments vary widely across different types of investment and regions, even within the same country. Better regional targeting holds significant potential to achieve more growth and poverty reduction with a given amount of investment. Regional analysis in Asia suggests that investments in less developed areas offer the largest poverty reduction per unit of spending, and also the highest economic returns. On the other hand, research in Africa shows high returns to public investment even in high potential areas, indicating an overall lack of investment in all regions for that continent. Second, agricultural research, education, and rural infrastructure are the three areas of public spending that most effectively promote agricultural growth and reduce poverty. Evidence from China shows that simple, low-cost types of infrastructure, such as rural feeder roads, often have the highest payoff in terms of growth and poverty reduction, per unit of investment, and a study of Uganda points to similar conclusions. Government spending on anti-poverty programs, such as safety nets or food subsidies generally has a small impact on poverty reduction, owing mainly to inefficiencies in targeting and misuse of funds.

Despite the strength of their analyses, past IFPRI studies have not considered the economy-wide (general equilibrium) effects of government spending. Since ignoring these effects can bias estimates of the returns to investment, this project seeks to combine econometric analysis with dynamic-recursive, country-level CGE models wherever possible. The next section outlines the conceptual and methodological content of this book.

IV. Content of the Book

This book begins with three background papers on the current state of knowledge about poverty and public policy in the Arab region, which establish the context for the set of five country-level case studies that follow. Ali reviews the existing knowledge on poverty in the Arab region in Chapter 2, touching on both measurement methodology and current evidence.

He notes that the studies in this chapter, and in the book as a whole, used the dominant money-metric approach to poverty measurement.[6]

As well, all studies used the cost-of-basic-needs method of calculating poverty lines, estimating the non-food component by Engel curves. In Chapter 3, Laabas and Limam estimate a simultaneous equation model with three endogenous variables, namely growth, inequality, and poverty, for a sample of 77 countries. They highlight the insights into regional-level trends that the cross-country regression methodology can provide. Babiker focuses on a second useful methodology in Chapter 4, where he provides a road map for conducting poverty analysis using a Computable General Equilibrium (CGE) framework for a typical Arab country.

Chapters 5-9 present the case studies examining the relationship between public spending, growth, and poverty reduction in five Arab countries: Egypt, Morocco, Sudan, Tunisia and Yemen. The case study countries were selected to capture some of the diversity of the region: they represent different stages of development, economic structure, poverty rates, and reliance on the rural, agricultural sector. At the same time, they all are either Diversified Economies or Primary Export Economies. Poverty is expected to pose a development problem in all of the Arab countries with these types of economies, and the sample represents five out of the ten Arab countries falling into these categories.

Chapter 5, authored by Fan, Al-Riffai, El-Said, Yu and Kamaly, presents the case study on Egypt. Egypt, a Diversified Economy, was chosen because it has one of the highest poverty rates among middle-income countries, and a large rural sector as a percentage of the overall economy. The chapter describes the Egyptian context by reviewing recent trends in economic and agricultural growth, poverty, and sector-specific public expenditures. Following this background, the authors use both econometric analyses and CGE modeling at the household, sector/regional, and macro level to assess the effects of various types of government spending on growth and poverty reduction and the trade-offs between these two goals. At the macro level, particular attention is paid to simulating how Egypt can achieve the Millennium Development Goals by reforming its public spending policy.

Tohami and Rockmore present the case study on Morocco in Chapter 6. Morocco was chosen because its striking disparity in rural and urban poverty rates hints at the underlying inequality in basic infrastructure. It also holds important lessons for policymakers trying to balance growth and equity goals as it is rapidly liberalizing trade with U.S. and EU, while also managing high rates of unemployment. After reviewing poverty and macroeconomic dynamics over the past several decades, the authors use

---

[6] While those who experience and study poverty know that it is a complex and multi-faceted condition, for research purposes material deprivation is often considered both the key constituent of poverty and a proxy for the wide array of other aspects involved.

economic and statistical optimization approaches to examine the impact of public policies on the evolution of both household and regional poverty in Morocco.

Chapter 7, authored by Mahran, presents the case study on Sudan. Sudan was chosen because it is both an Arab and a sub-Saharan African country and because it hosts one of the highest poverty rates in the world. It holds lessons about the public policy challenges in a country fraught with civil war. The chapter reviews the growth performance of the country since the 1970s and discusses trends in public policy with emphasis on the growth of major macro aggregates. With respect to poverty, the chapter notes the highly binding data constraint in the country due to security reasons related to the civil war that has been going on since 1983. Due to this binding data constraint, the approach adopted in the chapter involved two stages: in the first stage province-level data is used to estimate the relationship between poverty and its determinants (mean income and inequality); in the second stage, annual time-series data collected at the national level is used to estimate the relationship between real per capita income and some public policy variables for the period 1971-2002. These relationships are then used to identify the public policy variables with significant effects on income growth and income distribution, and therefore on poverty reduction.

Chapter 8, authored by Bibi and Chatti, is on Tunisia. Tunisia represents a Diversified Economy that has enjoyed very strong progress in human development. With dedicated government investment, extreme poverty is no longer a serious concern in the country, but economic vulnerability remains. Using a dynamic CGE model for the period 1998-2015, the authors simulate the poverty affect of various changes to government policies: trade liberalization accompanied by increased consumption taxes; consumer food subsidy (a universal program); direct cash transfers to the needs (a targeted program); and conversion of food subsidies to public spending on infrastructure, education, and health.

In Chapter 9 Chemingui builds a dynamic CGE model for Yemen. Yemen was chosen because it has the highest poverty rate on the Arabian Peninsula and nearly three-quarters of its population is employed in agriculture or herding. The analysis develops a baseline scenario for the economy while projecting poverty trends to 2016. Alternative policy scenarios are compared in order to isolate the specific impact of public policy on poverty changes. The alternative scenarios assume an increase in public spending devoted to three priority areas (agriculture, education, and health) which affect the economy through an increase in sectoral, or economy-wide, total factor productivity (TFP).

The final chapter synthesizes the book, draws lessons from regional and country case studies, and points out the knowledge gaps.

References

Abed, George and Hamid Davoodi. (2003) Challenges of Growth and Globalization in the Middle East and North Africa. Washington, D.C.: International Monetary Fund.

Adams, Richard and John Page. (2003). Poverty, Inequality and Growth in Selected Middle East and North Africa Countries, 1980-2000. *World Development*31(12): 2027-2048.

Chen, Shaoshua and Martin Ravallion. (2004) How Have the World's Poorest Fared since the Early 1980s? *The World Bank Research Observer* 19(2):141-169.

Deacon, R.T. (1978). A demand model for the local public sector. Review of Economics and Statistics vol 60: 1980-202.

Dunne, J.P. and R.P. Smith. 1984. The allocative efficiency of government expenditure: some comparative tests. *European Economic Review* vol 20: 381-394

Fan, S., and Rao, (2003). Public Spending in Developing Countries: Trends and Impacts. EPTD Discussion Paper no. 99. Washington DC: International Food Policy Research Institute.

Fan, S., Zhang, L., and X. Zhang. (2002) Growth Inequality, and Poverty in Rural China: The Role of Public Investments. IFPRI Research Report no. 125. Washington DC: International Food Policy Research Institute.

Fan, S., Hazel, P., and S. Thorat. (1999). Linkages Between Government Spending, Growth and Poverty in Rural India. IFPRI Research Report no. 110. Washington DC: International Food Policy Research Institute.

Haynes, K. and S. Grosskopf. 1984. The role of functional form in estimating the demand for local public goods. Review of Economics and Statistics 66: 63-179.

Tridimas, G. 2001. The economics and politics of the structure of public expenditure. Public Choice vol. 106 (3-4):299-316.

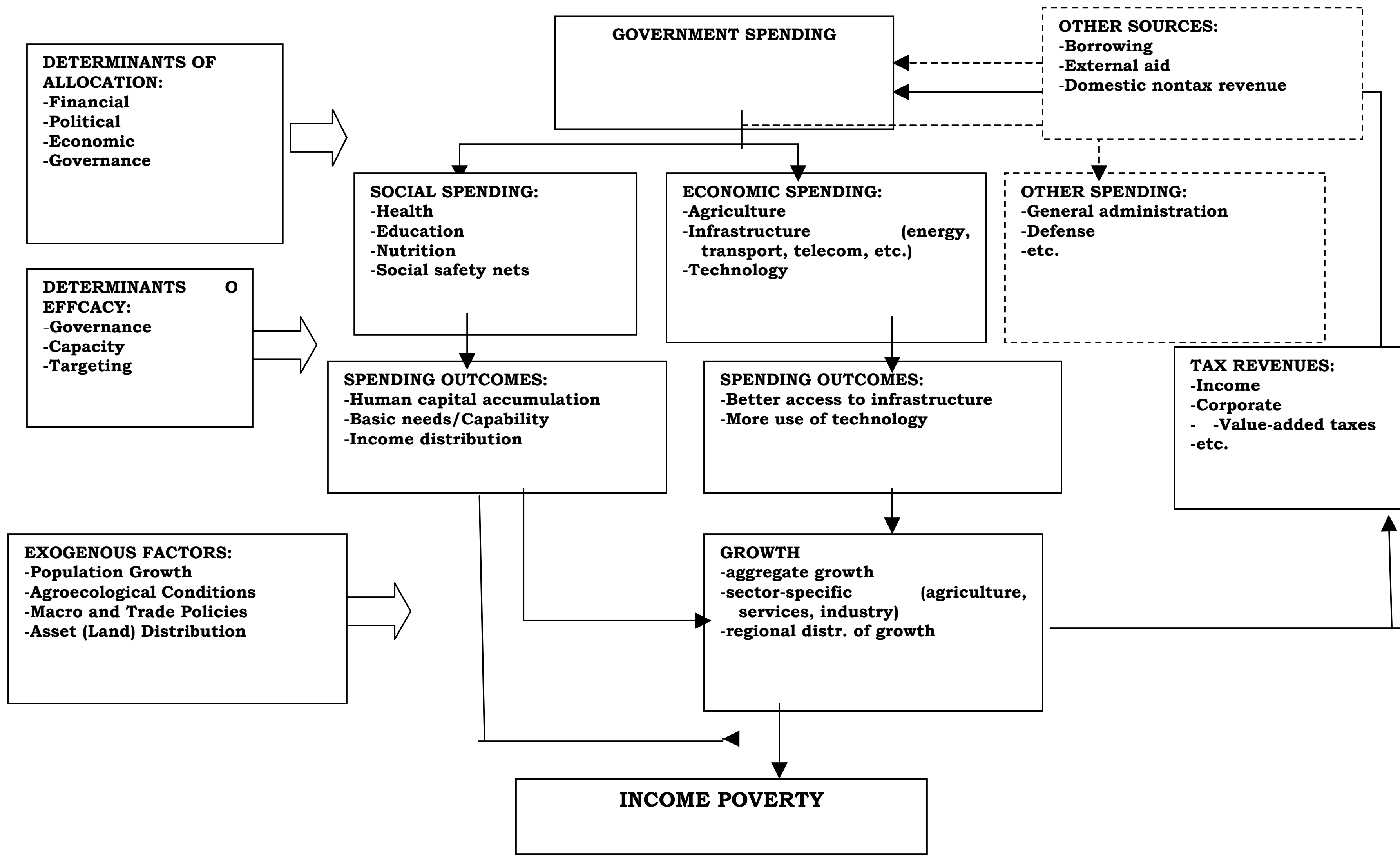
Walters, E. and M. Auriol. 2005. The marginal cost of public funds in Africa. Mimeo, World Bank, Washington

United Nations Development Programme. (2002) Arab Human Development Report 2002: Creating Opportunities for Future

Generations. New York: United Nations Development Programme.

World Bank, (2004) *Unlocking the Employment Potential in the Middle East and North Africa: Toward a New Social Contract.* Washington, D.C.: The World Bank.

Figure 1: Conceptual Framework: Effects of Public Expenditures



Chapter Two

Poverty in the Arab Region: A Selective Review

Ali Abdel Gadir Ali

I. Introduction:

This paper is written in the context of a research project on "public policy and poverty reduction in the Arab region". The recent resurgence of interest in matters relating to poverty reduction is due to the articulation of the Millennium Development Goals (MDGs) by the United Nations in the context of its Millennium Summit held in New York 2000. Prior to the Millennium Summit poverty reduction goals were articulated by the OECD in the form of the International Development Goals (IDGs). In this respect, and in a foreword to the report titled "A Better World for All", the representatives of the international community declared that poverty "in all its forms is the greatest challenge to the international community. Of special concern are 1.2 billion people living on less than $1 a day and the additional 1.6 billion living on less than $2 a day. Setting goals to reduce poverty is an essential part of the way forward". The "foreword" is signed by Mr. Kofi Annan, the Secretary-General of the United Nations (UN); Mr. Donald J. Johnston, the Secretary-General of the Organization for Economic Co-Operation and Development (OECD); Mr. Horst Kohler, the Managing Director of the International Monetary Fund (IMF); and Mr. James D. Wolfenson, the President of the World Bank Group (see the website: www.paris21.org/betterworld).

According to the United Nations (2002: 8) the "development goals set out in the Millennium Declaration express the resolve of the world's political leaders to free their fellow men, women and children from the abject and dehumanizing conditions of extreme poverty, to make the right to development a reality for everyone, and to free the entire human race from want"[1]. In the UN analysis the world is divided in such a way that one sixth of humanity has achieved levels of well-being that are very affluent by any standard. At the other extreme, another one sixth of humanity "struggles for daily survival, in a life-and-death battle against disease, hunger and environmental catastrophe". An estimated four billion people live in between these two extremes of affluence and

[1] See UN (2002), Implementation of the United Nations Millennium Declaration: Report of the Secretary-General; report no. A/57/270; page 8; www.un.org.

poverty, but their standards of living are judged to be relatively far below those enjoyed by the affluent group of countries.

In addition to the reduction of the proportion of people living below one US$ a day per person by half by the year 2015, five broad goals for social development have been identified. These include: the attainment of "universal primary education in all countries by 2015"; elimination of "gender disparity in primary and secondary education by 2005"; "the death rates for infants and children under five years should be reduced in each developing country by two thirds between 1990 and 2015"; "the rate of maternal mortality should be reduced by three quarters between 1990 and 2015"; and, "access should be available through the primary healthcare system for all individuals of appropriate ages, no later than 2015".

A seventh goal on environmental sustainability requires that "there should be a current national strategy for sustainable development, in the process of implementation, in every country by 2005, so as to ensure that the current trends in the loss of environmental resources are effectively reversed at both global and national levels by 2015". A final MDG is formulated for forging a global partnership for development.

The $1 and $2 a day per person noted by the representatives of the international community are known, in the dominant approach to the measurement of poverty, as the international poverty lines. The 1.2 and 1.6 billion people express the incidence of poverty in terms of the number of poor people. As a proportion of total population these numbers become the poverty head-count ratio. The goals under social development have to do with looking at poverty as capability deprivation; and all the goals taken together have to do with the quality of human lives. Section (II) of this chapter will present a brief review of the various approaches to the measurement of poverty with emphasis on the dominant methodology.

Section (III) presents evidence on the diversity of Arab countries and notes that, in the context of the dominant methodology to the measurement of poverty, the six Gulf Cooperation countries are not likely to have a poverty problem to speak of. The remainder of Arab countries comprise middle, and low, income countries where poverty could present a development problem that needs addressing by public policy. Six of these countries have been identified for study under this project: Egypt, Jordan, Morocco and Tunisia, representing middle income countries; and, Sudan and Yemen, representing low income countries.

Section (IV) deals with issues relating to inequality in the distribution of income in the Arab region. On average, and compared to other regions of the developing world, it is shown that the Arab region boasts a degree of inequality in the medium range. Over time, however, the evidence shows a declining trend in inequality in the region. Section (v) presents the evidence on poverty on the basis of international estimates of poverty in the Arab region. According to these estimates the region boasts the lowest degree of incidence of poverty. These estimates, it is noted, do not seem to conform of casual observations.

Section (VI) presents estimates of poverty based on national poverty lines for the Arab countries for which such information is available. As will become clear such results are reported for all six Arab countries in the project, except Sudan for which no high quality data is as yet available due to the civil war of 1983-present. Section (VII) offers some concluding remarks in response to the question: what do we know about poverty in the Arab region?

II. Methodological Issues:

2.1. Approaches to the Study of Poverty:

Three broad approaches to the measurement, and study, of poverty can be distinguished. The most widely used approach is the quantitative, money metric, approach. This approach looks at the issue of poverty in the context of welfare comparisons where welfare is defined on income or consumption expenditure as reflecting the standard of living enjoyed by individuals. Detailed discussion of this approach will follow in sub-section (3.2) below.

The second approach is that of capability which broadens the concept of the welfare of an individual to include fundamental freedoms in addition to the commodity dimension of welfare. The third approach is one that searches for the meaning of poverty by asking the poor themselves and is known as the participatory poverty assessment approach. A few comments on these two approaches are in order.

Descriptive poverty studies make a lot of use of the aggregate correlates of poverty such as life expectancy at birth (as a proxy for health status in a society) and school enrolment ratios (as a proxy for educational achievements). The use of these aggregate measures can be justified on a theoretical basis by resorting to Professor Sen's concepts of entitlements, capabilities and achievements. In contrast to the dominant approach to the measurement of poverty, which takes per capita consumption as the relevant indicator of the standard of living, the capability approach takes various kinds of freedom as the relevant indicators of the standard of living. In a recent articulation of this approach it is noted that "in analyzing social justice, there is a strong case for judging individual advantage in terms of capabilities that a person has, that is the substantive freedoms he or she enjoys to lead the kind of life he or she has reason to value. In this perspective, poverty must be seen as the deprivation of basic capabilities rather than merely the lowness of incomes”[2]. Deprivation of elementary capabilities can be reflected in, among others, premature mortality, under-nourishment, morbidity and illiteracy. An example of applying such an approach is to be found in the Human Development Index of the UNDP.

In its relation to the dominant approach to poverty analysis, it is perhaps important to note that the capability approach does not deny that “deprivation of individual capabilities can have close links to the lowness of income, which connects in both directions: (1) low income can be a major reason for illiteracy and ill health as well as hunger and malnutrition, and (2) conversely, better education and health help in the earning of higher income”[3]. This type of relationship between the two prompted the observation that they are complementary[4].

Having noted the above on the capability approach to poverty analysis we can now turn to the participatory approach to the study of poverty. This approach was popularized largely by the work of development practitioners who were involved in assessing development projects at the field level[5]. The basic premise underlying this approach is that the poor know more than anybody else about their realities, priorities and most of all the remedies to get out of the poverty trap. As a result, the information collection process differs substantially from that of representative household surveys on which the money metric approach relies. Thus under this approach it is the poor who are involved in providing non-quantitative information about poverty in the selected community through graphic presentation, anecdotes, social mappings, case stories, life histories, and local history.

Perhaps the most extensive application of this approach was the study undertaken by the World Bank in preparation for the “World Development Report 2000/2001: Attacking Poverty”. The study brought together experiences of over 60 thousand poor women and men from 60 countries around the world. The results of the study have been published in three volumes[6]. The results are hailed as demonstrating the multidimensional nature of poverty in the sense that “when poor people speak about well-being they speak about material, social,

---

[2] Sen (1999:87).

[3] Sen (1999: 19).

[4] See Ravallion (1998).

[5] For the origin of the participatory approach to development see, among others, Chambers (1994 and 1997) and Blackburn and Holland (1998-a and b).

[6] See Narayan et al (2000-a and b) and Nararyan et al (1999).

physical, psychological, and spiritual dimensions, in addition to security and freedom of choice and action. Conversely, poverty and ill-being are the lack of material well-being, insecurity, social isolation, psychological distress, and lack of freedom of choice and action"[7].

Despite the richness of the participatory approach to poverty assessment, however, a careful reading of the selected quotations from poor people around the world would show that material deprivation was central to the perceptions of poor people about the nature of poverty[8]. In a technical sense, therefore, the social, physical, psychological, insecurity, and lack of freedom of choice and action dimensions of poverty can be viewed as functions of the standard of living as summarized by mean per capita consumption in a given society. Thus an analytical framework based largely on the dominant money metric approach to the study, and measurement, of poverty is not likely to wildly off the mark.

2.2. Poverty Measurement:

We note at the outset of this sub-section that a vast technical literature that has developed[9] in the context of the dominant money-metric approach to poverty measurement. As such, therefore, the following discussion will be highly selective emphasizing a number of issues that are directly relevant to the review of the results on poverty in the Arab region.

As is well known, under the money metric approach, the first step taken towards measurement is to agree on a relevant measure for the standard of living. A relevant standard for countries in the developing world is per capita consumption expenditure (including the consumption of own production). In advanced countries it is income that is taken as the relevant measure of the standard of living. Given agreement on the measure of the standard of living, there are a number of methods to

---

[7] Narayan (2000).

[8] For a application of this approach in an Arab country see El-Issawy (1998) who applied a version of the approach to the case of Egypt.

[9] Sen (1976) pioneered the theory of poverty measurement by identifying a set of axioms that need to be satisfied by poverty measures. The literature that followed is indeed extensive as reviewed by Zheng (1997 and 2000). In Zheng (2000) seventeen axioms and sixteen poverty are identified. Of the sixteen poverty measures four are found to satisfy all seventeen axioms (these are the Foster-Greer-Thorbecke (1984), Watts (1968), and Hagenaars-Dalton measure and Hagenaars (1987)); two are found to satisfy sixteen out of the seventeen axioms (these are the Chakravarty (1983) ethical measure and the Clark, Hemming and Ulph (1981) sub-group consistent measure). At the other extreme, the head-count ratio is found to satisfy eight axioms while the poverty-gap ratio is found to satisfy eleven axioms.

determine the threshold of deprivation below which a person can be identified as poor. This threshold is commonly known as the poverty line.

There is general agreement that the relevant method for determining poverty lines for developing countries is the cost of basic needs. This method involves identifying a typical diet for the poor that is necessary for leading a healthy life. Healthy life is defined in terms of nutritional requirements using WHO and FAO nutritional requirements (recommended daily allowances e.g. 2500 calories per adult per day). Required quantities of the goods supplying the required calories are appropriately priced to arrive at a monetary value defining a food poverty line. By adding to this amount the cost of other requirements needed by individuals to live in a social context (e.g. the cost of clothing, shelter, education and medicine) an overall poverty line can be estimated[10].

While the international debate has been conducted in terms of a fixed poverty line (e.g. $1 dollar per day) applied to all countries and over time, there is increasing realization that poverty lines should vary among countries depending on the level of development. This is tantamount to saying that, in general, the poverty line will be expected to be a function of the standard of living. Indeed, allowing the poverty line to change with the standard of living has been the practice in Europe in contrast to the practice in the US where the poverty line was held fixed for a long period of time[11].

Having obtained the poverty line, an immediate measure of poverty is the ratio of the poor thus identified to the total population in a given society. This is the well-known head-count ratio. It is the most widely used, and easily understood, measure of poverty. Thus, for example, the international development goal on poverty is to reduce the head count ratio to half its current level by the year 2015. The head-count ratio measures the spread, or incidence, of poverty in a given society. Another useful poverty measure is the poverty-gap ratio, which takes into account the extent to which consumption of the poor falls below the poverty line. It measures the depth of poverty in a society. Using the

---

[10] Note that this method was applied rigorously since the turn of the 20th century in the famous contribution of Rowntree (1901), but the concept itself would be as old as when people started worrying about poverty.

[11] See Atkinson (1999) for the practice in Europe, and Citro and Robert (1995) for the debate on the desirability of allowing the poverty line to change with the standard of living in the US . In a recent comment Streeten (2001: 89) notes that poverty lines "are dynamically defined and rise with rising average incomes". Moreover, he argues that it is important to "note that not all poverty resulting from rising average incomes is relative; absolute poverty can also result from higher average incomes". Ravallion (1998) provides a microeconomic foundation for a poverty line that changes with income where the utility function of a representative agent is defined on own income and the ratio of own income relative to mean income. Also see Foster (1998).

head-count ratio and the poverty-gap ratio together one can immediately obtain the average income of the poor[12]. As is well known these two measures are special cases of a general class of additively separable poverty measures. The Foster-Greer-Thorbecke, FGT, measure is given by[13]:

(1) $P_\alpha = 1/n \sum [(z - y_i)/z]^\alpha$;

In the above equation the summation is over q poor people, n is total population, z is the poverty line, y_i is the consumption expenditure of the i^{th} poor person, and α is a non-negative poverty aversion parameter. When α=0 the equation gives the head-count ratio denoted by P_0 or H and is given by:

(2) $P_0 = H = q/n$

When α=1 the equation gives the poverty-gap ratio, denoted by P_1 and is given by:

(3) $P_1 = H\,(1 - y_p/z)$

Where y_p is the mean consumption expenditure of the poor. Note that with equations (2) and (3) the average consumption expenditure of the poor can easily be calculated as:

(4) $y_p = z\,(1 - P_1/H)$

The average consumption expenditure of the poor can also be used as an alternative measure of the depth of poverty.

To be able to identify the poor information on the distribution of consumption expenditure, or income, in the society is needed. This information is usually obtained from household budget, or expenditure, surveys. Such surveys, like population censuses, are very expensive to conduct in a rigorous fashion and as a result such information is usually lacking in developing countries, especially on a time series basis (but India is an exception in this regard). For Africa such information has only recently been made available for a limited number of countries.

In general, any poverty measure (call it P) could be expressed as depending on mean consumption expenditure in society, the poverty line and on a measure of the underlying inequality in the distribution of

---

[12] For the technical formulation of these measures see equations (2) and (3) below.

[13] See Foster, Greer and Thorbecke (1994).

consumption. Thus, in general form any poverty measure can be expressed in the following form:

$$(5)\quad P = P(z, \mu, \theta) = P(\mu/z, \theta)$$

where μ is mean consumption expenditure, z is the poverty line and θ is a measure of the inequality in the distribution of consumption expenditure usually taken as the Gini coefficient. The theoretical restrictions on the above general form are such that as per capita consumption increases (poverty line declines), other things remaining the same, poverty declines. Similarly, as inequality in the distribution of consumption expenditure declines, other things remaining the same, poverty declines. Note that in this general formulation if the poverty line changes by the same rate of change as mean consumption expenditure, other things remaining the same, poverty does not change[14]. Note also that if the poverty line is set as a constant proportion of mean consumption expenditure, then poverty changes will only depend on the change in the distribution of consumption expenditure[15].

In the context of the above general form of the poverty measure the percentage change in poverty over time, G(P) can easily be derived. Clearly if the poverty line does not change over time, then percentage changes in poverty will depend on the growth rate of per capita income and the percentage change in the Gini coefficient, each appropriately weighted by the elasticity of the poverty measure with respect to each of them. For generality, however, we assume that the poverty line is a function of per capita income with an elasticity of ε, which ranges between zero and unity. Using the second equality in equation (5) it is an easy matter to establish that the percentage change in poverty is given by the following equation:

$$(6)\quad G(P) = (1-\varepsilon)\, \eta\, G(\mu) + \nu\, G(\theta) = \eta^*\, G(\mu) + \nu\, G(\theta)$$

where η and ν are the elasticities of the poverty measure with respect to per capita income and the Gini coefficient respectively, and where $\eta^* = (1-\varepsilon)\,\eta$ is the poverty line adjusted elasticity of the poverty measure with respect to per capita income. Equation (6) gives a general formulation for the decomposition of the percentage change in poverty into a growth component and a distribution component.

[14] This is the property of zero homogeneity of the poverty measure with respect to mean consumption expenditure and the poverty line. This property is thought to hold for most of widely used poverty measures.

[15] This can easily be established by direct substitution in equation (5).

If, as seems reasonable for developing countries, it is assumed that the Gini coefficient is a function of per capita income along the lines of the famous Kuznets' hypothesis, then $G(\theta)$ can be expressed in terms of the rate of change in per capita income and a Kuznets elasticity, κ. As is well known the Kuznets' hypothesis asserts that at early stages of development, represented by a low per capita income, the degree of inequality in the distribution of income tends to increase with the increase in per capita income before it begins to decline[16]. This immediately implies that the Kuznets elasticity is expected to be positive at early stages of development (i.e. for low per capita incomes) and negative at later stages of development (i.e. for high per capita incomes). The turning point for the Kuznets curve (i.e. the per capita income level beyond which inequality begins to decline) can be estimated. On the basis of this the percentage change in poverty given by equation (6) can be written as follows:

$$(7) \quad G(P) = (1-\varepsilon)\, \eta\, G(\mu) + \nu\, \kappa\, G(\mu) = [\, \eta^* + \nu\, \kappa]\, G(\mu)$$

Seventh, if it is believed that the inequality in the distribution of consumption expenditure, and the poverty line, depend on mean consumption expenditure in society, then a powerful, yet simple, relationship between poverty and economic growth can be established. Note that in this case the poverty measure will be given by:

$$(8) \quad P = P(\mu/z, \theta) = P(\mu/z(\mu), \theta(\mu)) = P(\mu)$$

This relationship says that changes in poverty over time can always be calculated as a product of the elasticity of poverty with respect to mean consumption expenditure, after taking into consideration changes in the distribution of consumption expenditure, and the rate of change in mean consumption expenditure. The percentage change in poverty over time is given by:

$$(9) \quad G(P) = \gamma\, G(\mu)$$

The elasticity involved, γ, is the "growth elasticity of poverty" and it can be estimated or calculated. Such a relationship is important for the purposes of looking at the goal of poverty reduction over time.

---

[16] For the Kuznets' hypothesis see Kuznets (1955). For the empirical literature see Ahluwalia (1976), Ananad and Kanbur (1993-a & b), Jha (1996), Fishlow (1996), Sarel (1997), Bulir (1998), Bruno, Ravallion and Squire (1998), Millanovic (1999) and Barro (2000). Except for Bruno et al (1998) and possibly Ananad and Kanbur (1993), all others established the existence of a Kuznets curve.

2.3. Measuring Pro-Poor Growth:

In a recent paper Kakwani and Pernia (KP) (2000) proposed a measure for pro-poor growth based on a decomposition methodology similar to that presented by equation (6) above. Two major differences between equation (6) and the approach followed by Kakwani and Pernia (2000) need to be noted. The first is that while equation (6) presents the decomposition in a continuous fashion, Kakwani and Pernia work out their proposed formula for percentage changes in poverty between two periods. This not a major difference in view of the fact that the continuous changes in equation (6) can easily be translated into appropriate discrete changes for two periods. The second difference is that KP assume that the poverty line is fixed at the initial period's level and thus does not change over time. This is a major difference in view of the fact that keeping the poverty line fixed over time tends to underestimate poverty in growing economies and to overestimate it in declining economies, for a given distribution of expenditure. In technical terms such a procedure implies that the elasticity of the poverty line with respect to per capita income is zero and hence $\eta^* = \eta$.

Thus, without getting involved in the details of KP derivation what needs to be noted is their definition of the index of pro-poor growth, Φ, as the ratio of the growth elasticity of poverty to the partial elasticity of the poverty measure with respect to per capita income as follows:

(10) $$\Phi = [\gamma \;/\; \eta^*] = [(\eta^* + \nu\ \kappa)/\ \eta^*] = [1 + (\nu\ \kappa/\ \eta^*)]$$

Recalling the fact that (η^*) is negative, it is noted that the value of the index will be greater than unity if ($\nu\kappa$) is negative, "which means that growth is strictly pro-poor" (KP (2000: 13). Without claiming too much for our alternative decomposition methodology it needs to be noted that in KP the reason for why ($\nu\kappa$) should be negative is not explicitly noted. In equation (10) the obvious reason for this to be the case is that the country in question is on the declining arm of a Kuznets curve such that the Kuznets' elasticity, κ, is negative.

KP (2000: 13) suggest ranges for judging the degree of pro-poor growth according to the value of the index: negative values imply that growth is anti-poor; positive values that are equal to or less than 0.33 imply that growth is weakly pro-poor; values in excess of 0.33 and equal to, or less than, 0.66 imply that growth is moderately pro-poor; values in excess of 0.66 but less than unity imply that growth is pro-poor; and, values equal to, or in excess of, unity imply that growth is highly pro-poor.

Given KP's definition of the index it is not very clear why is this a measure of pro-poor growth. Note the index is defined on the basis of the total percentage change in poverty relative to the partial percentage in poverty as a result of a percentage change in per capita income. The elasticities defining these percentage changes relate to the fundamental determinants of poverty and hence relate to the nature of poverty in the country rather than to the nature of the growth process taking place. In defining the fundamental relationship of a poverty measure it is already required that growth is expected to reduce poverty, for a given distribution. The total change in poverty captures not only the effect of growth but also that of distribution inclusive of the effect of growth on the distribution itself. Once again this total effect relates to structural characteristics of poverty or the economy in question.

III. Diversity of the Arab Countries:

The Arab countries have very diverse characteristics in such key areas as the structures of economies, level of development, geographic location, and type of governance and institutions. To highlight the economic diversity of the region, ERF (1998) grouped the countries of the region into four broad categories[17]: mixed oil economies (MOE: Algeria, Iraq and Libya); Oil Economies (OE), which include the countries of the Gulf Cooperation Council of Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and UAE; diversified economies (DE: Egypt, Jordan, Lebanon, Morocco, Syria and Tunisia); and, primary export economies (PEE: Comoros, Djibouti, Mauritania, Somalia, Sudan and Yemen)[18].

Excluding Comoros and Somalia, the 2001 distribution of population and GDP (at current prices) over these country groups is shown in table (1). The table shows that DE accounted for 46.5% of population and 26.6% of GDP; MOE accounted for 22.7% of population and 23.6% of GDP; PEE accounted for 19.4% of population and only 3.3% of GDP; while OE accounted for only 11.5% of population and 46.5% of GDP. Intra-Arab diversity is also captured by differences in per capita GDP for 2001. Not surprisingly, OE ranks top on this scale with a per capita GDP of about US$10.3 thousand, followed by MOE (US$2.7 thousand). DE ranks third with a per capita GDP of US$1.5 thousand while PEE's per capita GDP amounted to only US$408. The same diversity is captured by per capita private consumption expenditure (PCE per capita) for 2001. For the OE

[17] For lack of adequate data at the time Palestinian territories, Somalia and Comoros were not included in the classification. We note in passing that such a classification scheme remains arbitrary but can be useful for the purposes of the analysis.

[18] Such classification is slightly different from that used by the World Bank in its World Development Reports which uses gross national income (GNI) per capita. High income group is that with GNI per capita of US$9.2 thousand or more (Bahrain, Kuwait, Qatar, and UAE); upper middle income group is that with GNI per capita range between about US$3.0-US$9.2 thousand (Lebanon, Libya, Oman, and Saudi Arabia); lower middle income group is that with GNI per capita in the range US$0.75-US$ 3.0 thousand (Algeria, Djibouti, Egypt, Iraq, Jordan, Morocco, Syria, Tunisia, and Yemen); and, low income group is that with GNI per capita of about US$0.75 thousand or less (Comoros, Mauritania, Somalia, and Sudan). See, for example, World Bank (2003: 243).

PCE per capita amounted to about US$4.1 thousand, implying an expenditure of US$11.2 per person per day, while that for MOE amounted to US$1.4 thousand (US$3.8 per person per day). For the DE PCE per capita amounted to US$1.1 thousand (implying a per person per day expenditure of about US$2.9), while for the PEE group PCE per capita amounted to US$328 (US$0.9 per person per day).

Table (1)
Population, GDP and Private Consumption Expenditure in Arab Countries 2001

Country/ Country Group	Total Population (million)	Population Share (%)	GDP (US$ billion)	GDP Share (%)	Per Capita GDP (US$)	Private Consumption Expenditure (PCE: US$ billion)	Per Capita PCE (US$)
Egypt	64.7	23.23	91.1	12.80	1408	70.8	1094
Jordan	5.2	1.87	8.8	1.24	1692	6.5	1250
Lebanon	3.8	1.37	16.7	2.35	4395	13.1	3447
Morocco	29.2	10.49	33.5	4.71	1147	20.5	702
Syria	16.8	6.03	19.2	2.70	1143	13.1	780
Tunisia	9.7	3.48	20.1	2.83	2072	12.1	1247
Diversified Economies	**129.4**	**46.46**	**189.4**	**26.62**	**1464**	**136.1**	**1052**
Algeria	32.9	11.81	54.7	7.69	1663	23.8	723
Iraq	24.5	8.80	81.0	11.38	3306	48.0	1959
Libya	5.8	2.08	32.1	4.51	5535	15.8	2724
Mixed Oil Economies	**63.2**	**22.69**	**167.8**	**23.58**	**2655**	**87.6**	**1386**
Bahrain	0.7	0.25	7.9	1.11	11286	3.8	5429
Kuwait	2.2	0.79	32.8	4.61	14909	15.7	7136
Oman	2.4	0.86	20.0	2.81	8333	8.2	3417
Qatar	0.6	0.22	16.2	2.28	27000	3.3	5500
Saudi Arabia	22.8	8.19	186.5	26.21	8180	68.3	2996
UAE	3.3	1.18	67.8	9.53	20546	31.5	9546
Oil Economies	**32.0**	**11.49**	**331.2**	**46.54**	**10350**	**130.8**	**4088**
Djibouti	0.7	0.25	0.6	0.08	857	0.4	571
Mauritania	2.7	0.97	1.0	0.14	370	0.8	296
Sudan	31.6	11.35	12.5	1.76	396	10.5	332
Yemen	18.9	6.79	9.1	1.28	482	6.0	318
Primary Export Economies	**53.9**	**19.36**	**23.2**	**3.26**	**430**	**17.7**	**328**
Total	**278.5**	**100.00**	**711.6**	**100.00**	**2555**	**372.2**	**1336**

Source: League of Arab States et al (2002: annex tables 2.5, p. 237; and 2.7, p. 239).

Within each group per capita PCE varies also. Thus, for example, for OE the highest PCE per capita is recorded for United Arab Emirates (US$26.2 per person per day) while the lowest is recorded for Saudi Arabia (US$8.2 per person per day). In the MOE the highest PCE is recorded for Libya (US$7.5 per person per day) while the lowest is recorded for Algeria (US$2 per person per day). The DE group also records a wide variation with five countries having an average PCE that varies between US$3.4 to US$1.9 per person per day while Lebanon had an average of US$9.4 per person per day, with the lowest US$1.9 average recorded for Morocco.

Using the above information on PCE per capita, the indicative international poverty lines of one and two dollars per person per day, and pending further information on the distribution of PCE in the various countries, it is reasonable to expect that poverty, appropriately defined, should be expected to pose a development problem in all of the Arab countries of the DE group, the PEE group and possibly Algeria of MOE group. Six of these countries have been selected for the study of public policy and poverty reduction in the Arab region: Egypt, Jordan, Morocco, Sudan, Tunisia and Yemen. In what follows emphasis will be on these six countries as representing the Arab region.

IV. Inequality in Distribution of Consumption Expenditure:

As a prelude to the discussion of poverty in the Arab region, it is perhaps important to look at the degree of inequality in the distribution of consumption expenditure and its development over time in the region. Using the Gini coefficient, and based on the most recent available high quality data, table (2) reports a comparison among world regions. The table, adapted from Deininger and Olinto (2002), adopts the standard World Bank classification of world regions. The Middle East and North Africa region of the World Bank is represented in the Deininger and Squire (1996) high quality data set by six Arab countries. The table summarizes the degree of inequality for various regions over five five-year periods (1966-1990) and as such it provides a highly aggregated picture. Nonetheless, it will be helpful to compare the Arab region with regions in the world in terms of the level and trend of income inequality.

Table (2)

Income Inequality in the Arab Countries and World Regions 1966-1990 (Gini Coefficients in percentages)

Region	Number of Countries	1966-70	1971-75	1976-80	1981-85	1986-90
Arab Countries	6	43.67	41.65	41.90	42.95	38.17
East Asia and Pacific	9	37.26	38.89	38.53	38.60	40.04
Latin America	17	57.24	50.93	49.77	49.06	50.16
North America	2	35.61	35.28	35.91	35.12	36.54
South Asia	4	33.30	33.32	35.37	36.68	33.57
Sub-Saharan Africa	7	39.00	-----	44.00	41.21	35.75
Western Europe	15	37.09	34.88	30.82	29.74	30.83
Sample	60	40.63	39.32	38.51	36.91	38.58

Source: Deininger and Olinto (2002: 23, table (1)).

The table shows that the Arab countries, as a group, ranked second to Latin America as the highest inequality region for the first two sub-periods as well as for the 1981-85 sub-period. During the sub-periods 1976-80 and 1986-90 the region ranked as the third highest inequality region. This is reflected in an average Gini coefficient for the distribution of consumption expenditure of about 44% compared to one of 57% for Latin America for the first sub-period. For the sub-period 1986-90 the Arab region's Gini coefficient of about 38% was the third highest with East Asia and the Pacific region ranking second highest (with a Gini coefficient of about 40%) and Latin America ranking as the highest inequality region (with a Gini coefficient of about 50%). We hasten to note that such comparison has to acknowledge the fact that for all regions, except Latin America and Western Europe and North America, the Gini coefficients are based on consumption expenditure rather than income. In this respect it is known that the distribution of expenditure is generally more equal than the distribution of income. Indeed Deininger and Squire (1996) advise researchers to upward adjust their expenditure based Gini coefficients by 6.6 percentage points to make them comparable to those based on income. Making such an adjustment, however, does not change the ranking of the regions. Making the adjustment the Gini coefficient of the distribution of income in the Arab countries becomes 50% for the first sub-period and about 45% for the last, which reflects a fairly high degree of inequality in the distribution of income[19].

In terms of inequality trends, the table shows that inequality in the Arab region recorded a declining trend with a decrease in the Gini coefficient from about 44% in the first sub-period to about 38% in the last sub-period, with a slight increase during the period 1971-1985. Declining inequality trends are reported for Latin America, Sub-Saharan Africa and Western Europe while increasing inequality trends are reported for East Asia and the Pacific and North America. Inequality in South Asia remained virtually the same. Noting that these results are based on averages over countries and that the Gini coefficient is not additively separable, the above should be interpreted with caution. However, the trend of declining inequality for Arab countries is confirmed by detailed official country information.

For five of the six Arab countries in this project recent information confirms the above trends. Thus, for example, El-Laithy, Lokshin and Banerji (2003: 24, table 3) report that the Gini coefficient for the distribution of consumption expenditure increased from 34.5% in

[19] It needs to be cautioned that such average comparisons are sensitive to the countries included in the sample and they should only be used as indications. Moreover, due to the fact that the Gini coefficient is not additively separable it is very difficult to compare their averages over countries. Alternative methodologies compute inequality measures from decile observations from various countries of a given region as will be noted below.

1995/96 to 37.8% in 1999/2000, thus recording an annual rate of increase of 2.31 percent per annum. For Jordan it is reported that the Gini coefficient declined from 40% in 1992 to 36.4% in 1997 thus recording an annual rate of decline of 2.33 per cent. Both these changes in the Gini coefficient can be considered quantitatively significant. By contrast, the changes for Morocco and Tunisia are quantitatively insignificant where for Morocco the recorded annual rate of increase is 0.13 per cent (from a Gini of 39.3% in 1990/91 to 39.5% in 1998/99) and where for Tunisia the recorded annual rate of decline is 0.48 percent (from a Gini of 41.7% in 1995 to 40.9% in 2000).

For both sets of countries, and given the short periods of time over which the above changes in the distribution of expenditure have occurred, and given the fact that the underlying structural factors affecting inequality are not likely to have undergone drastic changes over the same period, it is open to empirical investigation as to what might have caused such changes. One possible hypothesis worthy of testing is that perhaps changes in macroeconomic policy may be the cause. Almost all of these countries have experienced such macro policy changes during the indicated time periods. However, the precise ways in which macro policy changes affect income inequality are not theoretically well known, though the design and content, of most policy packages would suggest that their influence would be to worsen the state of expenditure distribution. An important component of these macroeconomic policy packages is that of trade policies designed to increase the degree of openness of these countries to the global market[20].

V. International Estimates of Poverty in the Arab Countries:

The most recent estimates on poverty in the Arab region are reported by Chen and Ravallion (2004; hereinafter CR). Drawing on a sample of 454 national sample surveys from 97 countries ("representing 93 percent of the population of all low-and middle-income countries), CR reported poverty results for the Arab region (in their terminology the Middle East and North Africa region). The most important methodological points to note about these new results are the following:

(a) the paper provides poverty estimates for the years 1981, 1984, 1987, 1990, 1993, 1996, 1999 and 2001 where all poverty and inequality measures are estimated from the primary survey data;

(b) the estimates are based on consumption figures in 1993 purchasing power parity (PPP) produced by the World Bank and

[20] For a possible explanation of the declining trend see Page and van Gelder (2002).

based on the 1993 International Comparison Project (IPC). On the basis of this an international poverty line in 1993 PPP is specified as the median of the lowest ten poverty lines in the poverty lines data set of Ravallion et al (1991) following the updating of the national poverty lines to the new PPP base. The updated poverty line is found to be $32.74 per person per month, or about $1.08 per person per day. The poverty line is kept constant over time[21];

(c) to estimate regional poverty at a given reference year surveys are lined up in time. For countries with one survey the Lorenz curve is assumed to remain unchanged and is used for all comparison years. When the reference date is between two surveys an appropriate weighted average poverty rate is estimated using the available information. Estimates for 1998 assume that the Lorenz curves remain unchanged for all countries that do not have a 1998 survey; and,

(d) in a significant departure from the 1991 results the authors report poverty results where the poverty line is allowed to change with income (but see Ravallion (1998)). The justification for reporting relative poverty results is given as the recent work by Atkinson and Bourguinon (1999). The procedure adopted is such that "people are deemed poor if they do not attain either the $ 1 a day consumption level or a given proportion of mean consumption. The constant of proportionality is set at one-third" (CR (2004: 148). Continuing their absolute poverty focus, however, the authors kept this "relative" poverty line constant "over time for each country. So these poverty lines are relative between countries but absolute over time" (CR (2004: 184).

In the sample of countries used six Arab countries are included to represent the Middle East and North Africa: Algeria (with two surveys in 1988 and 1995), Egypt (three surveys for 1991, 1995, and 2000), Jordan (three surveys 1987, 1992 and 1997), Morocco (three surveys 1985, 1990, and 1998/99), Tunisia (four surveys 1985, 1990, 1995 and 2000)

---

[21] On the updated 1993 poverty lines and consumption levels a regression model for the poverty line as a function of consumption expenditure was run with a new format as follows:

$$\ln z = \underset{(40.5)}{3.46} + \underset{(6.54)}{0.004}\,(c - c_{min}) - \underset{(-2.81)}{0.00000156}\,(c - c_{min})^2$$

with an R-squared of 0.88; where c_{min} is the lowest consumption per capita in the sample. Noting that the intercept of the above estimated equation gives the logarithm of the poverty line in the poorest country, the authors note that this implies a poverty line of $31.96 per person per month and note that "our $1.08 poverty line is a close approximation to the poverty line one would expect to find in the poorest country" (CR (2000: .6)).

and Yemen (two surveys 1992 and 1998)[22]. We note that the population of these countries represented about 56% of the total population of the Arab countries in 2002[23]. The results of the absolute poverty approach for the Arab countries are reproduced in the table below.

Table (3)
Head Count Ratios in the Arab and World Regions
(%; poverty line $1.08 per person per day in 1993 PPP)

Region	1981	1984	1987	1990	1993	1996	1999	2001
Arab Countries	5.1	3.8	3.2	2.3	1.6	2.0	2.6	2.4
East Asia	57.7	38.9	28.0	29.6	24.9	16.6	15.7	14.9
Eastern Europe and Central Asia	0.7	0.5	0.4	0.5	3.7	4.3	6.3	3.6
Latin America and the Caribbean	9.7	11.8	10.9	11.3	11.3	10.7	10.5	9.5
South Asia	51.5	46.8	45.0	41.3	40.1	36.6	32.2	31.3
Sub-Saharan Africa	41.6	46.3	46.8	44.6	44.1	45.6	45.7	46.4
Total	40.4	32.8	28.4	27.9	26.3	22.8	21.8	21.1

Source: Chen and Ravallion (2004: 152, table 3).

From the above results it is clear that the Arab region had the least poverty rate among all regions in the world starting in 1993. Prior to 1993 The Arab region was second to the Eastern Europe and Central Asia region in terms of the lowest head count ratio. Not only this, at a poverty line of $1.08 per person per day the Arab head count ratio for all years in the table is very insignificant to the extent that a claim to the effect that the region does not a have a poverty problem would be very credible. However, given the Arab countries in the sample, the nature of their economies and their growth records during the period such a claim will be hard to sell to ordinary Arabs having to devise all sorts of survival strategies to make ends meet. Such observations throw serious doubt about the so-called absolute poverty approach of choosing the poverty line in question and keeping it constant across countries and over time. When the poverty line is increased to $2.15 per person per day both the ranking and the magnitudes of the poverty results change, but then Sub-Saharan Africa results become equally unbelievable for ordinary Africans. Table (4) summarizes these results.

[22] Note that Iran is included in the MENA region. The results, however, can be used as representing poverty in the Arab countries in view of the fact that the six Arab countries accounted for about 71% of the 2002 total population of the seven countries in the MENA sample (as per UNDP (2004: 152- 155, table 5)).

[23] UNDP (2004: 155, table 5).

Table (4)
Head Count Ratios in the Arab and World Regions
(%; poverty line $2.15 per person per day in 1993 PPP)

Region	**1981**	**1984**	**1987**	**1990**	**1993**	**1996**	**1999**	**2001**
Arab Countries	28.9	25.2	24.2	21.4	20.2	22.3	24.3	23.2
East Asia	84.8	76.6	67.7	69.9	64.8	53.3	50.3	47.4
Eastern Europe and Central Asia	4.7	4.1	3.2	4.9	17.3	20.7	23.8	19.7
Latin America and the Caribbean	26.9	30.4	27.8	28.4	29.5	24.1	25.1	24.5
South Asia	89.1	87.2	86.7	85.5	84.5	81.7	78.1	77.2
Sub-Saharan Africa	73.3	76.1	76.1	75.0	74.6	75.1	76.0	76.6
Total	66.7	63.7	60.1	60.8	60.2	55.5	54.4	52.9

Source: Chen and Ravallion (2004: 152, table 3).

In the results of table (4) an average head-count ratio for the Arab countries of about 25% would be taken as a reasonable representation of reality of the early 2000s. Given such perceptions, a real poverty line of about 2.15 may be the right order of magnitude. Despite this, some would still consider the estimated poverty rate too low. Having noted the above, we now look at the quasi-relative poverty results reported by Chen and Ravallion (2004). We note, however, that the indicated poverty lines by region are from Chen and Ravallion (2000). Table (5) summarizes these results.

Table (5)
Quasi-Relative Poverty: Head-Count Ratios
in the Arab and World Regions (%)

Region	**Poverty Line ($/person /day)**	**1981**	**1984**	**1987**	**1990**	**1993**	**1996**	**1999**	**2001**
Arab Countries	1.78	37.4	33.4	21.8	19.3	17.6	17.2	18.3	16.9
East Asia	1.92	63.2	44.5	33.9	35.3	30.2	21.5	20.9	19.7
Eastern Europe and Central Asia	2.71	8.1	7.5	6.4	7.8	22.7	23.2	27.2	21.5
Latin America and the Caribbean	3.31	40.6	45.4	42.3	43.3	45.0	39.4	39.0	39.8
South Asia	1.08	58.2	50.7	47.7	41.5	40.3	36.9	32.1	31.4
Sub-Saharan Africa	1.33	45.9	50.5	51.3	47.6	47.6	48.7	49.7	50.2
Total	1.59	50.1	42.0	36.6	35.3	34.9	30.6	29.8	28.8

Source: Chen and Ravallion (2004: 160, table 8)

Despite the reasonable nature of these results compared to those of the absolute approach presented in table (3), judging by among other things the results pertaining to Sub-Saharan Africa, we note that they also produce the same pattern of ranking among regions where the Arab region is the lowest poverty region for all years from 1993 onwards. This is certainly an achievement by the region. However, a head-count ratio of about 17% by 2001 will be judged too low to be credible by people familiar with the countries in the sample.

In what follows we provide alternative estimates guided largely by country specific poverty lines. To facilitate adding poverty measures we denominate these country poverty lines in 1985 PPP dollars using the GDN data- base that provides real per capita income figures together with the share of private consumption expenditure as a share of GDP. Further, we use the latest high quality information on expenditure distribution. Whenever available we also use the change in the Gini coefficient between the base year for which we have poverty line information and high quality distribution information to project the results to 1998. Our base line results are presented in table (6) where the per capita expenditure and poverty lines are per person per month in 1985 PPP dollars.

Table (6)
Poverty in a Sample of Arab Countries:
National Poverty Lines

Country (survey year)	Per Capita Consumption (US$ 1985 PPP)	National Poverty Line (US$ 1985 PPP)	Head-Count Ratio (%)	Poverty-gap Ratio (%)	Squared Poverty-gap Ratio (%)
Algeria (1995)	119	66	28.01	7.97	3.20
Egypt (1995)	127	78	24.13	4.15	1.05
Jordan (1997)	179	88	21.48	4.59	1.32
Morocco (1998)	128	61	25.51	6.83	2.61
Tunisia (1990)	141	56	18.48	5.18	2.12
Yemen (1998)	55	36	37.00	10.31	3.65

Source: own calculations.

While our objective is not to report final poverty results for the Arab countries involved we note that the above results can be taken as reasonably close to observed poverty phenomenon in the countries involved. Admittedly our results underestimate poverty for Egypt (see, for example Datt et al (1998) and the references to other estimates by Egyptian authors that goes up to 45% for the same year) and Yemen. Our choice of the reported result for Egypt is due to its approximation of the recent results of Datt et al (1998). Our results may also overestimate poverty for Tunisia for which we estimated head-count ratios of 5.52% for a poverty line of US$35 per person per month (i.e. 24.8% of mean consumption expenditure) and 9.42% for a poverty line of US$42 per person per month (i.e. 29.8 of mean consumption expenditure). Given the population weight of Egypt in the Arab region, as well as in the sample, the above observations should not detract from the comparison we are about to make.

To compare these alternative results with those in tables (3) and (4) above we need to appropriately adjust the estimates for Algeria, Egypt, Jordan and Tunisia. To maintain maximum comparability we assume that the poverty line does not change with per capita consumption expenditure (the usual suspect assumption used by the World Bank following various contributions by Ravallion). Further, for Algeria, Jordan and Tunisia we also assume that the Lorenz curve did not shift over time (a very strong assumption for Tunisia) while for Egypt we have evidence that the Gini coefficient for consumption expenditure has increased by an annual rate of 6.59 per cent over the period 1995 to 1997 (increasing from 0.289 to 0.35). For Egypt, therefore, we will also use the elasticity of the head-count ratio with respect to the Gini coefficient which is calculated as 2.09.

Table (7) reports illustrative results for the head-count ratio. Our ultimate interest is in the overall weighted average of the head-count ratio for the region. We note that the reported rate of growth of per capita consumption expenditure in the table is a result of fitting a time trend equation for each country. For Jordan (with a growth rate of 0.19 per cent), Algeria (with a negative growth rate of 0.61 per cent) and Morocco (with a growth rate of 0.5 per cent) the estimates are not significantly different from zero. So for these countries, and given the assumption on distribution, poverty should not have changed between the relevant periods. However, we still use the estimated rates of growth to refine the trend in poverty. For the rest of the countries the estimates are significant and are used accordingly.

Table (7)
Poverty in a Sample of Arab Countries: 2001

Country	Initial Head-count Ratio (%)	Elasticity of the Head-count Ratio wrt Mean Consumption Expenditure	Growth Rate of Mean Consumption Expenditure (%)	Projected Head-count Ratio 2001 (%)	2002 Population Share (%)
Algeria (1995)	28.01	-1.87	-0.61	28.98	18.9
Egypt (1995)*	24.13	-3.33	2.16	27.45	42.4
Jordan (1997)	21.48	-2.44	0.19	21.38	3.2
Morocco (1998)	25.51	-2.01	0.60	25.51	18.1
Tunisia (1990)	18.48	-2.03	4.00	9.39	5.8
Yemen (1998)	37.00	-1.52	-8.60	37.00	11.6
Average/ Total	25.77	-2.20	Na	26.71	100.0

Source: own calculations. * For Egypt we use equation (6) for the change in the poverty measure over time. Hence we note that the elasticity of the head-count ratio with respect to the Gini coefficient is 2.09. Population weights are from UNDP (2004).

Thus, according to our calculations a reasonable, lower estimate, of the head-count ratio in the Arab region in 2001 would be about 27%. If countries like the Sudan and Mauritania are added to the sample of Arab countries (with a population weight of 12% of Arab total population in 2002 and head-count ratios in excess of 50 per cent of their respective populations) the incidence of poverty in the Arab region would be much higher than our own, albeit, conservative estimate.

VI. Country Estimates:

6.1. Poverty Lines:

As per international recommendations all of the reported country estimates for the Arab countries are based on poverty lines calculated according to the cost of basic needs method. Calculations, however, differ as to the approach adopted. Earlier studies adopted the approach of identifying a typical food basket, representing the dominant patterns of food consumption among the poor and satisfying the nutritional requirements for a healthy life. The quantities of the goods in the representative food basket are priced according to the prevailing, relevant, market prices for the survey year in question to get the food poverty line, z_f . An additional allowance for non-food basic needs, z_{nf} , is added to the food poverty line to obtain the overall absolute poverty line for the year in question. Some studies followed the standard practice of using the share of food in total expenditure, derived from household budget surveys, to deflate the food poverty line in order to get to the overall poverty line.

As is well known Ravallion (1998: 16-20) proposed a method to ensure the consistency of the non-food component of the poverty line with standard welfare analysis. The proposal is based on estimating a food Engel curve of the form:

(11) $f(y_i)/y_i = \alpha + \beta_1 \log (y_i/z_f) + \beta_2 [\log (y_i/z_f)]^2$

Where y is total expenditure and f(y) is food spending. By substituting spending on basic food needs, z_f, in the above equation, it is clear that the value of α estimates the average food share of those households who can just afford basic food needs. This implies that spending on non-food basic needs is given by $[(1 - \alpha)z_f]$. Using this information, a lower poverty line is given by:

(12) $z_L = z_f + (1- \alpha)\, z_f = (2- \alpha)\, z_f$.

It is also suggested that an upper poverty line, z_U, is given by $[z_f/\alpha^*]$, where α^* is defined implicitly by:

(13) $\alpha^* = \alpha + \beta_1 \log (1_i/ \alpha^*) + \beta_2 [\log (1_i/ \alpha^*)]^2$

It is suggested that (13) may be solved numerically or by non-parametric methods without imposing a functional form on the Engel curve. Most of the recent studies in the Arab countries followed the proposal by Ravallion.

Examples of calculating the poverty line using the conventional method include that for Jordan for 1987[24]. The required minimum daily nutritional intake is taken as 2224 calories and 40.5 grams of proteins per person per day. The cost of the food basket that provided this minimum level of nutrition was calculated, for various sub-regions of the country, using local consumption habits and prevailing prices and a national average was calculated to arrive at the food poverty line.

The cost of non-food basic needs was calculated on the basis of enumeration of these needs as identified at the time. These included five components of (i) cost of housing of 3 rooms per family, with a bathroom, latrine, and kitchen and inclusive of the cost of fuel, electricity and water; (ii) clothes and footwear; (iii) education; (iv) health; and (v) transport. For subsequent studies a different approach was adopted where the food poverty line is deflated by the share of food in total

---

[24] Another example, for Egypt, is to be found in Korayem (1994). There also estimates for Sudan based on this method that date to the 1980s.

expenditure of the poor households, after excluding expenditure on non-essentials (e.g. recreation). For 1992 such share was found to be 0.512. For 1997 the same procedure was used but the items deleted from the total expenditure of the poor households differed resulting in a food share of 0.418[25].

According to World Bank (1999: 7 table 4) the official poverty lines, per person per annum, for Jordan amounted to JD261 for 1992 and JD313.5 for 1997. Per capita expenditure, as per the household income and expenditure surveys for these two years, amounted to JD684 for 1992 and JD762 for 1997. This implies that the official poverty line was about 38% of per capita consumption expenditure for 1992 and 41% for 1997.

Examples of the use of Ravallion's suggestion for welfare consistent poverty lines are recently reported for Egypt, Morocco, Tunisia and Yemen[26].

Egypt: El-Laithy, Lokshin and Banerji (ELLB: 2003: 8) note that after estimating a food poverty line based on minimum caloric requirements "the share of nonfood expenditure is estimated by fitting Engel's curves of the food share onto total expenditure controlling for the household's demographic composition. The total poverty line is then calculated by dividing the cost of the food poverty line by the estimated share of nonfood expenditure. The lower poverty line restricts a nonfood expenditure to the share typical of those individuals whose total expenditure is equivalent to the food poverty line".

Similarly, El-Ehwany and El-Laithy (EEEL: 2001: 57) explain that after calculating a food poverty line, based on the consumption patterns of the poor, and providing 2200 calories per person per day, non-food expenditure was estimated by fitting Engel's curves where "the food share is regressed on log total expenditure relative to the cost of basic needs, augmented for household size". The equation they report is identical to equation (11) without the quadratic term and including a term capturing household size. Thus the lower poverty line they use is the one given by equation (12) appropriately adjusted for household size. "The upper poverty line was estimated at the total expenditure for households who spend on food an amount equal to the food poverty line".

---

[25] An alternative procedure used is to inflate the 1987 and 1992 poverty lines by the consumer price index. The CPI for 1997 was calculated as 210.4 percent in terms of 1987 prices and 120.1 percent in terms of 1992 prices. Moreover, another alternative was to update the cost of basic needs that satisfy the nutritional requirements after allowing for the possibility of substituting cheaper food items.

[26] See Laabas (2001) for estimates for Algeria.

EEEL (2001: 46, table 2.11) report their estimates for the per capita annual poverty lines for rural and urban areas. For urban areas the food poverty line is estimated as LE. 902; with lower, and upper, poverty lines of LE.1297 and LE.1952.9 respectively. In accordance of equation (12) this implies an average ratio of spending on basic food needs of 0.56, not accounting for the family size in urban areas. For rural areas the food poverty line is estimated as LE.707; with lower, and upper, poverty lines of LE.955 and LE. 1324.6 respectively. This implies an average ratio of spending on basic food needs of 0.65 in the rural areas, not accounting for the family size in rural areas.

Unfortunately, EEEL (2001) do not report the per capita consumption expenditures for urban and rural sectors. We calculated this information from EELB (2003: 24, table 4) as simple averages of the regions they consider (metropolitan, lower, upper and border urban and rural regions). According to our calculations per capita consumption expenditure for 2000 amounted to LE.2008 for urban areas and LE.1156 for rural areas. These imply that the ratio of the poverty line to consumption expenditure is 0.65 for the urban areas and 0.83 for the rural areas. For a lower middle income country such as Egypt these ratios can be considered to be on the high side.

Morocco: The World Bank (2001-b: annex A: 1) notes that the food poverty line for Morocco is calculated on the basis of a bundle of goods that yielded an average food energy requirement of 2000 calories per person per day. For 1998/99 the food poverty line is obtained from that of 1990/91 by appropriately using the food consumer price indices for the two years. Thus, for 1998/99 the poverty lines amounted to DH1888 per person per year for the whole country, and DH1962 for the urban areas and DH1878 for the rural areas.

Lower poverty lines are based on an estimation of equation (11) for urban and rural areas on the 1998/99 household data. The estimated equation for the urban areas gave a value of $\alpha = 0.5316$ (with a standard error of 0.0048), and a value of $\beta = -0.0625$ (with a standard error of 0.0031) and an adjusted R-squared of 0.1211. For the rural areas the estimated equation areas gave a value of $\alpha = 0.6406$ (with a standard error of 0.0046), and a value of $\beta = -0.0582$ (with a standard error of 0.0046) and an adjusted R-squared of 0.0699). With these estimates for the values of α the lower poverty lines amounted to DH2881 per person per year for the urban areas and DH2553 for the rural areas and DH2652 for the national level.

An upper poverty line is estimated on the basis of the logic of equation (13) where an allowance for non-food spending is obtained by considering those households whose food expenditure is equal to the food poverty line. The approximation used to get the upper poverty line is given by $z_L = (1+\beta)z_f/(\alpha + \beta)$. On the basis of this the upper poverty line is estimated as

DH3922 per person per year for the urban areas and DH3039 for the rural areas and DH3337 for the national level.

According to information reported in World Bank (2001-b: annex A, p. 7, table 7) nominal mean expenditure at the national level amounted to DH7826 per person per year, and to DH10157 for urban areas and DH5087 for rural areas. These mean expenditure figures imply that the ratios of the poverty line to mean expenditure for Morocco amounted to 0.339 and 0.426 for the lower and upper poverty lines respectively at the national level; 0.284 and 0.386 for the lower and upper poverty lines in the urban areas; and, 0.501 and 0.597 for the lower and upper poverty lines for the rural areas.

Tunisia: According to the World Bank (2003: 12) a food poverty is estimated from the 2000 household budget survey data. "The share of non-food items is estimated following Engel's law. Basic non-food items are estimated on the share of expenditure on non-food items made by households whose total expenditures are equal to the food poverty line". The annual per capita food poverty lines for 2000 are estimated as TD247 , TD222 and TD205 for metropolitan, other urban and rural areas respectively. The estimated annual lower per capita poverty lines are estimated as TD357, TD318 and TD294 for metropolitan, other urban and rural areas respectively. It is curious that the average ratio of expenditure on basic food needs is almost the same for all areas and equal to about 0.57. No information is provided on per capita consumption expenditure from the survey.

Yemen: According to the recent World Bank (2002-a and b) a food poverty line, allowing for a food energy intake of 2200 calories per person per day, is estimated on the basis of 35 food commodities reported in the Household Budget Survey (HBS) of 1998 together with the unit values generated from the survey. The calculated food poverty lines that are used in the analysis are YR2101 per person per month for the whole country, YR2093 for urban areas and YR2103 for rural areas. Lower poverty lines are estimated on the basis of the average non-food spending of households whose total expenditure equals the food poverty line. The lower poverty lines amounted to YR3210 per person per month for the country, YR3195 for urban areas and 3215 for rural areas. The upper poverty lines are estimated on the basis of calculating the average non-food spending among households who actually spend the cost of the cost of the minimum food requirements. The estimated upper poverty lines, which are used in the analysis, amounted to YR4720 per person per month for the country, YR4764 for urban areas and YR 4707 for rural areas. As ratios of the respective per capita consumption expenditure the lower poverty lines amounted to 0.72 for the country, 0.59 for the urban areas and 0.78 for the rural areas.

6.2. Country Poverty Estimates:

Poverty estimates for a number of Arab countries are available from different sources. For each country poverty estimates, however, vary considerably.

Egypt: The most striking example of the different estimates for the same country is that of Egypt. El-Issawy (1995: 18- 25) provides a critical evaluation of earlier studies covering estimates for 1974/75, 1981/82 and 1990/91, and suggests a synthesis of these results to come up with an acceptable average estimate. Without getting involved, at this stage, in issues relating to poverty trends over time it is sufficient to note that the compromise estimate of El-Issawy (1995: 20-21) for 1990/91 gives a head-count ratio that ranges between 0.42 and 0.46 for the rural areas and between 0.38 and 0.45 for urban areas. If the proportion of urban population is taken as 0.45 in 1990/91, then the overall head count ratio for Egypt will range from 0.402 to 0.4555 . These are indeed much higher estimates than the international estimates referred to in the previous section.

As noted in sub-section (2.1) above recent estimates for poverty in Egypt are provided by EEEL (2001: 46, table 2.12) for 1999/2000. According to these estimates 20.15% of the total population of Egypt was found to be living below the lower poverty line and 49.63% of the total population were living below the upper poverty line. For the lower poverty line, the head-count ratio is found to be 0.1844 for the urban areas (z_L = LE. 1297), while that for the rural areas it is 0.2141 (z_L= LE. 955). For the upper poverty line, the respective head-count ratios are 0.4607 for the urban areas (z_U = LE. 1953) and 0.5227 for the rural areas (z_U = LE. 1325).

These recent estimates should be contrasted with those of ELLB (2003: 23, tables 1 and 2). Despite the fact that these authors refer to poverty lines used by EEEL (2001) their estimate of the head-count ratio for the lower poverty line is substantially lower for 1999/2000 at 0.1674.

Similarly, their estimates for urban poverty of 9.21% of the urban population falling below the lower urban poverty line, and for rural poverty of 22.07% of the rural population falling below the lower rural poverty line, are different from the above quoted results.

The above two sources on poverty in Egypt also report trends in poverty over the second half of the 1990s. Table (8) summarizes these results which are based on the lower poverty lines.

Table (8)
Trends in the Incidence of Poverty in Egypt
(head-count ratios in percentages)

Details	EEEL	ELLB
1995/96:		
Urban	22.51	
Rural	23.30	
National	22.96	19.41
1999/2000:		
Urban	18.44	9.21
Rural	21.41	22.07
National	20.07	16.74

From the above table it is clear that both sources show poverty to have declined during the second half of 1990s in Egypt. At the national level poverty decreased by 2.89 percentage points according to EEEL and by 2.67 percentage points according to ELLB. Urban poverty declined by 4.07 percentage points while rural poverty declined by 1.99 percentage points.

Jordan: Recent poverty estimates for Jordan are reported for 1997 at the national level. For the lower poverty line it is reported that 11.7% of the population were poor while for the upper poverty line 18.24% of the population were poor. Between 1992 and 1997 poverty declined in Jordan. In 1992 it is reported that 14.42% of the population were living below the lower poverty line for that year (i.e. z_L= JD261 per person per year), while 20.88% of the population were living below the upper poverty line (i.e. z_U = JD304 per person per year).

Morocco: The spread of poverty in Morocco for 1998/99 is estimated as 19% of the population as falling below the upper poverty line at the national level, with 12% of the urban population and 27.2% of the rural population being poor as per the respective upper poverty lines.

Poverty trends over the 1990s are reported by comparing 1990/91 with 1998/99. For 1990/91 it is reported that 13.1% of the population were below the upper poverty line for that year at the national level. Urban poverty is reported as 7.6% of the urban population while rural poverty was 18% of the rural population. Thus, compared to 1990/91 poverty in Morocco increased during the 1990s by about 5.9 percentage points at the national level and by 4.4 percentage points in the urban areas and by 8.8 percentage points in rural areas.

Tunisia: The most recent estimates of poverty in Tunisia show that about 9.9% of the population fell below the upper poverty line in 2000. The spread of poverty in the metropolitan areas was about 6.2% of the population that for other urban was 6.9% of the population while that for the rural was 16.1% of the population. At the lower poverty line the incidence of poverty was indeed very marginal being 4.1% at the national level, 0.8% in the metropolitan areas, 2.3% in urban areas and 8.3% in rural areas.

Poverty trends over the 1990s compare 1990, 1995 and 2000. For the respective upper poverty lines it is shown that at the national level poverty has increased from 16.2% of the population in 1990 to 17.1% in 1995 and then declined to 9.9% of the total population in 2000. The increase in poverty between 1990 and 1995, and its decline thereafter, was recorded for all areas.

Yemen: The most recent estimates of poverty in Yemen show that in 1998 the incidence of poverty was such that 41.8% of the total population was living below the lower poverty line at the national level. In the urban areas 30.8% of the urban population was living below the lower urban poverty line while in rural areas 45% of the rural population was living below the lower rural poverty line. The incidence of poverty at the respective upper poverty lines was such that the head-count ratios amounted to 0.669 at the national level, 0.578 in the urban areas and 0.696 in the rural areas.

For the case of Yemen, and despite the availability of a household budget survey for 1992, no poverty trends over the 1990s is reported. The reason for this is a number of methodological differences between the two surveys that had to do with survey design, sample representativeness, food bundles, and the use of prices versus that of unit values (see World Bank (2002-a: 2, box 1).

From the above brief review of recent poverty estimates at the level of the countries, and assuming that the results are comparable between countries, table (9) reports the weighted average head-count ratio for the Arab countries using the population weights for the year 2000. These are only indicative results that can be compared with the international estimates for the region.

Table (9)
The Spread of Poverty in Arab Countries
at the End of 1990s

Country	Population Weight	Head-count at the Lower Poverty Line (%)	Head-count at the Upper Poverty Line (%)
Egypt	0.523	20.07	49.63
Jordan	0.039	11.70	18.24
Morocco	0.224	9.80	19.00
Tunisia	0.037	4.10	9.90
Yemen	0.141	41.80	66.90
Sample	1.000	19.355	41.095

According to the above results about 19% of the Arab population lived below an implicitly defined lower poverty line at the end of 1990s. Poverty incidence is much higher at the implicitly defined upper poverty lines with a head-count ratio of 0.411. These results, tentative as they may be, should be contrasted with those reported in section (V) above.

6.3. Conditions for Pro-Poor Growth:

From section (II) it will be recalled that an index of pro-poor growth has been proposed by Kakwani and Pernia (2000) in the form of equation (10) as follows:

$$(10)\ \Phi = [\gamma \ / \ \eta^* \ ]$$

Where it is recalled that (η^*) is the elasticity of the poverty measure with respect to consumption expenditure after allowing for the changes in the poverty line with respect to consumption expenditure, and is negative; and (γ) is the poverty elasticity of growth which is the sum of (η^*) and (ν κ) where ν is the partial elasticity of the poverty measure with respect to the Gini coefficient, which is positive, and κ is the Kuznets' elasticity, which can be positive or negative. Note that in view of the fact that for all countries in under

The suggested ranges for judging the degree of pro-poor growth according to the value of the index require that negative values should indicate that growth is anti-poor; positive values that are equal to or less than 0.33 indicate that growth is weakly pro-poor; values in excess of 0.33 and equal to, or less than, 0.66 indicate that growth is moderately pro-poor; values in excess of 0.66 but less than unity indicate that growth is pro-poor; and, values equal to, or in excess of, unity indicate that growth is highly pro-poor. As we suggested these ranges could be interpreted as reflecting the underlying structural nature of poverty and its response to growth inducing policy interventions.

Table (13) presents our calculations for the index of pro-poor growth for the countries for which we have information. To compute the Kuznets' elasticity use has been made of the following estimated equation (based on a sample of 50 countries, 33 developing countries and 17 advanced countries) and where the functional format proposed by Anand and Kanbur (1993-a, b) is used (where u is real per capita income in 1985 PPP; figures between brackets are t-values and where the R-squared is 0.329):

$$(14)\quad \underset{(13.4)}{\text{Gini} = 0.5121} - \underset{(3.62)}{0.0000203\, u} - \underset{(2.08)}{49.8037\, (1/u)}$$

The implied Kuznets' elasticity is given by:

$$(15)\quad \kappa = -0.0000203\, u + 49.8037u^{-1}$$

Given the existence of a Kuznets' curve as in the above estimated equation it is an easy matter to check that the implied turning point is $1354 per person per year in 1985 PPP (for the details see Ali (1998: 95-96). Real GDP per capita for the countries under discussion are well beyond the turning point which implies that for all of them the Kuznets elasticity is negative as is shown in the table below.

For Jordan, Morocco and Tunisia we estimated the partial poverty elasticities using the information provided in the different studies on the distribution of consumption expenditure and poverty lines. For Egypt we used the average of the elasticity magnitudes provided in EEEL (2001: 51 table 3.3).

Table (10)
Pro-Poor Growth Index for a Sample of Arab Countries

Country	η	ν	κ	Φ	Status of Pro-poor Growth
Egypt	-2.91	2.26	-0.025	1.019	Highly pro-poor
Jordan	-2.79	3.15	-0.047	1.053	Highly pro-poor
Morocco	-1.88	1.96	-0.024	1.025	Highly pro-poor
Tunisia	-2.03	2.93	-0.064	1.093	Highly pro-poor
Yemen	-1.54	0.59	0.033	0.987	Pro-poor

According to the above results growth inducing public policy is expected to be highly pro-poor in the four middle income countries and pro-poor in Yemen . Recalling that the pro-poor index is generated by appropriate relative variation of the poverty measure and its fundamental determinants there is no reason to prevent interpreting it as an index of pro-poor policy interventions. All that needs to be done is that a composite index for policy needs to be formulated and its partial effects on per capita consumption expenditure and the measure of inequality ascertained. As such therefore, public policy intervention for poverty reduction in the Arab region should be expected to have a high pay off.

VII. Concluding Remarks:

So what do we know about poverty in the Arab region? The highly selective review of the relevant literature presented in the various sections of this paper shows the following:

(a) for all the countries in the project, except for Sudan, there exists a set of excellent studies on various aspects of poverty, thanks largely for the efforts of the World Bank in terms of conducting household budget surveys in low, and middle income, countries of the Arab region;

(b) for all countries for which there exists fairly rigorous poverty studies, except for Jordan, the cost of basic needs approach to the estimation of poverty lines is used including the estimation of the non-food component by Engel curves;

(c) for all countries, except Jordan, lower and upper poverty lines are reported as the case may be for rural, urban and national levels;

(d) though not reviewed most of the studies attempted, though on a speculative level, looking at the effect of macroeconomic policy on poverty;

(e) for almost all countries an attempt has been made to decompose observed changes in poverty over time using the conventional Datt-Ravallion method.

On the basis of the above it seems safe to conclude that our knowledge base about poverty in the region is fairly decent, despite conflicting results and sometimes incomplete information. From a public policy perspective it also seems fair to conclude that policies that are likely to be growth enhancing will have a pro-poor impact in the middle income countries of the region.

Bibliography

Ahluwalia, M., (1976), "Inequality, Poverty and Development"; Journal of Development Economics; vol. 3.

Ali, A.A.G. and I. Elbadawi, (2001), "Growth Could Be Good for the Poor"; unpublished manuscript.

Ali, A.A.G., (1998), "Dealing with Poverty and Income Distribution Issues in Developing Countries: Cross-Regional Experiences"; Journal of African Economies, vol. 7, supplement 2 (AERC supplement).

Anand, S. and R. Kanbur, (1993-a), "Inequality and Development: A Critique"; Journal of Development Economics, vol. 41.

Anand, S. and R. Kanbur, (1993-b), "The Kuznet's Process and the Inequality-Development Relationship"; Journal of Development Economics, vol. 40.

Atkinson, A.B., (1998), Poverty in Europe; Blackwell, Oxford.

Atkinson, A.B., (1987), "On the Measurement of Poverty"; Econometrica, vol. 55.

Barro, R., (2000), "Inequality and Growth in a Panel of Countries"; Journal of Economic Growth, vol. 5.

Barro, R., (1998), Determinants of Economic Growth: A Cross-Country Empirical Study; MIT Press, London.

Blackburn, J. and J. Holland, (eds.), (1998-a), Who Changes? Institutionalizing Participation in Development; Intermediate Technology Development, London.

Blackburn, J. and J. Holland, (eds.), (1998-b), Whose Voice? Participatory Research and Policy Change; Intermediate Technology Development; London.

Blackorby, C., and D. Donaldson, (1980), "Ethical Indices for the Measurement of Poverty"; Econometrica, vol. 55.

Bulir, A., (1998), "Income Inequality: Does Inflation Matter?"; WP/98/7, IMF, Washington DC.

Bruno, M., Ravallion, M. and L. Squire, (1998), "Equity and Growth in Developing Countries: Old and New Perspectives on the Policy Issue"; in

V. Tanzi and K. Chu, (eds.), Income Distribution and High Quality Growth; MIT Press, Cambridge, Mass.

Chakravarty, S.R., (1983), “A New Index of Poverty”; Mathematical Social Sciences, vol. 6.

Chambers, R., (1997), Whose Reality? Putting First Last; Intermediate Technology Development; London.

Chambers, R., (1994), “The Origins of Participatory Rural Appraisal”; World Development, vol. 22.

Chen, S., and M. Ravallion, (2004), “How Have the World’s Poorest Fared since the Early 1980s?”; World Bank Research Observer, vol. 19, no. 2.

Chen, S. and M. Ravallion, (2000), “How did the World Poorest Fare in the 1990s?”; Policy Research Working Paper 2409, World Bank, Washington D.C.

Chen, S., Datt, G. and M. Ravallion, (1994), "Is Poverty Increasing in the Developing World?"; Review of Income and Wealth, vol. 40:359-76.

Chen, S., Datt, G. and M. Ravallion, (1993), "Statistical Addendum to 'is poverty increasing in the developing world?'"; Policy Research Department, World Bank, Washington DC.

Chenery, H., Ahluwalia, M., Bell, M., Duloy, C., Jolly, J. and R. Jolly, (1974), Redistribution with Growth; Oxford University Press, Oxford.

Citro, C.F. and M. Robert, (1995), Measuring Poverty: A New Approach; National Academy Press, New York.

Clarke, G., (1995), "More Evidence on Income Distribution and Growth"; Journal of Development Economics, vol. 47:403- 27.

Collier, P. and D. Dollar, (2000), “Can the World Cut Poverty in Half? How Policy Reform and Effective Aid Can Meet the International Development Goals”; World Bank, Washington, D.C.

CSO, (1999), A Summary of the Final Results of the Household Budget Survey of 1998; Ministry of Planning and Development, Sana’a.

Dasgupta, P., (1993), An Inquiry into Well-being and Destitution; Clarendon Press, Oxford.

Datt, G. and M. Ravallion, (1992), "growth and redistribution components of changes in poverty measures: a decomposition with applications to Brazil and India in the 1980s"; Journal of Development Economics, vol. 38, no. 2.

Datt, G., Jolliffe, D. and M. Sharma, (1998), A Profile of Poverty in Egypt: 1997; FCND discussion paper no. 49, IFPRI.

Deininger, K. and P. Olinto, (2001), "Asset Distribution, Inequality and Growth"; World Bank Working Paper no. 2375, World Bank, Washington D.C.

Deininger, K. and L. Squire, (1996), "A New Data Set for Measuring Income Inequality"; World Bank Economic Review, vol. 10, no. 2.

Dollar, D. and A. Kraay, (2001), "Growth is Good for the Poor"; World Bank, www.worldbank.org/research.

Donaldson, D., and A. Weymark, (1986), "Properties of Fixed-Population Poverty Indices"; International Economic Review, vol. 27.

El-Ehwany, N., and H. El-Laithy, (2001), Poverty, Employment and Policy-Making in Egypt: A Country Profile; ILO Area Office, Cairo.

El-Issawy, I., (1998), "Poverty and the Poor in Egypt: Facts, Diagnosis and Prescriptions"; Arab Economic Journal, vol. 13, pp. 5-25 (in Arabic).

El-Issawy, I., (1995), "Human Development in Egypt: Notes on the Egyptian Report 1994"; Egyptian Review of Development and Planning; vol. 3, no. 1 (in Arabic).

El-Laithy, H., Lockshin, M., and A. Banerji, (2003), "Poverty and Economic Growth in Egypt, 1995-2000"; Policy Research Working Paper no. 3068, World Bank, www.worldbank.org.

Fatah, Z., Limam, I., and S. Makdisi, (2000), "Determinants of Growth in Arab Countries"; Global Development Network (www.gdnet.org/grproject).

Fishlow, A., (1996), "Inequality, Poverty and Growth: Where Do We Stand?"; Annual World Bank Annual Conference on Development Economics 1995, 25-39.

Foster, J., (1998), "Relative versus Absolute Poverty"; American Economic Association, Papers and Proceeedings.

Foster, J., Greer, J. and E. Thorbecke, (1984), "A New Class of Decomposable Poverty Measures"; Econometrica, vol. 51, no. 1.

Hagenaars, A., (1987), "On a Class of Poverty Indices"; International Economic Review, vol. 28.

Hayami, Y., (1998), Development Economics: From the Poverty to the Wealth of Nations; Clarendon Press, Oxford.

Hoff, K. and J. Stiglitz, (2001), “Modern Economic Theory and Development”; in Meier and Stiglitz (eds.).

IFAD, (2001), Rural Poverty Report 2001: The Challenge of Ending Rural Poverty; Oxford University Press, Oxford.

Jha, S., (1996), “The Kuznets Curve: A Reassessment”; World Development, vol. 24, no. 4.

Kakwani, N., (1993), “Poverty and Economic Growth with Application to Cote d’Ivoire”; Review of Income and Wealth; Series 39, no. 2.

Kakwani, N., (1980), “On a Class of Poverty Measures”; Econometrica, vol. 48.

Kakwani, N., and E. Pernia, (2000), “What is Pro-Poor Growth?”; Asian Development Review, vol. 8, no. 1.

Kanbur, R. and L. Squire, (2001), “The Evolution of Thinking about Poverty”; in Meier and Stiglitz (eds.).

Korayem, K., (1994), Poverty and Income Distribution in Egypt; Third World Forum, Cairo.

Kuznets, S., (1955), “Economic Growth and Income Inequality”; American Economic Review, vol. 45, no. 1.

Laabas, B., (2001), “Poverty Dynamics in Algeria”; Journal of Development and Economic Policies, vol. 4, no. 1.

League of Arab States, AFESD, AMF, and OAPEC, (2002), Consolidated Arab Economic Report 2002; Cairo.

Lewis, W.A., (1954), “Economic Development with Unlimited Supplies of Labour”; Manchester School of Economic and Social Studies; vol. 22.

Li, H., Squire, L., and H. Zou, (1998), “Explaining International and Intertemporal Variations in Income Inequality”; Economic Journal, vol. 108.

Lundberg, M., and L. Squire, (1999), “Growth and Inequality: Extracting the Lessons for Policymakers”; World Bank, Washington D.C.

Meier, G. and J. Stiglitz, (eds.), (2001), Frontiers of Development Economics: A Future in Perspective; Oxford University Press, Oxford.

Milanovic, B., (1999), “Determinants of Cross-Country Income Inequality: An Augmented Kuznets’ Hypothesis”; World Bank, Washington D.C.

Minami, R., (1998), “Economic Development and Income Distribution in Japan: An Assessment of the Kuznets Hypothesis”; Cambridge Journal of Economics, vol. 22.

Narayan, D., (2000), “Poverty is Powerlessness and Voicelessness”; Finance and Development, vol. 37, no. 4.

Narayan, D., Chambers, R., Shah, M.K., and P. Petesch, (2000-a), Voices of the Poor: Crying Out for Change; Oxford University Press, Oxford.

Narayan, D., Patel, R., Schafft, K., Rademacher, A., and S. Koch-Schulte, (2000-b), Voices of the Poor: Can Anyone Hear Us?; Oxford University Press, Oxford.

Narayan, D., Chambers, R., M. Shah, and P. Petesch, (1999), Global Synthesis: Consultations with the Poor; World Bank, Washington D.C.

Pritchett, L., (2003), “Who is not Poor? Proposing a Higher International Standard for Poverty.”; Centre for Global Development, www.cgdev.org.

Ravallion, M., (1998), “Poverty Lines in Theory and Practice”; LSMS Working Paper no. 133, World Bank, Washington D.C.

Ravallion, M., (1994), Poverty Comparisons: A Guide to Concepts and Methods; Harwood Academic Publishers, Chur, Switzerland.

Ravallion, M., and M. Lokshin, (2003), “On the Utility Consistency of Poverty Lines”; Policy Research Working Paper no. 3157, World Bank, www.worldbank.org.

Ravallion, M., and G. Datt, (1999), “When is Growth Pro-Poor? Evidence from the Diverse Experiences of India’s States”; World Bank, www.worldbank.org.

Ravallion, M., Datt, G. and D. van de Walle, (1991), “Quantifying Absolute Poverty in the Developing World?”; Review of Income and Wealth, no. 37.

Rodrik, D., (2000), “Growth Versus Poverty Reduction: A Hollow Debate”; Finance and Development, vol. 37, no. 4.

Rowntree, B., (1901), Poverty: A Case of Town Life; Macmillan, London.
Sarel, M., (1997), “How Macroeconomic Factors Affect Income Distribution: The Cross-Country Evidence”; WP/97/152, IMF, Washington, D.C..

Sen, A. K., (1999), Development as Freedom; Anchor Books, New York.

Sen, A.K., (1981), Poverty and Famines: An Essay on Entitlement and Deprivation; Clarendon Press, Oxford.

Sen, A.K., (1976), "Poverty: An Ordinal Approach to Measurement"; Econometrica, vol. 44.

Streeten, P., (2001), "Comment on 'On the Goals of Development'"; in G. Meier and J. Stiglitz, (eds.).

Takayama, N., (1979), "Poverty, Income Inequality, and their Measures: Professor Sen's Axiomatic Approach Reconsidered"; Econometrica, vol. 47.

Thomas, V., Dailimi, M., Dhareshwar, A., Kaufmann, D., Kishor, N., Lopez, R. and Y. Wanget, (2000), The Quality of Growth; Oxford University Press, Oxford.

Thon, D., (1979), "On Measuring Poverty"; Review of Income and Wealth, vol. 25.

Watts, H., "An Economic Definition of Poverty"; in D.P. Moynihan, (ed.), On Understanding Poverty; Basic Books, New York.

UNDP, (2004), Human Development Report 2004; www.undp.org.

UNDP, (1996), Human Development Report for Egypt, 1996; web site http://www.undp.org.eg/HDR.

UNDP, (1998), Human Development Report for Yemen, 1998; Sana'a.

Van de Walle, D., (2002), "Poverty and Transfers in Yemen"; www.worldbank.org.

World Bank, (2003-a), Republic of Tunisia: Poverty Update: Vol. 1: Main Report; World Bank, Washington D.C.

World Bank, (2003-b), World Development Report 2003: Sustainable Development in a Dynamic World: Transforming Institutions, Growth and Quality of Life; Oxford University Press, Oxford.

World Bank, (2002-a), Republic of Yemen Poverty Update: Vol. I, Main Report; Report no. 24422-Yem; www.worldbank.org.

World Bank, (2002-b), Republic of Yemen Poverty Update: Vol. II: Annexes; Report no. 24422-Yem; www.worldbank.org.

World Bank, (2001-a), Kingdom of Morocco Poverty Update: Volume I Main Report; Report No. 21506-MOR; www.worldbank.org.

World Bank, (2001-b), Kingdom of Morocco Poverty Update: Volume II: Annexes; Report No. 21506-MOR; www.worldbank.org.

World Bank, (2000), World Development Report 2000/2001: Attacking Poverty; Oxford University Press, Oxford.

World Bank, (1999), Poverty Alleviation in Jordan in the 1990s: Lessons for the Future; Report no. 19869 JO; Washington D.C.

World Bank, (1991), World Development Report; Oxford University Press, Oxford.

Yahia, H., Al-Rabiaai, A., and M. Badr, (2001), "Poverty and Income Distribution in Jordan: A Cross Section Study 1997"; Arab Economic Journal, no. 24, pp. 5-33.

Zheng, B., (2001), "Statistical Inference for Poverty Measures with Relative Poverty Lines"; Journal of Econometrics, vol. 101, no. 2.

Zheng, B., (2000), "Poverty Orderings"; Journal of Economic Surveys, vol. 14, no.4.

Zheng, B., (1997), "Aggregate Poverty Measures"; Journal of Economic Surveys, vol. 11, no. 2.

Chapter Three

Impact of Public Policies on Poverty, Income Distribution and Growth

Belkacem Laabas and Imed Limam

1. Introduction

Given the still daunting issue of the worldwide spread of poverty with almost 50% of the population of the globe living with less than $2 a day and the lively debate over the possibility of reaching the Millennium Development Goals (MDG) emanating from the 2000 United Nations Millennium declaration and aiming at, among other things, reducing poverty levels by 2015 at half the levels of the base year 1990, it is very legitimate to address the issue of whether public policies are at all efficient in alleviating poverty and improving social outcomes.

Public policies have the dual role of achieving efficiency by correcting numerous market failures, and equity by improving the distributional and poverty outcomes that would result from a market-based allocation of resources. While the redistributive role is played by direct taxation in developed economies, this role is usually assumed by public policies mainly through targeted government expenditures in the form of direct provision of certain public services such as education, health and housing.

The assessment of the role of public policies in affecting income distribution and poverty requires the knowledge of the functional relationship between the targets (poverty and income distribution) and the instruments (public policies). This relationship is, however, far from being completely understood. Part of the problem resides in the fact that public policies are not only exclusively directed toward poverty alleviation, and affect poverty mainly indirectly through a web of complex interactions between public policies and growth on the one hand, and public policies and income distribution, on the other.

Public policies are generally intended to affect the mean income of the entire population and subsequently to improve poverty. However, it may also affect the income inequality that has a direct bearing on poverty as well. The final impact on the poor would depend on the magnitude as well as the direction of these two impacts.

Analysis of the impact of policies aimed at increasing the mean income of the population on the poor, for a given state of the income distribution, has been treated thoroughly in the literature. Kakwani (1993), for instance, has shown that for different classes of poverty measures, any policy aimed at increasing the mean income of the population would reduce poverty for a given level of income distribution. On the other hand, he has also shown that, under mild conditions and for a wide class of poverty measures, greater inequality leads to greater poverty.[1]

Since any given public policy intended to increase the mean income of the population may also change income distribution in either direction, the final impact on poverty cannot be known a priori. This impact can only be known based on empirical assessment.

Many of the relevant studies available in the literature on the link between public policies and poverty have relied on estimation procedures that have not accounted for the complex interactions between poverty and other variables such as growth and income distribution, and the endogeneity of the latter variables. In addition, sample sizes in these studies were generally small and estimation was problematic by the unavailability of relevant data. Finally, rarely any sensitivity or robustness tests were conducted in the literature.

This paper proposes to analyze the impact on poverty of several components of public policies by avoiding the flaws in the scattered literature on the subject. It departs from available literature in the sense that it directly focuses on the link between public social policies and poverty rather than indirectly through the impact of these policies on specific social outcomes. It also uses a framework that accounts for the endogeneity of and interactions between growth, income inequality, and poverty using a relatively larger sample size and more recent data compiled from various sources. Last but not least and unlike many of the previous studies, our results are more robust in the sense that they purport to different definitions of poverty and estimation methods.

The rest of the paper is composed as follows: Section 2 conducts a selective review of the literature on the impact of public policies on poverty; section 3 explains the methodology used in the paper; section 4 describes the data used; section 5 analyzes the results and section 6 concludes.

[1] The requirement that greater inequality leads to greater poverty is that poverty line income be less than the mean income. This condition is almost always satisfied. In our sample, the average ratio of poverty line income to mean income is 0.33 and hence verifies the stated condition.

2. Public Policies and Poverty

Many studies, old and new, have taken up the issue of the impact of public policies on social outcomes such as poverty. However, the empirical evidence on the impact of public policies on poverty can best be characterized as mixed. Although from a principle point of view public policy is expected to affect income distribution and poverty, the empirical evidence is not overwhelmingly in support of this claim.

One element of solution to this puzzle is provided by the World Development Report of the World Bank (2004) which remarked that despite the fact that Governments devote about a third of their budgets to health and education, very little of it goes to the poor. Even if funds are dedicated to the poor people, the weak systems of incentives and delivery largely explain the lack of a consistent relationship between changes in the structure of public spending and poverty.
Along the same lines, Squire (1993) had previously expressed the dilemma facing policy makers in their efforts to fight poverty. He argues that universal programs to reduce poverty have tended to incur costly leakages to the nonpoor whereas highly targeted programs have tended to result in the incomplete coverage of the poor. In both cases, the impact on the poor of public policy would not be expected to be a significant one.

Various incidence studies, that differ in nature from studies using cross-country evidence, reveal, on the other hand, that spending on basic services such as primary and secondary education and basic health care, tend to reach the poor, while spending on tertiary services such as university education, hospital services, tend to be pro-rich (Van De Walle, 1996).

In general, there is an agreement that the lack of structural relationship between social policy and social outcomes is due to the lack of efficiency of Government expenditure in LDCs. Some researchers, such as Sanjeev et al. (1997), have even tried to measure the extent of inefficiency in public service delivery.

Another explanation of the often reported weak link between public policy and poverty resides in differences in coverage and sample sizes across studies focusing on this link. In some of these studies only a limited number of countries were used. Difference in results reflects to a great extent the paucity of relevant data especially the limited number of expenditure surveys (Gootaert et al., 1995).

Not less important is the difference in estimation methods and treatment of poverty across studies. In all likelihood, poverty is simultaneously determined with other variables in the process such as growth and income distribution. However, in most of the studies related to the impact of public policy on poverty, the latter is treated within single-equation models that do not take into account the endogeneity or the omission of many relevant variables.

In a recent work that is very close to the spirit of the actual paper, Dollar and Kray (2001), have attempted to address the impact of public policies such as macroeconomic stability and fiscal discipline, and certain components of public spending on health and education, on poverty. They find that many supposedly "pro-poor" policies such as public expenditure on health and education do not have any significant impact on the income of the poor. In contrast, income of the poor seems to respond systematically to pro-growth policies such as fiscal discipline, macroeconomic stability, good rule of law and openness to international trade.

They conclude that these pro-growth policies should be at the center stage of any program aiming at eradicating poverty. They argue, however, that social spending in developing countries often benefits the rich and middle classes more than the poor. Therefore a higher share of social spending on items such as health and education will not be reflected in higher incomes for the poor.

Similarly, Filmer and Pritchett (1997) have not found any significant impact of public expenditures on health and infant mortality that mainly touch the poor fringe of any society. In contrast, Bidani and Ravallion (1997) have found a statistically significant relationship between public spending on health and poverty.

In two separate studies, Fan et al. (1999) and Fan et al. (2002), have tried to analyze the role of different types of Government expenditures in contributing to poverty alleviation in rural areas in India and China, respectively. One of the merits of these two studies is their taking into account the endogeneity of many relevant variables in their model. This framework is extremely useful in delineating the direct as well as the indirect channels through which public expenditures affect poverty. Another merit of these studies is their focus on rural areas where the poor are the more likely to be located.

Their results indicate that Government's production-enhancing investments in agriculture, investment in rural infrastructure, and expenditures on health and education have a visible impact on poverty, with expenditures on education having the largest impact in reducing poverty in the case of China, and expenditures on roads to have the largest impact in the case of India.

The evidence on the impact of public policies on the main determinants of the degree of poverty namely, the poverty line, the average level of income and inequality in income distribution, is not very conclusive either and is frequently flawed with serious issues of causality between the dependent variables and their respective determinants.[2]

With regard to income distribution, Li, Squire and Zou (1998) have found, for instance, that policies aimed at boosting education level, improving the work of institutions, developing the financial market and ensuring a better distribution of land tend to reduce inequality in income distribution and hence to lower poverty levels.

As for growth, although the recent cross-country literature did not look at the impact of detailed government spending on growth, it almost consistently reported compelling evidence on the distortionary impact of aggregate Government expenditure on growth. Barro (1991), for instance, found that an increase in non-productive spending tends to lower growth. However, it remains to be established through further studies which of the components of Government spending are more pro-growth than others.

The only regular evidence pertaining to the determinants of poverty lines is that it tends to respond to variation in mean consumption and growth (Ravallion et al., 1991). Subsequently any policy that affects these two variables should affect the poverty line and hence poverty.

3. Methodology

In order to analyze the impact of public policy on poverty, we use a modeling framework that accounts for the simultaneity in the determination of poverty, inequality and growth. As pointed out by Lundberg and Squire (1999), accounting for the simultaneity of the above variables allows first to avoid the shortcomings of previous studies that deal with each variable separately. Second, the simultaneous treatment of growth, inequality and poverty is useful from a policy perspective in the sense that it enables decision makers to choose the combination of mutually beneficial and mutually exclusive policies that have positive impact on all three variables. Third, public policies tend to affect poverty mainly indirectly through their impact on growth and income distribution. The simultaneous treatment of growth, income distribution and poverty that model explicitly the interaction between all the variables involved is, therefore, the most appropriate tool to assess the direct as well as the indirect channels through which public policies affect poverty.

---

[2] For instance the issue of causality and reverse causality between growth and income distribution is well documented in the literature. Abdelgadir (1998), for instance, has presented a good survey and reflected on this issue.

More specifically, we use a simultaneous equation model with three endogenous variables namely, growth, inequality and poverty. We draw heavily on pertinent standard theoretical and empirical models available in the literature. In the specification of each equation, care has been taken to adopt as parsimonious and robust specifications as possible to avoid any risk of spurious results. The generic specification of the system of equations is given as follows:

$$Growth = f_1(INV, OPEN, POLICY, INST, INITIAL) + \varepsilon \quad (1)$$

$$Gini = f_2(Growth, POLICY, OTHER) + \xi \quad (2)$$

$$Poverty = f_3(Gini, Mean\ Consumption / PovertyLine) + \zeta \quad (3)$$

In the growth equation, our selection is guided by variables that proved more "robust" than others in recent empirical growth literature through the work of Barro (1991) and others. Among the variables that are incorporated in most of this literature is the investment ratio (INV) that is generally found to be associated with higher growth rates. Another important source of growth highlighted in the recent empirical growth literature is institutions (INST) defined as the regular and patterned forms of social behavior and interaction among human beings established by formal and informal rules (North, 1990). Institutions matter for growth because they affect incentives of actors.

Macroeconomic policy, POLICY, plays an important role for growth sustainability. Fisher (1993) has shown that growth is negatively associated with inflation, large Government size and distorted foreign exchange markets. Among the three measures, we favor Government size as proxied by the share of its expenditure in GDP.

Openness has been used extensively in the literature as a major determinant of growth performance. Openness affects growth positively in as much it magnifies the benefits of international knowledge spillover and technological diffusion. It also enforces cost discipline through import competition. Openness measured by the ratio of trade to GDP is simply not appropriate for the case of many developing countries. Very frequently, the high trade ratios reflect partly the nature of factor endowment and not openness per se. For this reason, an alternative index of trade restrictiveness, OPEN, is used instead.

The last variable that is used in the growth equation is the initial level of income, INITIAL, measured in the year 1975 (i.e. prior to the earliest survey year in the sample). Recent empirical growth literature provides ample evidence of the existence of conditional income convergence across countries. Under the assumption of diminishing marginal returns to capital, the lower the initial level of income the greater the opportunity of catching up through higher rates of capital accumulation and diffusion of technology. This convergence is evidenced by the negative relationship between the growth rate of per capita GDP and the initial level of GDP per capita after controlling for other relevant variables.[3]

With respect to income inequality, less guidance is provided by the recent empirical literature. The very few empirical regularities in this literature points to the positive role played by Government expenditure, education, land distribution (Li et al., 1998 and Lundberg and Squire, 1999); the negative role played by inflation (Bulír, 2001) and to the existence of a U or inverted U-shaped relationship between growth and income inequality (Dollar and Kraay, 2001 and Lundberg and Squire, 1999). Some recent evidence also points to a positive relationship between income inequality and growth (Forbes, 2000).

The income inequality equation of the model has the Gini coefficient as dependent variable and an index for cereal production, transfers, inflation, public expenditure as share of GDP, growth of real per capita GDP and its square as explanatory variables.

As argued by Kakwani (1993), the degree of poverty depends on the poverty line, the average level of income and the extent of inequality in income distribution. The specification of the poverty equation in the model is directly derived from this conjecture. Attempts at incorporating aggregate policy measures in the poverty equation did not produce any significant improvement over the core specification suggested by Kakwani and the theoretical literature on poverty.

In order to analyze the potential impact of public policy on poverty, three measures of poverty have been used namely, the poverty headcount (H), the poverty gap ratio (PG) and a composite measure of the severity of poverty (PG2) that belongs to a parametric class, branded Pa class, proposed by Foster, Greer and Thorbecke (1984), referred to as FGT hereafter, and where a=2. The headcount measures the proportion of population living under the poverty line, the income gap ratio measures the extent of immiseration measured by the relative shortfall of their income or consumption with respect to the poverty line. The general expression of the FGT poverty measures used in this paper can be written as follows:

$$Pa = (1/n)[\sum_{i=1}^{q}(g_i/z)^a] \quad , \quad for\ a \geq 0 \qquad (4)$$

[3] Makdisi et al. (2003).

where:

n = total number of households

g_i = poverty gap of the ith household

q = number of households below the poverty line

z = poverty line.

For a=0, Pa is equal to the headcount ratio H, for a=1, Pa is equal to the PG product of the headcount ratio and the average income or consumption shortfall, and for a=2, Pa is equal to PG2. It is important to note at this stage that these poverty measures have different focus from a normative perspective. The headcount ratio would be more relevant if the purpose of policy makers is to reduce the number of people living below the poverty line. However, if the focus is not only on the absolute number of the poor but also on the degree of their immiseration, the poverty gap ratio would be more relevant. In the case where a=2, the distribution of income or consumption among the poor becomes more important since income or consumption shortfalls of the poorest fringe of the poor have heavier weights than the less poor. Therefore, the last index would be more relevant if the purpose of the policy maker is to help the poorest first and to help the less poor last.

Paramount to the three adopted measures of poverty is the concept of poverty line. There are several definitions that are available in the literature.[4] Among these, we have chosen a consumption-based concept of poverty line. It has been argued that a consumption-based concept of poverty is more appropriate when trying to analyze the standard of living in a society since current income may fluctuate and hence tend not to reflect consumption smoothing that is a good indicator of life-time material wealth or resources. In addition, we have chosen not to use a universal absolute poverty line as it may differ from national poverty lines that tend to better reflect the context in which needs arise.

We follow here the approach of Chen and Ravallion (2000), by regressing national poverty lines on a quadratic function of the difference between consumption per capita and the lowest consumption per capita in the sample, expressed in Purchasing Power Parity (PPP). The estimated value of the poverty line is then taken as the actual value of the poverty line for each country in the sample including the countries where no official national poverty line was reported.

---

[4] See for instance, Hagenaars and van Praag (1985), Kanbur (1987) and Ravallion (1998) for the wide spectrum of measurement issues related to poverty line definitions.

4. The Data

The data used in this paper relate to 77 different countries representing 129 expenditure distribution surveys with 25 countries having one survey and 52 countries two different surveys. All relevant variables used in the analysis as well as their respective sources are reported in table (a) in the appendix.

Initial data on national poverty lines measured in 1985 PPP for a sample of 48 countries were taken from Ali and El Badawi (2002). The estimated quadratic equation used in the extrapolation of poverty line is given by :

$$\underset{(107.66)}{\text{LOG}(Z) = 3.226} + \underset{(13.32)}{0.000500*[\mu-\min(\mu)]} - \underset{(-3.86)}{2.93E-08*[\mu-\min(\mu)]^2}$$

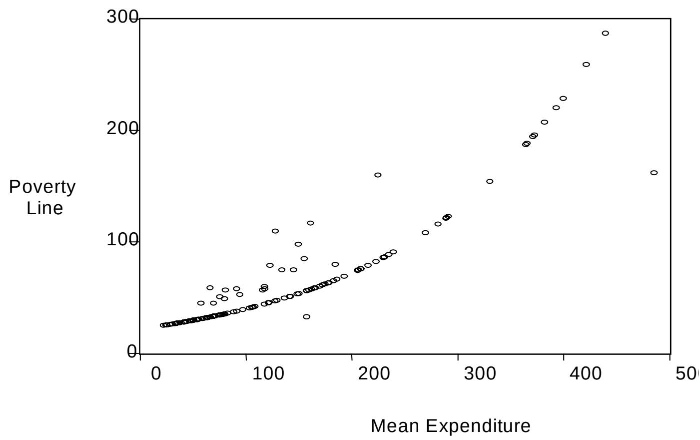
$$R^2 = 0.95; \quad F(45,42)=447.72.$$

where Z is the poverty line, μ is the mean consumption expenditure in the sample, min(μ) is the lowest mean consumption expenditure in the sample.

The estimated equation presents a very good fit for the data at hand as shown in figure 1 and by the high coefficient of determination and t-ratios reported in parentheses. The fitted values of poverty lines from the latter equation were used in conjunction with expenditure distribution for the 129 surveys in the sample to compute the Gini indices, and the three FGT indicators namely, head count, poverty gap, and poverty severity using the computer program POVCAL developed by Chen et al. (1998).

Data on mean expenditure and expenditure distribution are expressed in constant international prices (PPP 1985) and compiled from World Bank (2003), Wider (2004) database, Deininger and Squire (1996) and Dollar and Kraay (2001).

Figure 1. Relationship between Poverty Line and Mean Expenditure



Before using the computed poverty indicators and to ensure consistency with data used in other sources, our own estimates of these indicators were compared with the estimates reported respectively in the World Bank (2003), Chen and Ravallion (2002) and Ali and El Badawi (2002).

Overall, our estimates are broadly in line with the estimates reported in the previous sources. For instance, table 6.2 in the World Bank Development Indicators (2003) gives an average head count ratio of 35.4% that is only slightly higher than our own estimates of 34.7 %, both of which are lower than the estimates of Ali and El Badawi (2002, table 1 p.6) of 37.96%. Given sample differences in terms of number of countries covered and years of surveys, these minor discrepancies in the estimates of poverty head counts are only natural.

Public policy stance is measured in this paper by the ratio of public expenditure to GDP and by the distribution of public spending on education, health, transfers and subsidies, social security and welfare, agriculture, and housing. Data on these items were taken from the Government Financial Statistics of the IMF also published in the Web site of the Global Development Network (GDN).[5] Since public social expenditures and other control variables included in the model impact poverty and income distribution with a considerable time lag, these variables were included in the model as five-year backward moving averages from the date of the survey.

In order to reflect some stylized facts and possible correlations between public policies, poverty, income distribution, and growth as well as other aspects of the countries included in the sample, different data and

[5] The web site of GDN is http://www.gdnnet.org.

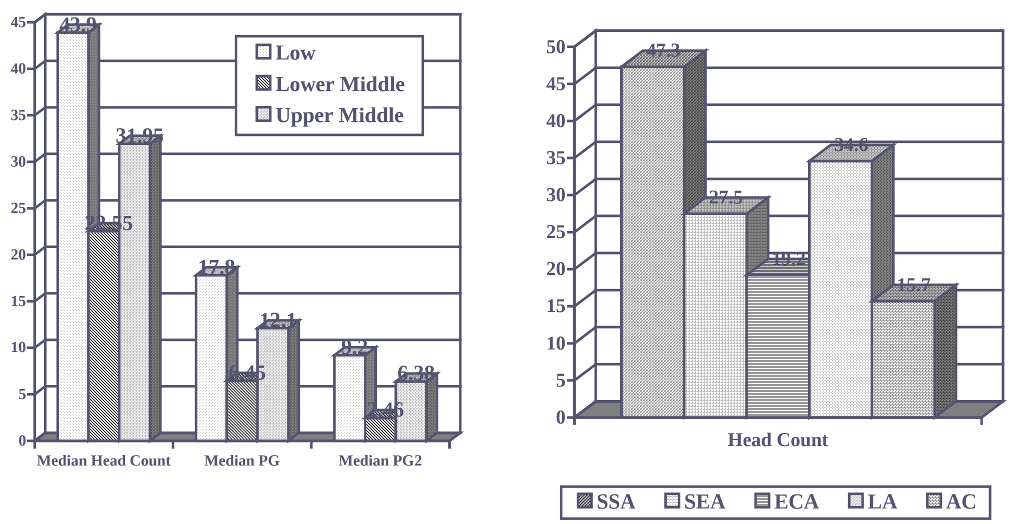
indices are summarized according to the income classification of the countries adopted by the World Bank. This classification distinguishes developing countries according to low, lower and upper middle income.

The data were also geographically grouped into the following areas: Sub-Saharan Africa (SSA), Arab Countries (AC), East and Central Europe (ECA), East/South Asia and the Pacific (SEA), and Latin America (LA).

Figure 2 depicts the structure of poverty by income level and by region. The distribution of poverty measures according to income levels shows that low income countries have the highest headcount poverty with a median ratio of 43%, while lower upper middle income countries have almost half the level of low income countries. Poverty in upper middle income countries increases to 32% probably affected by countries with high income and high poverty such as Botswana.

It should be noted that despite their poor growth record, Arab countries included in the sample have the lowest poverty incidence with a median headcount ratio of 16% only a third that of Sub-Saharan Africa and half that of Latin America.

Figure 2. Income and Geographical Structure of Poverty



As shown in figure 3, the computed Gini index of income distribution shows a sample average value of 45.4 and a U-shaped like pattern with inequality more pronounced for high and low income groups. Sub-Saharan Africa and Latin American countries have the highest Gini index and Arab countries have a relatively favorable income distribution although less favorable than that of East and Central European countries.

On average, Government expenditure represents about a quarter of GDP. Arab and East European countries have the highest Public expenditure to GDP ratio and also the lowest poverty levels. However, this should not be taken as a well established relationship between the two variables since the number of countries in these two groups represents only a small fraction of the sample. In fact, the overall sample correlations between, on the one hand, the share of expenditure and the head count ratio, and the share of expenditure and Gini coefficient, on the other, are only –0.24 and -0.15, respectively.

Figure 3. Gini Coefficient by Income Level

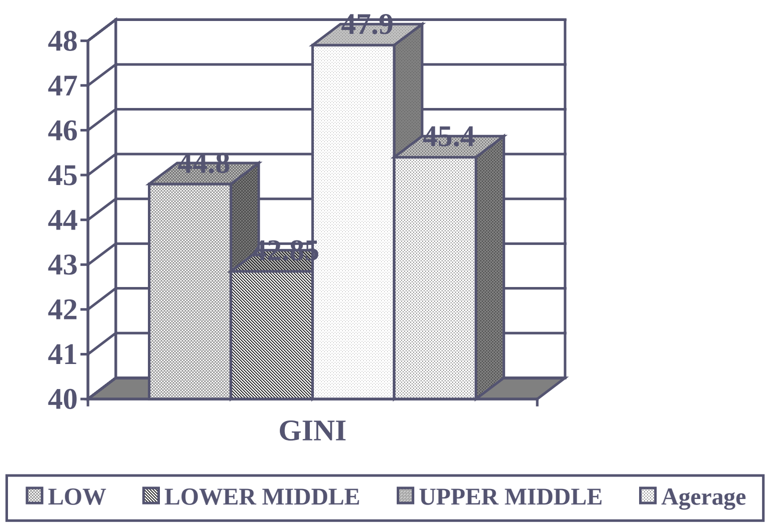
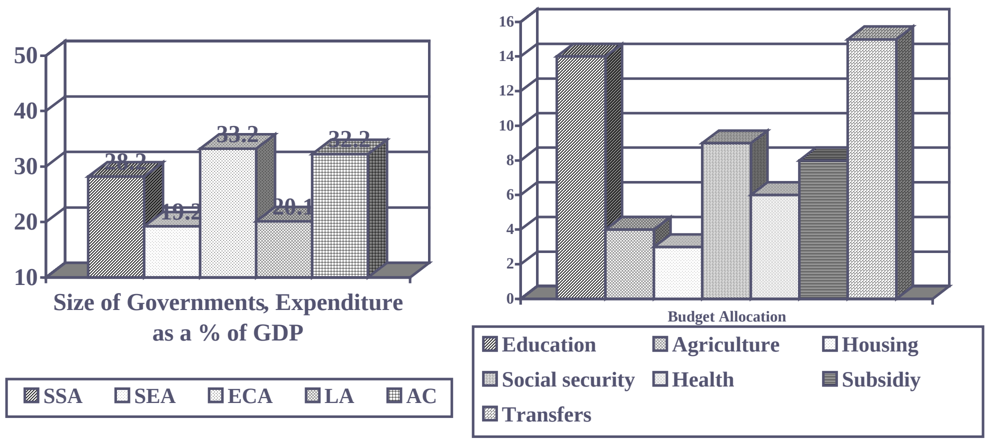


Figure 4 shows the share of Government expenditure in GDP and the sectoral allocation of budgets for the countries in the sample computed as five-year backward moving averages from the year of each survey. The figures show that, on average, Governments allocate 14% and 15% of their total expenditure on education and transfers, respectively; whereas health receives only 6% and housing 3%. Overall, the expenditure items that make up governments social policy constitutes 59% of total Government expenditure.

Figure 4. Share in GDP and Composition of Government Expenditures



When countries are classified according to the degree of severity of poverty, there does not appear a clear cut correlation between shares of social spending and poverty. However, despite the insignificant differences in social policy stance between the low-level and high-level poverty countries, the data on other structural and economic data reveal wide differences between these groups of countries. For instance, countries with high poverty levels are in general characterized by lower growth of per capita GDP (-0.054%) compared with low-poverty countries (1.63%), and by higher median inflation of 99%, lower openness and higher inequality in income distribution.

Table 1 provides mean-difference tests for three groups of poverty levels: low poverty (headcount ratio less than 20%), medium (headcount ratio between 20 and 45%) and high (more than 45%). As the table shows, countries classified according to poverty levels allocate expenditure similarly except in the case of aggregate expenditure, transfers and social security whose shares are significantly low in countries with high poverty levels.

Table (1)
Tests of Mean Difference according to Poverty Levels

Social Policy	Test of Mean Difference
Total Expenditure	8.530 0.004)**
Housing	1.363 (0.261)
Health	0.426 (0.564)
Social Security	3.861 (0.025)*
Subsidies	1.127 (0.329)
Transfers	5.524(0.006)**
Education	0.574 (0.566)

N.B. The expenditure items are calculated as percentage of GDP. P-values are in parentheses where (**) and (*) indicate statistical significance at the 1 and 5% levels, respectively.

5. The Results

Estimation results of the simultaneous equations model are presented in tables (b), (c) and (d) in the appendix. It should be noted that all variables have been converted to the logarithmic form so that estimates can directly be interpreted as elasticities. The model was estimated using three estimation procedures namely, Ordinary Least Squares (OLS), Two-Stage Least Squares (TSLS) and Three-Stage Least Squares (3SLS). The system was also estimated for the three poverty measures: headcount ratio, H, poverty gap ratio, PG, and the squared poverty gap ratio, PG2.

In general, the model presents a very good fit for the data and all the variables are statistically significant at conventional levels. The results are pretty similar across estimation methods despite the fact that the model was estimated in the case of TSLS and 3SLS using smaller numbers of observations given the incomplete data on several instrumental variables. It should be noted that given the recursiveness of the model, OLS estimates are in principle consistent.

The estimation of the growth equation, provided in table (b) in the appendix, reveals that many of the variables suggested by the recent empirical growth literature are rightly signed although statistically not very significant. The results pertaining to the income distribution equation, provided in table (c) in the appendix, also confirm some the regularities observed in recent literature pertaining to income distribution. For instance, it was found that the public expenditure ratio and share of transfers in public expenditures affect positively income distribution. Cereal production was also found to affect income distribution positively. Inflation was found to have a negative impact on income distribution and growth can positively impact the latter only at high rates.

As reported in table (d) in the appendix, poverty depends significantly on the poverty line, income distribution and mean consumption expenditure. Attempts at including other variables in the poverty equation notably those pertaining to public expenditures have yielded statistically insignificant results. The estimation of the poverty equation confirms the previous findings notably by Ali (1998) and those of Bruno et al. (1995) as reported in Ali, that poverty, no matter how measured, is more sensitive to changes in income distribution than to changes in mean consumption.

Our estimates of the elasticities of poverty with respect to mean consumption and the Gini coefficient show that the former is significantly above unity ranging across the three estimation methods between 1.15 and 1.98. The elasticity of poverty with respect to the Gini coefficient ranges between 1.74 and 4.61. It is also found that PG2 tends to be more responsive to changes in poverty line, income distribution and mean consumption expenditure than the other two measures of poverty.

Similarly, by deriving the reduced form parameters, it is possible to obtain the elasticity of any of the endogenous variables with respect to any of the exogenous variables. Table (e) in the appendix gives the multiplier (elasticity) matrix with respect to some of the variables of interest.

Based on the estimation of the structural parameters and the derived matrix of multipliers, we present here below some of the conclusions that can be drawn from the overall analysis of the results.

First and foremost, the results show that poverty respond to public policies only indirectly through the impact of the latter on growth and income distribution since none of the policy variables enter significantly into the estimated poverty equation.

Second, poverty is more responsive to public policies than income distribution and growth. The magnitude of the elasticities of poverty with respect to public policy and other control variables is higher than those of income distribution and growth. This is mainly due to the high elasticity of poverty with respect to income distribution, estimated between 1.8 and 4.0, that magnifies the impact of any policy or control variable on poverty.

Among the three measures of poverty adopted, PG2 and to a lesser extent PG seem to be more sensitive to public policy. This suggests that the impact of aggregate public policy tends to be more pronounced on the way income is distributed among the poor and the intensity of poverty than on the number of people living below the poverty line.

Third, the size of the Government proxied by the share of public expenditures in GDP is among the variables that have conflicting impact on growth and poverty. However, despite its distortionary impact on growth, the size of public expenditure seems to have a positive impact on income distribution and poverty. The elasticity of poverty with respect to aggregate Government expenditures was found to vary, across poverty definitions and estimation methods, between 0.35 and 1.31; and with respect to income distribution between 0.20 and 0.27.

Fourth, among the social public spending chapters in Government budget under study, transfers seem to be the more effective in affecting income distribution and poverty. However, transfers were found to have a small poverty elasticity ranging between 0.04 and 0.22. This result adds credence to previous findings on the statistical insignificance of the impact of aggregate public social policies on poverty (Dollar and Kraay, 2001).

Fifth, many indicators that are directly related to public policies and targeted toward the poor such as cereal production, are found to be important determinants of poverty and income distribution. The elasticity of poverty with respect to cereal production was systematically found to be larger than the elasticity of poverty with respect to transfers. This strengthens the validity of the argument calling for focusing public policies on basic needs and services at the expense of universal services such as higher education and hospital services, in order to improve the effectiveness of programs to fight poverty. This also confirms the results of Fan et al. (1999, 2002) on the role of production-enhancing investments in agriculture such as Research and Development in reducing poverty.

Sixth, the results pertaining to the poverty impact of growth seem to suggest an inverted–U relationship between the two. This means that only at high rates that economic growth can start affecting positively both income distribution and poverty.

Seventh, consistent with theory, it is found that macroeconomic imbalances such as high rates of inflation are detrimental to growth, income distribution and especially to poverty. A disciplined monetary policy is therefore a first line of defense against poverty.

Eighth, the results obtained from the growth equation fairly confirm established facts from the recent empirical growth literature. However and unlike what is reported in previous studies such as in Dollar and Kraay (2001), many of the factors impacting positively growth such as openness, institutional performance do not seem to have any significant impact on poverty or income distribution. On the contrary, openness is found to affect negatively poverty.

Ninth, many factors are mutually exclusive when it comes to their respective impact on growth, on the one hand, and income distribution and poverty, on the other. This, as argued by Lundberg and Squire (1999), calls for the adoption of a combination of both mutually exclusive and mutually beneficial policies in order to achieve positive results with respect to the three variables at hand namely growth, income distribution and poverty.

Tenth, table (f) in the appendix, shows the partial elasticities of poverty with respect to mean consumption and income distribution classified by poverty and income levels as well as geographical location. A cursory analysis of these elasticities, computed using the POVCAL program, reveals that poverty tends to be more responsive for medium-income countries since the respective elasticities were found to be higher for this group than those of low and high income groups. This pattern may be interpreted as the mirror image of Kuznet's inverted U for income distribution since at low level of development attempts at poverty reduction are not very effective, become more successful as income level increases and less successful for higher levels of income.

The partial elasticities by geographical location show that East and South Asian countries have the higher elasticities followed by the group of Arab countries. This finding may reflect the fact that many of the countries in East and South Asia are among the medium-level income group in the World, while those of the Arab countries are in the lower fringe of this group.

Eleventh, the elasticities of poverty , whether partial or structural , with respect to mean consumption and income distribution tend to be higher for PG2 than for PG and H. This shows again that it is easier to impact the way income is distributed among the poor and the intensity of poverty than reducing the number of people living below the poverty line.

Finally, the results pertaining to the Arab countries confirm the previously reached conclusions for the whole sample. Table (h), reveals that higher-income Arab countries should in principle be more successful in reducing poverty than lower-income countries. In addition, the results show that policies aimed at improving income distribution are more effective in affecting poverty than policies directed to increase mean consumption (i.e. growth).

6. Conclusion

One of the most important results of the paper is that policies aimed at improving income distribution are more effective in affecting poverty than policies directed to increase mean consumption and growth. Although public policies were found to affect poverty only indirectly through their impact on growth and income distribution, the high elasticity of poverty with respect to income distribution is such that any policy that is favorable to income distribution has a more positive and immediate impact on the poor. This has important implications as far as the conventional prescription stating that the only viable anti-poverty measures are those aiming at promoting growth. In fact, our results firms up previously reached conclusions notably by Ali (1998) that growth-promoting policies need to be accompanied by equity and poverty enhancing policies in order to be effective and realistic.

Our results also show that Government expenditures, transfers and monetary policy aimed at reducing inflation, have all a positive impact on the extent of poverty. Openness, on the other hand, although a pro-growth policy, was found to have negative impact on income distribution and poverty. Given the conflicting impact of public policies on growth, poverty and income distribution, care has to be taken to choose the right of mix of policies achieving positive results on the three targets. Among the social spending chapters in Government budget, transfers seem to be more effective in affecting income distribution and poverty

The results also suggest that policies aimed at sustaining basic necessity production such as that of cereals, have a larger impact on poverty and income distribution than aggregate public policies. This suggests that policies targeted toward the basic necessities of the poor are more effective in reaching the poor than policies aiming at improving universal and non-basic services.

Finally, public policies and other variables affecting poverty are found to have a more significant impact on the degree of severity of poverty than on the number of the poor.

References

Ali, A. G. A. and I. El Badawi, (2002). "Is Economic Growth Good for the Poor ? Revisiting Dollar and Kraay, Unpublished Manuscript.

Ali, A. G. A., (1998). "Dealing with Poverty and Income Distribution Issues in Developing Countries: Cross-Regional Experiences", Journal of African Economies, Vol. 7, Supplement 2, pp. 77-115.

Barro, R., (1991). "Economic Growth in a Cross-Section of Countries", Quarterly Journal of Economics, Vol. 106, pp. 407-443.

Bidani, B. and M. Ravallion. (1997), "Decomposing Social Indicators using Distributional Data", Journal of Econometrics, Vol. 77, pp. 125-139.

Bulir (2001). "Income Inequality: Does Inflation Matter?", IMF Staff Paper, Vol. 48, No. 1, pp. 139-159.

Castro-Leal, J. Dayton, L Demery, and K. Mehra (1999). " Public Spending in Africa: Do the Poor Benefit?", The World Bank Research Observer", Vol. 14, No. 1.

Chen, S. and M. Ravallion, (2000). "How Did the World's Poorest Fare in the 1990s", Unpublished Manuscript, the World Bank.

Chen, S. , G. Datt and M. Ravallion, (1998). "POVCAL: A Program for Calculating Poverty Measures From Grouped Data", the World Bank. Available through the internet at http://www.worldbank.org/lsms/tools/povcal/.

Deininger and Squire (1996). "Measuring Inequality: A new Data-Base", World Bank Economic Review, Vol. 10, No. 3, pp.565-591.

Dollar and Kraay (2002). " Data Set for Growth is Good for the Poor"; World Bank, www.worldbank.org.

Dollar D. and A. Kraay, (2001). "Growth is Good for the Poor", Unpublished Manuscript, the World Bank.

Filmer, D. and L. Pritchett, (1997). "Child Mortality and Public Spending on Health: How much Does Money Matter?", Policy Research Working Paper No. 1864, the World Bank.

Fan, S. and Rao (2003). “Public Spending in Developing Countries: Trends and Impacts”, Environment and Production Technology Division, IFPRI, EPTD Discussion Paper No 99.

Fan, S. , L. Zhang, and X. Zhang, (2002). “Growth, Inequality, and Poverty in Rural China: The Role of Public Investments”, IFPRI Research Report, 125, Washington D.C.

Fan, S. , P. Hazell, and S. Thorat, (1999). “Linkages Between Government Spending, Growth, and Poverty in Rural India”, IFPRI Research Report, 110, Washington D.C.

Fischer, S., (1993). “The Role of Macroeconomic Factors in Growth”, Journal of Monetary Economics Vol. 32, No. 3, pp. 485-512.

Forbes, K., (2000). “A Reassessment of the Relationship Between Inequality and Growth”, American Economic Review, Vol. 90, No. 4, pp. 869-897.

Foster, J. , Greer J. and E. Thorbecke, (1984). “A Class of Decomposable Poverty Measures”, Econometrica, Vol. 52, No. 3, pp. 761-766.

Gootaert, et al. (1995). “ The Dynamics of Poverty: Why Some People Escape from Poverty and Others Don’t”, World Bank Working Paper, May 1995.

Hagenaars, A. J. M., and B. M. S. van Praag, (1985). “A Synthesis of Poverty Line Definitions”, Review of Income and Wealth, June, pp. 139-154.

Kakwani, N., (1993). “Poverty and Economic Growth with Application to Côte d’Ivoire”, Review of Income and Wealth, Vol. 39, No. 2, pp. 121-139.

Kanbur, S. M. R, (1987). “Measurement and Alleviation of Poverty”, IMF Staff Papers, March, pp. 60-85.

Li, H. , L. Squire and H. Zou, (1997). “Explaining International and Intertemporal Variations in Income Inequality”, The Economic Journal Vol. 108, pp. 1-18.

Lundberg, M. and L. Squire, (1999). “Growth and Inequality: Extracting the Lessons for Policymakers”, Unpublished Manuscript.

Makdisi, S. , Fattah Z. and I. Limam, (2003). “Determinants of Growth in the MENA Countries”, Arab Planning Institute Working Paper API/WPS 0301, Kuwait.

North, D. (1990). Institutions, Institutional Change and Economic Performance, Oxford: Oxford University Press.

Ravallion, M. (1998). “Poverty Lines in Theory and Practice”, LSMS Working Paper #133, World Bank, Washington D.C.

Ravallion, M., G. Datt, and van De Walle, (1991). “Quantifying Absolute Poverty in the Developing World”, Review of Income and Wealth, Vol. 37, No. 4, pp. 345-361.

Sanjeev, D. et al (1997). “ The Efficiency of Government Expenditure: Experiences from Africa”, IMF Working Paper WP/97/153.

Squire, L., (1993), “Fighting Poverty”, American Economic Review, Vol. 83, No.2, pp. 377-382.

Tanzi, V., (1998). “Fundamental Determinants of Inequality and the Role of Government”, IMF Working Paper, WP/98/178.

United Nations Development Programme, UNDP, (2003). Human Development Report 2003: Millennium Development Goals: A Compact among Nations to End Human Poverty, Oxford University Press, New York.

Van De Walle, (1996). Assessing the Welfare Impacts of Public Spending,, policy Research Working Paper 1670 , The World Bank , Washington D. C.

World Bank (2004), World Development Report, The World Bank, Washington D. C.

Table (a) Variable Definitions and Data Sources

Variable	Sources
GINI	World Bank(2003), UN-Wider (2003) databases, Deininger and Squire (1996), Dollar and Kraay (2002)
Mean Expenditure	Summers and Heston Penn World Tables, World Bank database.
Poverty Line	Ali and El Badawi (2002) , Chen and Ravallion (2002)
Growth Rate	World Bank Indicators (2003)
Investment Ratio	World Bank Indicators (2003)
Trade Restrictions Index	Economic Freedom in the World (2004)
Cereal Production Index	World Bank Indicators (2003)
Inflation Rate	World Bank Indicators (2003)
Expenditure to GDP	World Bank Indicators (2003)
Government expenditure on: Education, Health, Social Security, Agriculture, Transfers, Subsidies	GDN and World Bank Indicators

Table (b) Growth Equation

	OLS	2SLS	3SLS
Constant	-0.106	-0.230	-0.284
	(-1.643)	(-2.043)**	(-2.877)***
Investment Ratio	0.038	0.034	0.033
	(2.698)***	(3.981)**	(2.358)**
Trade Restriction Index	0.010	0.003	0.006
	(1.001)	(0.103)	(0.301)
Expenditure Ratio	-0.025	-0.027	-0.021
	(-3.369)***	(-2.088)**	(-1.835)*
Quality of Institutions	0.028	0.033	0.048
	(2.201)**	(1.728)*	(1.310)
Initial Income	-0.006	0.012	0.007
	(-1.116)	(0.927)	(0.716)
Obs	**70**	**37**	**37**
R^2	**0.426**	**0.343**	**0.330**

* Significant at the 10 % Level, ** Significant at the 5% Level, **** Significant at the 1 % Level

Table (c) Income Distribution (GINI) Equation

	OLS	2SLS	3SLS
Constant	5.577	5.316	5.224
	(12.424)***	(8.575)***	(9.800)***
Cereal Production Index	-0.156	-0.133	-0.129
	(-2.305)**	(-2.634)***	(-3.473)***
Transfers	-0.055	-0.025	-0.022
	(-2.713)***	(-1.048)	(-1.045)
Inflation Rate	0.104	0.160	0.157
	(3.191)***	(3.609)***	(2.543)***
Expenditure to GDP	-0.165	-0.156	-0.143
	(-1.526)	(-1.579)	(-2.122)**
Growth Rate	2.445	4.266	4.615
	(1.932)**	(2.364)***	(2.750)***
Squared Growth Rate	-29.457	-40.280	-29.836
	(-1.817)*	(-1.229)	(-1.059)
Obs	**64**	**37**	**37**
R^2	**0.395**	**0.241**	**0.214**

Table (d) Poverty Indicators Regressions

	Head Count			Poverty GAP			Poverty Severity (PG2)		
	OLS	2SLS	3SLS	OLS	2SLS	3SLS	OLS	2SLS	3SLS
Constant	-0.410	0.282	0.486	-4.569	-5703	-5.580	-7.092	-12.049	-10.563
	(0.658)	(0.567)	(1.053)	(6.503)***	(5.612)***	(8.405)***	(-8.656)***	(-6.808)***	(-7.343)***
GINI	2.217	1.797	1.738	3.326	3.438	3.976	3.950	4.608	4.545
	(15.239)***	(13.657)***	(14.261)***	(20.338)***	(11.720)***	(13.344)***	(20.112)***	(11.057)***	(12.003)***
$\frac{MeanExpenditure}{PovertyLine}$	-1.440	-1.157	-1.150	-1.796	-1.450	-1.436	-1.980	-1.667	-1.646
	(-13.114)***	(-14.384)***	(-15.403)***	(-14.514)***	(-8.830)***	(-9.451)***	(-13.324)***	(-6.542)***	(-7.009)***
Observations	129	37	37	129	37	37	129	37	37
R^2	0.741	0.927	0.926	0.816	0.900	0.898	0.806	0.872	0.871

Table (e) Model Derived Structural Elasticities

Estimation Method		Investment Ratio	Trade Restriction	Expenditure Ratio	Quality of Institutions	Initial Income level	Cereal Output	Transfers Share	Inflation Rate	Poverty Line	Mean Expenditure
OLS	Growth Rate	0.04	0.01	-0.03	0.03	-0.01	0.00	0.00	0.00	0.00	0.00
	Income Distribution	0.10	0.02	-0.23	0.07	-0.02	-0.16	-0.06	0.10	0.00	0.00
	Poverty Severity	0.39	0.10	-0.93	0.29	-0.10	-0.64	-0.24	0.40	2.20	-2.05
2SLS	Growth Rate	0.03	0.00	-0.03	0.03	0.01	0.00	0.00	0.00	0.00	0.00
	Income Distribution	0.13	0.01	-0.29	0.13	0.04	-0.13	-0.03	0.16	0.00	0.00
	Poverty Severity	0.62	0.06	-1.39	0.62	0.21	-0.63	-0.14	0.77	1.88	-1.72
3SLS	Growth Rate	0.03	0.01	-0.02	0.05	0.01	0.00	0.00	0.00	0.00	0.00
	Income Distribution	0.14	0.03	-0.24	0.23	0.05	-0.13	-0.02	0.16	0.00	0.00
	Poverty Severity	0.66	0.13	-1.13	1.10	0.22	-0.62	-0.10	0.76	1.79	-1.68

Table (f) Poverty Partial Elasticities

	Expenditure			Gini		
Poverty Indicator	**H**	**PG**	**PG2**	**H**	**PG**	**PG2**
Poverty incidence						
Low Incidence	-2.80	-3.34	-3.73	4.54	8.03	11.29
Medium Incidence	-1.87	-2.40	-2.78	2.59	5.63	8.47
High Incidence	-1.01	-1.45	-1.78	0.81	2.85	4.82
Income Level						
Low	-1.61	-2.09	-2.39	1.63	3.80	5.80
medium	-2.17	-2.95	-3.62	3.58	7.57	11.38
Upper	-1.81	-2.00	-2.08	2.69	5.22	7.61
Region						
Sub Saharan Africa	-1.06	-1.49	-1.80	0.92	3.07	5.12
East and South Asia	-3.48	-4.52	-5.30	5.22	9.29	12.99
East and Central Europe	-2.76	-2.57	-2.23	4.38	6.58	8.54
Latin America	-1.32	-1.79	-2.19	1.92	5.01	8.02
Arab Countries	-2.72	-3.60	-4.27	4.24	8.10	11.65
Sample Average	**-1.85**	**-2.36**	**-2.73**	**2.56**	**5.44**	**8.15**

Table (g) Model Derived Elasticities of Poverty

	Expenditure/Poverty Line			Gini		
	H	**PG**	**PG2**	**H**	**PG**	**PG2**
OLS	-1.44	-1.80	-1.98	2.22	3.33	3.95
TSLS	-1.16	-1.45	-1.67	1.80	3.44	4.61
3SLS	-1.15	-1.44	-1.65	1.74	3.80	4.55
Average	**-1.25**	**-1.56**	**-1.77**	**1.92**	**3.52**	**4.37**

Table (h) Partial Poverty Elasticities for Arab Countries

COUNTRY	SURVEY	ELASTICITIES					
		MEAN CONSUMPTION			GINI INDEX		
		H	PG	PG2	H	PG	PG2
ALGERIA	1995	-2.841	-3.501	-3.818	4.546	8.202	11.309
ALGERIA	1988	-2.981	-3.121	-2.827	4.86	7.719	9.87
EGYPT	1999	-5.53	-5.3	-4.55	9.049	11.31	12.718
JORDAN	1997	-2.784	-4.483	-6.184	4.982	10.812	16.646
JORDAN	1991	-4.357	-7.43	-10.532	7.79	16.072	24.406
MORROCO	1998	-2.643	-4.271	-5.892	4.385	9.745	15.095
MORROCO	1990	-2.726	-3.477	-3.9	4.444	8.3	11.619
MAURITANIA	1995	-1.668	-2.159	-2.637	1.399	3.649	5.889
MAURITANIA	1993	-1.275	-1.875	-2.261	0.987	3.225	5.299
TUNISIA	1995	-2.222	-2.748	-3.027	3.921	7.614	10.871
TUNISIA	1990	-2.117	-2.909	-3.534	3.804	8.023	11.942
YEMEN	1992	-1.465	-1.875	-2.044	0.758	2.487	4.091

Chapter Four

Impacts of Public Policy on Poverty in Arab Countries: Review of the CGE Literature

Mustafa Babiker

1. Introduction

Over the last two decades, developing countries have witnessed major macroeconomic shocks that have had significant impacts on the level of poverty and the distribution of incomes in these countries. Some of these shocks are the result of fluctuations in the world prices of crucial developing countries export products, whereas others are endogenously produced by economic policy reforms such as structural adjustment programs and trade liberalization that have been implemented by these countries during the period.

Quantifying and assessing the size of these impacts as well as designing public policies to mitigate them are now among the top national issues in the debate around economic policy reforms in developing countries. Further, many multilateral agencies, such as the World Bank and the International Monetary Fund (IMF) started to condition their funding operations in developing countries on the progress achieved nationally with respect to poverty reduction policies and measures. In particular the preparation of Poverty Reduction Strategy Papers (PRSPs) to meet the World Bank funding conditions for some developing countries requires the assessment and the quantification of the impacts of economic policies to be taken on the poor. This requires answering important policy questions such as how specific changes in public spending or the delivery of public goods, particularly education, infrastructure, and health affect the poor? What is the poverty impact of structural reforms such as tax policy, trade policy, and privatization? How inflation and exchange rate management affect poverty? and what are the poverty impacts of exogenous shocks such as price and capital flows fluctuations, and emergences of financial crises?.

Answering such questions necessarily requires the development of economic tools that are capable of linking the macroeconomic structure with the microeconomic behavior. Computable General Equilibrium (CGE) models provide one of these tools. These models have been used widely to simulate the impacts of exogenous shocks and changes in policies on the socioeconomic system including households welfare and income distribution. Some good examples of such applications in developing countries are Adelman and Robinson (1979) for Korea, Dervis, de Melo and Robinson (1982) for Kenya, Thorbecke (1991) for Indonesia, De Janvry, Sadoulet and Fargeix (1991) for Ecuador, Morrisson (1991) for Morocco, Chia, Wahba and Whelley (1994) for Côte d'Ivoire, Löfgren et al. (1999) for Morocco and Cogneau and Robilliard (2000) for Madagascar.

There are two approaches used to address the question of poverty and income distribution within the CGE framework. The first and the most common one is the representative household (RH) approach in which the household agent is disaggregated according to socioeconomic or geographical criteria and where the solution from the CGE model is sequentially augmented with household survey data to simulate poverty and inequality indices (Decaluwe et al. (1999), Hertel et al. (2001), Stifel and Thorbecke (2003)). The main shortcoming of this approach with respect to poverty analysis is its assumption that income distribution within the groups represented by the household agents is not affected by the policy shock. The other approach is the micro simulation (MS) approach in which the household agents in the CGE model correspond to the observed individual households in a survey (Cogneau and Robilliard, 2000). By endogenzing intra-group distributions, this approach effectively circumvents the shortfalls of the RH approach, but on the other hand it creates significant demands in terms of data, statistical procedures and modeling that may not be affordable in a developing country context. The first objective of this paper is to review and compare the various versions of these two approaches with special emphasis on data requirements, applicability to developing countries, and on how public policy targeting poverty may be modeled and assessed within the CGE framework.

The situation in the Arab countries with respect to vulnerability, poverty, and economic reform policies is not different from that prevailing in other developing countries. Indeed, faced by acute economic imbalances during the 1980s, many Arab countries have embarked the path of economic reforms and structural adjustment programs (Sudan in 1983, Morocco in 1983, Tunisia in 1987, Jordan in 1989, Egypt in 1991 and Algeria in 1995) with the help of the international financial institutions. The implementation of these reforms, however, has invoked wide concerns on their socioeconomic and political implications and increased the calls for public policies to correct their detrimental effects on poverty and income distribution. A second objective of this paper is to review the available CGE studies that were undertaken to address the poverty impacts of economic policies in the Arab region. The emphasis in this review will be more on methodology and data availability than on the specific results of these studies.

Thus the overall objective of this paper is rather a pedagogical one in the sense that the paper aims at drawing a road map for how poverty analysis might be conducted within a CGE framework for a typical developing country. The rest of the paper is organized as follows. Section 2 reviews model construct and outlines the poverty analysis methodologies within the CGE framework, section 3 reviews contemporary CGE literature on poverty in Arab countries, section 4 suggests a framework for modeling public policy impacts on poverty taking into consideration existing data gaps in Arab countries, and section 5 concludes.

2. *Computable General Equilibrium Modeling and Poverty*

2.1 Overview

An analysis of the impacts of economic policy on poverty and income distribution requires an economy-wide framework that includes considerable details on household income and expenditure patterns. The conventional CGE construct provides a starting point for this framework. A CGE model is a simultaneous system of non-linear equations that characterizes the general equilibrium in an economy. Typically such a system is calibrated on a Social Accounting Matrix (SAM), which is a comprehensive accounting framework that incorporates all major transactions within a socioeconomic system in a given year (Pyatt et al. (1977), Pyatt and Round (1979)). The structure, the level of disaggregations, and the scope of a CGE model usually depend on the type of questions to be answered by the model. Accordingly there is a spectrum of model structures including static vs. dynamic, single sector vs. multisectoral, single region vs. multiregional, and single agent vs. multiagents CGE models. For the purpose of poverty analysis, the CGE model should include as much disaggregation as possible of the household sector and the factors of production accounts to represent the pre-existing heterogeneity with respect to the sources and uses of incomes. This usually requires augmenting the model database with survey data on household income and expenditure characteristics. To simulate the impacts of a policy shock, the CGE model is first solved to generate the SAM (Static) or a projected baseline (Dynamic) as an initial solution path. Next, the model is solved for the counterfactual policy shock and the results are usually reported as percentage deviations from the initial solution. For poverty analysis, poverty measures are computed either endogenously (MS approach) or exogenously following the solution of the CGE model (RH approach).

2.2 The Structure of SAM

The Social Accounting Matrix (SAM) provides an accounting as well as a conceptual framework for understanding the impact of economic policies on poverty. This is because the SAM framework includes all the major socioeconomic relationships that would be affected by the policy shock besides an organizational setup for classifying and discussing the actual components that would be included in a CGE model.

Table 1 outlines the basic structure of a SAM, in which each account is represented by a row displaying the receipts and a column displaying the expenditures of the corresponding account. There are six accounts in SAM; factors of production, institutions (households, companies, government), capital account, production activities, and the rest of the world (ROW) account. Factors account receives, factor earnings from production activities and ROW, and allocates them to households and companies. Institutions receive incomes from factors account and from domestic and foreign transfers and spend them on tax payments, consumption, and transfers, with the residual constituting net savings. Production activities account generates receipts from sales to households, government, capital account, other production activities and to the rest of the world and spends on value added payments to factors, indirect taxes and purchases of domestic and imported raw materials. The capital account receives savings from households, companies, and the government, and net capital flows from abroad and uses its receipts to purchase domestic and foreign investment goods. The rest of the world account generates receipts from factor earnings, transfers and exports and spends on factor payments, transfers and imports with the residual being the net capital outflow (foreign savings).

Table (1)
Basic SAM Structure

Receipts		Expenditures								
		Activities	Commodities	Factors	Institutions				Rest of the World (RoW)	Total
					Households	Enterprises	Government	Capital		
Activities			Domestically marketed outputs		Home-consumed outputs		Export subsidy		Exports	Production
Commodities		Intermediate inputs			Private consumption		Government consumption	Investment		Domestic demand
Institutions	Factors	Value-added							Factor income from RoW	Factor income
Institutions	Households			Factor income to households	Inter-households transfers	Distributed profits to households	Transfers to households		Transfers to households from RoW	Household income
Institutions	Enterprises			Factor income to enterprises		Undistributed profits	Transfers to enterprises		Transfers to enterprises from RoW	Enterprise income
Institutions	Government	Producer taxes, value-added tax	Sales taxes, tariffs	Factor income to government, factor taxes	Transfers to government, direct household taxes	Surplus to government, direct enterprise taxes			Transfers to government from RoW	Government income
Capital					Household savings	Enterprise savings	Government savings		Foreign savings	Savings
Rest of the World (RoW)			Imports	Factor income to RoW		Distributed profits to RoW	Government transfers to RoW			Foreign exchange outflow
Total		Activity expenditures	Domestic supply	Factor expenditures	Households expenditures	Enterprise expenditures	Government expenditures	Investment	Foreign exchange inflow	

Among these, the most important endogenous accounts with respect to poverty analysis are the factors of production account, the households account, and the production activities account. Indeed, the key to poverty analysis is the mapping from the factorial income distribution to the household income distribution. Therefore, the more disaggregated these two accounts the better suited the given SAM for poverty analysis. In contrast, the only truly exogenous account in the context of economic policy impacts on poverty is the government account. This is obvious, since any policy measures such as structural adjustment, trade liberalization or policies to alleviate poverty will be carried through this account. For example, a reduction in government expenditure would effect transfers and subsidies to households and government expenditure on education, health and infrastructure. A trade liberalization regime, in contrast, could lead to an increase in domestic taxes to compensate the government for the loss of tariff revenues.

On the other hand, exogenous economic shocks such as terms of trade and capital flows volatilities will be transmitted into the SAM framework through the rest of the world account. In that sense and with the trade assumption of small open economy, the rest of the world account may be largely considered as exogenous. Alternatively, when the government actively engages in trade policies such as trade liberalization and foreign exchange management, the rest of the world account may considered as endogenous even with the assumption of small open economy.

The investment-saving account can be viewed either as exogenous or endogenous, depending on the time horizon and the type of the policy shock in question. In the static context, investment is usually considered as exogenous whereas in a dynamic context and where the policy shock is likely to affect the structure of the economy, e.g. a policy associated with structural adjustment, the investment account should be treated as endogenous.

As an organizational tool, SAM provides an orderly way of identifying the main components of a CGE model. These modules include production and technology, household income and expenditure account, investment-savings behavior, foreign trade and balance of payment account, and the government activity account.

2.3 Income Distribution and Measurement of Poverty

2.3.1 Income distribution

Knowledge of income distributions within an between socioeconomic groups is essential for conducting analysis of poverty incidence. Fine disaggregation of the household sector in SAM into homogenous groups is a first step towards this goal. Three main criteria seem important in classifying households: location, endowment and wealth, and occupation. Different researchers have adopted different schemes of classifications.

For example Decaluwé et al. (1999) used a hybrid location – education – ownership criterion to divide the households into rural land-less, small landowner, large landowner, urban low-education, urban high-education, and capitalist households. Löfgren and El-Said (1999) used a location-income criterion classifying the Egyptian households into rural and urban groups disaggregated by quintile. Hertel et al. (2001) classified households, in a cross-country study of trade liberalization effects on poverty, according to the sources of income into households relying exclusively on transfers, self-employed households in agriculture, self-employed households in non-agricultural enterprises, wages/salaries earners, and diversified-income households. Stifel and Thorbecke (2003) adopted a location-employment criterion and accordingly classified their households into the six groups: rural small-holders, rural unskilled, rural skilled, urban informal, urban unskilled and urban skilled.

Alarcon et al. (1986) argued that the classification scheme should meet the following criteria to be useful for policy analysis: (a) consists of relatively homogenous groups; (b) be composed of groups that are recognizable for policy purpose; and (c) be based on comparatively stable characteristics that are easily identifiable and measurable.

Nevertheless, even if its is possible to disaggregate the household sector in the SAM following the proceeding lines, a model based on such a structure will not be able to assess poverty incidence. This is because a model with such a structure may only explain the determination of mean incomes and inter-group income inequalities but not the intra-group income distribution, which is necessary for poverty analysis. Hence, it is necessary to augment the SAM database with additional outside information on intra-group income distribution. One source for this additional information is household micro surveys, which by now are available for many developing countries from national and international sources. Provided that it is complete and compatible with the SAM, the survey information on intra-group distributions may either be integrated directly into SAM, so that the model will endogenously generate the post-shock intra-group distributions, or be augmented with the solution from the model to characterize the poverty incidence of the policy shock exogenously.

Unfortunately, complete and compatible intra-group distributions based on household survey data may not be possible in many cases. This is due to either data gaps and incomplete coverage of the survey or to differences in statistical procedures, classification, and time lags between the survey and the given SAM. In cases where satisfactory intra-group distributions can not be generated from the survey data or when survey data are unavailable, resort is made in the poverty literature to the statistical theory.

There are a number of studies in the CGE literature that made use of this approach to assess the impact of economic policies on poverty. The earliest attempt is by Adelman and Robinson (1979), who used a lognormal model to simulate the intra-group income distributions in their study. De Janvry et al. (1991) used both the lognormal and the Pareto distribution functions to depict the income distribution of each household group in their model. The properties of the constructed intra-group distributions for some groups in these two studies are, due to the restrictiveness of these functional forms, are however, not satisfactory. The latter literature (e.g. Decaluwé et al. (1999), Stifel and Thorbecke (2003), and AKA (2003)) attempts to use more flexible functional forms such as the Beta distribution.

The Beta distribution is a flexible functional form that is characterized by three arguments: the minimum, the maximum, and the skewness. For the case of income distribution, the Beta density function has the form:

$$f(y;p,q)=\frac{1}{\beta(p,q)}\frac{(y-\min)^{p-1}(\max-y)^{q-1}}{(\max-\min)^{p+q-1}} \qquad (1)$$

$$where\ \beta(p,q)=\int_{\min}^{\max}\frac{(y-\min)^{p-1}(\max-y)^{q-1}dy}{(\max-\min)^{p+q-1}}$$

Unlike the lognormal, the Beta function can be skewed to the left or to the right and can be symmetric. If $p>q$ the distribution is skewed to the left. If $p<q$ the distribution is skewed to the right and is symmetric if $p=q$ [1]. In applied work the main problem with the Beta distribution is that in the absence of a survey data, from which p and q can be estimated, the choice of these parameters is adhoc.

2.3.2 Measurement of Poverty

Given the intra-group income distributions a number of poverty indices may be computable (Ravallion, 1994). The most widely used class of poverty indices in the literature is the FGT, following Foster, Greer and Thorbecke (1984). The FGT indicators, denominated p_α, belong to a class of additively decomposable poverty measures. These indicators allow the measurement of the proportion of poor population (the headcount ratio) as well as the depth and the severity of poverty at both the group and the national levels.

The FGT poverty measure is defined as:

---

[1] These conditions are true only if both p and q are greater than one.

$$P_{\alpha} = \frac{1}{n}\sum_{i=1}^{q}\left(\frac{z-y_i}{z}\right)^{\alpha} \qquad (2)$$

where n is the total number of individuals under consideration, q is the total number of poor, y is the income of the ith poor individual, z is the poverty line, and α is a parameter characterizing the degree of poverty aversion.

For z, most of the literature uses the national absolute poverty line. The absolute poverty line can either be assumed as exogenous in the analysis, e.g. using the one or two dollars World Bank estimates adjusted or unadjusted for purchasing power, or generated endogenously using the national basket of basic needs and the commodity prices generated by the CGE solution, i.e.

$$Z = \sum_{com} \omega_{com} PC_{com} \qquad (3)$$

where ω is the basket of basic needs and PC is consumer price of the corresponding commodity.

The value of α in (2) can be specified exogenously by the policy maker. For $\alpha = 0$, the poverty index becomes the headcount ratio,

$$P_0 = \frac{q}{n}$$

As is obvious the P_0 implies a complete insensitivity of the measure to the degree of poverty. When $\alpha = 1$,

$$P_1 = \sum_{i=1}^{q}\frac{(z-y_i)}{nz}$$

which reflects the poverty depth in the sense that it measures the total additional incomes necessary to bring every poor to the poverty line in proportion to the total incomes needed to support the poverty line income as an average income for the population.

Finally, for $\alpha > 1$, the weight assigned to the poor individual increases with the income gap. In the case $\alpha = 2$, each of the poors is given a weight in proportion to the shortfall of his/her income from the poverty line, i.e.,

$$P_2 = \sum_{i=1}^{q}\frac{(z-y_i)^2}{nz^2}$$

An important property of the FGT index is that it is additively decomposable among population subgroups, allowing a consistent quantitative mapping from changes in subgroup poverty to changes in aggregate poverty. Hence the poverty impacts of a given policy may first be assessed at the subgroup level and then mapped to the aggregate level using the subgroup relative population shares as weights, i.e.,

$$P_\alpha = \sum_{g=1}^{k} \frac{n_g}{n} P_{g,\alpha} , \sum_{g=1}^{k} n_g = n$$

where $P_{g,\alpha}$ is the FGT subgroup poverty index. Some authors (e.g., Jensen and Tarp, 2003) have considered renormalizing the subgroup FGT indices (dividing by subgroup population) to ease comparability of poverty intensities across the different socioeconomic groups in the population.

Ravallion and Huppi (1991) extends the FGT decomposition to account for inter-group migration. The change in national poverty measures between the baseline and the policy simulation is accordingly decomposed into the sum of subgroup poverty changes at the baseline population shares, plus the sum of changes in subgroup poverty arising from migration at the baseline, plus the sum of poverty changes arising from the correlation between the policy shock and migration:

$$P_\alpha^s - P_\alpha^B = \sum_g \left(P_{g,\alpha}^s - P_{g,\alpha}^B\right) POP_g^B + \sum_g \left(POP_g^s - POP_g^B\right) P_{g,\alpha}^B + \sum_g \left(P_{g,\alpha}^s - P_{g,\alpha}^B\right) \left(POP_g^s - POP_g^B\right)$$

where POP is the population share, s is the policy simulation, and B is the baseline.

When the Beta distribution is used to characterize the intra-group income distributions, the FGT poverty measure will have the form (Decaluwé et al. (1999)):

$$P_\alpha = \int_{min}^{z} \left(\frac{z - y}{z} \right)^\alpha f(y; p, q) dy \qquad (4)$$

2.4 The Standard General Equilibrium Model

The Conventional CGE model follows the standard structure of SAM, adding to it the specification of technologies, macroeconomic balances, and the optimization behavior of the active decision units (Agents) in the economy. In its simplest form, the CGE model should describe production activities and technologies in the economy, factor and commodity markets, the composition and the behavior of the household sector, the government activity, foreign trade and the balance of payment account. The level of disaggregation and the structural complexity in modeling these components depend on the nature of the study and the policy shocks in question. For poverty analysis, the detailed representation of the household block and the factor markets in the CGE model is of critical importance. This subsetion provides a non-mathematical description of the main modules in the CGE model with particular emphasis on poverty analysis (For a complete mathematical description of a standard CGE model see www.ifpri.org).

2.4.1 Production Activities and Technologies

Producers are typically assumed to maximize profits subject to technologies and input prices. Technologies are usually assumed to exhibit constant returns to scale (CRS). Inputs and outputs are produced and sold in competitive markets with the result that output prices equal marginal costs.

To capture the effect of relative price changes on poverty, production activities should be distinguished with respect to at least the three following criteria: (a) whether the commodity is tradable or non-tradable; (b) the type of technology characterized by its labor and capital intensities; and (c) the form of organization, e.g. family business relying on family labor or a company relying on hired labor, formal sector or informal sector.

On the output side, production of tradable goods may be characterized by market segmentation, in which case goods are made either for the domestic market or for exports. In CGE models, this segmentation is represented by constant-elasticity-of-transformation (CET) production functions in which the elasticity of transformation determines the split of output between the domestic market and the export market in response to changes in relative prices.

On the input side, production technologies are usually specified by nested constant-elasticity-of substitution (CES) functions, in which input aggregates of similar substitutability are put together, e.g. on the top nest value-added and intermediate input aggregates are used in fixed proportions, and on the second nest the value-added aggregate is represented by a CES function of primary factors. For agriculture, the inputs of land and water may further be bundled on a separate layer under the value-added aggregate along with fertilizers input to describe the technology specificity in developing countries irrigated agriculture. The possibility of multiple commodities in agricultural activities such as crop or livestock production needs to be considered in modeling these activities either by assuming that multiple outputs are produced in fixed proportions or by specifying a CET function to describe the trade off among these outputs.

The production elasticities as well as the other elasticities used in the CGE model are obtainable from various sources including econometric estimates, past studies, expert elicitations, and knowledge of the technology. It is always recommended that special care be exercised when borrowing elasticities from other studies and that extensive sensitivity analysis be performed on the crucial elasticities.

2.4.2 Factor Markets

Factor markets represent the primary channel for transmitting the impacts of economic policy to poverty. Hence, a more detailed and realistic representation of the factor markets in the CGE model is essential to carry out poverty analysis properly. A detailed representation requires distinguishing factors by type, quality, substitutability and by mobility. According to type and quality, the different factors (land, labor and capital) may be classified as follows:

(a) Land and other natural resources may be classified by type, fertility, the size of holding, or/and by location.
(b) Labor may be classified by occupation and skills, hired vs. self-employed, location (rural vs. urban), organization (formal vs. informal), education, and/or by sex.
(c) Capital may be classified by origin (domestic vs. foreign), ownership (private vs. public), and/or by vintage or type of capital (e.g. old vs. new).

Factor substitutability within as well as across factor groups may differ according to the type of activity, e.g. for some production activities skilled labor is more substitutable to capital than unskilled labor whereas for other activities skilled labor and capital may actually be compliments. A realistic representation of the factor markets, thus, also requires a careful distinction of degree of substitutability within and across the factor categories. In the CGE model this distinction is described through extending the nesting structure of the CES value-added aggregate.

As for mobility, some factors are mobile across production activities while others are sector-specific. For labor, skilled labor is mostly sector-specific whereas unskilled labor may move freely within as well as between the rural agricultural sector and the urban manufacturing and service sectors. Land is mostly sector-specific but may be allocated easily to different crop and livestock production activities. The new vintage of capital may be allocated to the various production activities and hence is mobile, whereas the old vintages are mostly sector-specific. For policy purposes, factor mobility is important for assessing poverty impacts of economic policies since the benefits or the costs of such policies would mostly accrue to owners of sector-specific factors such as the small land holders in the agricultural sector.

Alternative mechanisms for clearing the factor markets are used in the CGE literature. In the static context factor are treated as in elastically supplied, thereby the effects of policy shocks are transmitted through factor prices or/and unemployment to the affected socioeconomic groups. The widely used clearing mechanisms include the standard neoclassical full employment assumption with factor prices adjusting endogenously to clear the markets, possibly with a labor-leisure choice and voluntary unemployment; and the Kenysian fixed price regime with unemployment adjusting endogenously to clear the factor markets. In the dynamic context, the same mechanisms apply with factor supplies being updated exogenously (recursive models) or physical and human capital being accumulated endogenously (inter-temporal models).

2.4.3 Foreign Trade and Commodity Markets

Most CGE models focus on the merchandise side of the balance of payment account, i.e. the trade balance. The rest of the items in the current account such as transfers and invisible payments as well as the net capital flows are fixed or projected exogenously in the CGE model. These exogenous accounts are usually denominated in the foreign currency and hence represent one channel through which foreign exchange policies, such as those associated with structural adjustment packages, would be transmitted to the rest of the economy. The trade account consists of the merchandise exports and imports. The small economy assumption means that exporters and importers have no influence on international prices, i.e. countries face horizontal export demand and import supply curves. The exports supply and the imports demand are determined endogenously by the optimization behavior in the CGE model. Given international export prices, exchange rate, domestic taxes and transaction costs, exporters maximize profits by deciding on how much to supply to the different export markets using the production technology in (2.4.1).

In particular, the greater the transformation elasticity the more responsive the exporters to changes in international prices and domestic export policies. Importers maximize profits by deciding on how much to import from the different markets given international import prices, the exchange rate, tariffs, transaction costs, and consumer preferences. The responsiveness of the importers and hence the effectiveness of domestic import policies will hinge on the Armington elasticity to be discussed soon. The implications of foreign trade and hence trade policies are important in conducting poverty analysis. Indeed both domestic tax and exchange rate policies have crucial differential income distributional impacts among the socioeconomic groups engaged in export, import, and import competing activities. In the CGE model the nature of these impacts depend on how the current account is closed. For a fixed level of the current account deficit, the balance of payment account is usually closed in CGE models by endogenizing the real exchange rate, i.e. the real exchange rate adjusts to equilibrate the supply and demand for foreign exchange in the economy.

Alternatively, if the real exchange rate is fixed, then the current account deficit must be endogenized through permitting foreign borrowing and lending to take place in the CGE model.

In reality, however, many developing countries adopt a mized regime of an administered foreign exchange in which the real exchange rate is partially fixed and partially flexible. Hence, predicting the poverty impacts of the typical structural adjustment policies in developing countries requires careful modeling of the exchange rate regime.

The aggregate supply of goods in the economy consists of goods produced domestically and goods imported from foreign markets. Following Armington (1969), imperfect substitutability is generally assumed between commodities domestically produced and imported varieties of the same commodities as well as across imports from different origins. In CGE models this is usually represented by two-level nested CES structure, where on the top nest an elasticity governs the substitution between domestic and foreign goods and on the bottom nest another elasticity governs the substitution among goods from the different foreign origins. These elasticities are crucial for determining the responsiveness of imports demand to changes in international prices and domestic import policies, and generally referred to as the Armington elasticities. Technically, these elasticities help to dampen the effects of sharp movements in the terms of trade and insulate the domestic price system from the exogenous international price shocks.

On the demand side, aggregate absorption consists of private consumption, government consumption, intermediate input demands by industry, and investment demand. The supply-demand balance in the commodity markets is, in turn, achieved through the price mechanism. Market structure consideration could also be incorporated in the CGE model to add more realism to the representation of the commodity markets. Under constant returns to scale, sellers in perfectly competitive markets maximize profits by selling at prices equal to their marginal costs whereas sellers in imperfectly competitive markets maximize profits by selling at markups upon their marginal costs. The magnitude of the markup is determined by the demand elasticity and the number of firms in the market, the larger the number of firms and the higher the demand elasticity the smaller the markup.

2.4.4 Households

This module is the most important component in the poverty assessment exercise. The primary step is to disaggregate the household sector into as many homogenous socioeconomic groups as practically possible following any of the methods outlined in section (2.3). The key question is then the mapping from the factorial income distribution to the household distribution. This is done by specifying the factor endowments for each household group (Agent) in the model. Next, non-factor incomes need also be mapped to the household groups. These incomes include government transfers, remittances from abroad (denominated in foreign currency), intra household transfers, and distributed profits from the business sector. In CGE models, these non-factor incomes are usually treated as exogenous flows. Among these non-factor incomes, government transfers clearly represent an important policy channel for alleviating poverty. The aggregate household income is used to pay direct taxes, make transfers, save, and to consume. Tax rates are represented in ad-valorem form in CGE models and may either be exogenous or be endogenously determined to meet a given government budgetary constraint. Transfers are usually treated as fixed shares of income. Household saving is either determined as a fixed share of income or endogenously determined in the CGE model to generate a total level of savings needed to finance a targeted aggregate investment level.

The household consumption bundle is usually modeled as a system of demand equations in the CGE model. Popular functional forms used in deriving the demand system include nested CES, Almost Ideal Demand System (AIDS), and the Linear Expenditure System (LES). Income and price elasticities are either estimated using household income and expenditure surveys or obtained from previous similar studies. By introducing fixed household expenses, the LES form is useful for representing non-homotheticity and income elasticities in the model. In LES the fixed expenses are inversely proportional to the level of household income and therefore are generally calibrated from the household income elasticities in the model. The level and the composition of these fixed expenses can differ from one household to another and thus it is distinct from the uniform fixed commodity basket used to define the national poverty line referred to in equation (3).

Finally, the optimization behavior deriving the demand system and the household module in the CGE model is that households maximize utility subject to their budget constraints.

2.4.5 Government

The government account is the main source of policy shocks in the CGE model. Hence for the analysis of public policy impact on poverty, this component is crucial. The government revenue mainly consists of transfers from the rest of the world (denominated in foreign currency) and taxes. Variety of taxes may be represented in the CGE model. These include direct taxes on household incomes, indirect taxes, sale taxes, export taxes, and import tariffs. Tax instruments are the main vehicle for carrying out economic policies and therefore are integral part of any structural adjustment package.

Foreign transfers are usually treated as exogenous in CGE models. In contrast, taxes may be treated exogenously in the CGE model or some taxes may be endogenously determined to meet a budgetary target, e.g., revenue neutral tax reforms.

Government expenditure consists of purchases of consumption and investment goods and transfers. Along the baseline government transfers to the household sector in the CGE model are fixed in real terms or as a share of GDP. Under the policy scenarios these transfers may be varied to target poor household groups in the model. In addition to transfers government may use price subsidies (negative taxes) or the coupon rationing system to target the poor. Alternatively, the government may change the level or the composition of its purchases of goods and services to alleviate poverty, e.g., its expenditure on education, health, and infrastructure. The modeling of government cash transfers and price and coupon subsidies in the CGE framework is mostly straight forward using the existing instruments in the government module. In contrast modeling the poverty impact of changes in government expenditure on education, health and infrastructure is a challenging exercise. The key difficulty is how to map the current government expenditure on these items to the different household groups in the model. This may require the difficult task of breaking down the current government capital expenditure by geographical regions and the estimation of benefit incidence ratios to map it to the socioeconomic groups in the model. Even if this is possible, two issues remain to be resolved. The first is the public goods element of the government provision and the second is the nature of the capital element involved in such expenditure, the treatment of which would require a dynamic model.

Unfortunately, inspite of the importance of these issues for assessing poverty alleviation measures, only a few CGE studies have attempted to tackle them. One such study is Löfgren et al. (1999) which attempts to capture the effect of government education expenditure on the poor by applying an exogenous upgrading ratio to transfer the rural unskilled labor into the skilled category of labor in the model. The relative neglect of the government expenditure aspect in the contemporary CGE literature on poverty is due to the fact that most of the relevant CGE studies have focused on the poverty impacts of economic policies rather than on public policies specifically designed to target the alleviation of poverty. The usual practice in most CGE studies is, then, to treat the aggregate of government expenditures on goods and services as fixed in real terms or in relation to the GDP. The government account is then closed by targeting the budget deficit (savings) and endogenizing some tax instruments (usually the direct taxes on households) to meet the target.

2.4.6 Investment-Savings Behavior

This is the most unsatisfactory component in static CGE models, because the determination of the investment-savings behavior is conceptually a dynamic issue. In practice most CGE models treat government savings and the rest of the world savings (foreign borrowing) as fixed in real terms or in relation to a pre-specified aggregate investment level. In contrast, some models specify household savings as a fixed share of income and the economy is said to be savings driven whereas in other models household savings is endogenously determined to achieve a given aggregate investment target, in which case the economy is said to be investment-driven. In dynamic CGE models savings and investment are determined by the process of capital accumulation. In recursive dynamic models the exogenous growth rate of capital stock determines the investment target for the next period and hence the needed level of savings. In inter-temporal models the endogenous process of capital accumulation determines simultaneously the equilibrium rates of savings and investment in the model.

2.5 Measuring Poverty Impacts in CGE

2.5.1 The Representative Household (RH) Approach

To restate, the key to poverty analysis in CGE models is the availability of a detailed disaggregation of the household sector and the factors account in the SAM. In most cases, exogenous data linking factor earnings and household composition is needed to achieve this disaggregation. The solution of the CGE model generates for each representative household (RH) in the model data on incomes (disaggregated by source), quantities consumed, consumer prices, factors employment and factor earnings (factor prices and total earnings). Under the RH approach this data, augmented with additional information on the individual households belonging to each RH group, is fed into a separate household module, which generates the intra-group income distributions and computes poverty indices. The actual implementation of the procedure depends on whether the additional information is sufficient to generate the intra-group distribution or not.

When sufficient data to generate complete intra-group distributions is lacking, the practice is to use parametric probability models such as the lognormal or the Beta distributions to specify these intra-group distributions. The solution of the CGE model provides the household module with total income (or total consumption) for each representative household group and consumer prices. The household model, then, requires the additional data on: the exogenous national poverty line or the national basket of basic needs required to generate the poverty line endogenously using the simulated consumer prices, the size of each RH group to be used in computing mean incomes or consumption levels, and the dispersion of each intra-group distribution (the variance for the lognormal and the minimum and the maximum for the Beta distribution). The dispersion is typically assumed to be fixed across simulations and hence only the location of the intra-group distribution changes in response to a policy simulation. For each simulation these intra-group distributions are generated for all RHs and then summed horizontally to generate an overall income distribution for the economy.

The overall distribution along with the intra-group distributions are then used to generate poverty measures using the methodology of section (2.3).

In contrast, when a consistent, complete and disaggregated household survey data exists, use may be made of it in both the CGE model and the household module. In the CGE model the data may be used to disaggregate the household sector and the factor accounts. In the household module the survey data may be used to generate directly the intra-group distributions through mapping each survey observation into its corresponding RH group in the CGE model. As before CGE solution supplies the household module with data on total income (consumption) for each RH and consumer prices. The CGE solution for each policy simulation is used to update the initial intra-group distributions and the poverty line in the household module. Aggregate and group poverty measures are then computed in the usual way. The details of the treatment depend on the scope and the quality of the survey data.

One alternative is that the survey classification is consistent with the CGE household classification but only data on individual incomes or consumption spending, not necessarily consistent with the SAM totals, exist. For this case, intra-group distributions are updated by scaling each individual household consumption or income in the survey by the relative real change in consumption or income from the base level for the corresponding RH in the CGE model.

Alternatively, if the survey classification is only consistent with the factors classification in the CGE model, then the intra-group distributions in the household module are updated by scaling the survey household incomes by the relative changes in the real incomes of the factors corresponding to the survey observations in the CGE model.

2.5.2 The Micro Simulation (MS) Approach

Micro simulation is relatively a new technique in the CGE studies of poverty. The main objective of the approach is to integrate the household level data into the macroeconomic model, hence enabling the endogenous assessment of poverty incidence in the CGE model. The main advantage of the MS approach compared to the RH approach is, thus, the endogenization of the variances of the intra-group distributions. A first difficulty with the MS approach is the ability to find a representative household survey that is consistent with the macro data in the SAM. The second difficulty relates to the availability of computational resources and solution algorithms that are capable of handling large scale models. This latter difficulty limits the use of the approach in practice to highly aggregated models with only a few thousands households.

When the proper survey data exists, the implementation of the approach is straightforward. First, the household sector and factor accounts in SAM are fully broken down to the level of the individual households in the survey using the survey income and consumption data after properly being adjusted to the population totals in SAM through applying the relevant sample weights in the survey.

The second step is to calibrate and solve the integrated CGE-MS model with the full households as agents in the model. The solution of model then generates the overall distribution of income or consumption along with the consumer prices needed to computed the national poverty line. Aggregate and group poverty measures are then computed in the usual way.

2.5.3 A Hybrid RH-MS Approach

When the survey data, though consistent with the SAM, is too large to be accommodated in a tractable CGE model, a sequential two-stage approach may be proposed. The objective of the approach is to reduce the size of the model and the same time preserve the endogeniety of the variances of the intra-group distributions.

In the first stage, a CGE model with as many representative household agents as practical is solved to generate prices, incomes and consumption levels for each agent to be used in the second stage MS models. In the second stage, a series of MS models, one for each RH group, are solved to generate intra-group distributions. In each MS model, factor earnings and other incomes are mapped from the RH agent to the MS individual households belonging to the agent using the household benchmark earnings data and the corresponding sample weights. Next, the MS model is solved as a partial equilibrium problem to determine the optimal individual consumption bundles subject to the exogenous prices, individual budget constraints, and the balancing constraint that the sum of individual consumption bundles equal the sample adjusted aggregate consumption bundle of the RH agent.

The solution of the MS along with the exogenous consumer prices generate an intra-group distribution of the consumption spending for the given household group, which can then be used to compute poverty measures in the usual way.

3. Contemporary CGE Literature on Poverty in Arab Countries

3.1 Overview

Poverty incidence and reduction strategies in Arab countries are getting more publicity, following the implementation of structural adjustment programs by many countries in the region during early 1990s. Rising unemployment, with rates in excess of 30% in some countries, and the deterioration in the living standards of the poor have been key Public Policy worries in the region. Indeed, in a number of the reforming countries in the region, the social cost of restructuring and downsizing associated with the structural adjustment programs appears to have been unevenly shouldered by the poor. In addition to the structural adjustment programs, the 1990s have also witnessed the accession of a number of Arab countries to the WTO agreement (Oman, Lebanon, Jordan, Mauritania, and Yemen) and a number of bilateral partnership agreements with the EU (Morocco, Tunisia, Egypt, Jordan, and Lebanon). Major elements in these agreements are tariff reforms, trade liberalization and market access, which would undoubtly affect public revenues and the composition and the structure of foreign trade with clear implications on income distribution and poverty in these countries. In response, Public Policy in the region has taken active role in designing policy measures and strategies to address the adverse consequences of these developments on poverty. These measures and strategies range from the short-run focus on financial transfers, subsidies and social safety-net programs targeting the poor to the long-run focus on education, health, infrastructure, social security and labor market policies.

In fact, under the world bank poverty reduction program, eligible Arab countries, such as Yemen and Mauritania, have already posted their poverty reduction strategies papers (PRSP) on the world bank website, signaling the importance of the poverty issue in the region.

The ability to assess and quantify the poverty impacts of structural adjustment and trade policy reforms, on one hand, and to investigate the impact and the effectiveness of public policy on poverty reduction, on the other hand, is thus clearly needed to evaluate performance and guide future policy in the region. As indicated in the proceeding sections, CGE models are major vehicles for accomplishing this. CGE applications on public policy analyses in the Arab region are relatively recent, dating back to the early 1990s. Since then and with the help of international organizations, a few country studies have been conducted in the region. Almost all of these CGE studies, however, have a primary trade focus with minor or no emphasis on poverty. The leading examples are the CGE studies that have been sponsored by the world bank in connection with the EU-Mediterranean partnerships, e.g. Rutherford et al. (1993) for Morocco, Rutherford et al. (1995) for Tunisia, and Konan and Maskus (1997) for Egypt. Studies with explicit treatment of poverty in the CGE model are lacking. In contrast, the main examples of CGE studies that have more visible focus on poverty are an OECD sponsored study on Morocco by Morrisson (1991), studies conducted by the International Food Policy Research Institute (IFPRI) for Egypt (1999, 2001) and for Morocco (1999), and a study by Chemingui and Thabet (2001) for Tunisia. The following subsection reviews this latter group of studies.

Among the major obstacles that have been hindering the wide use of CGE models for the purpose of economic policy analyses in the region is the availability of proper country databases. With the exception of a few countries (Morocco, Tunisia, Egypt, Algeria, Jordan, and Kuwait) reasonably recent social accounting matrices data is lacking in the region. In many Arab countries, wide data gaps, large statistical discrepancies, and errors exist in the national accounting systems. Nevertheless, fair amount of progress in the various data areas seems to have been made with a number of countries starting, more recently, the process of updating or constructing SAMs for their economies, e.g. Oman, Qatar and Mauritania. In addition, a number of countries have conducted relatively recent household surveys that may be used for CGE analysis of poverty, e.g. Algeria (2000), Egypt (1999), Jordan (1997), Mauritania (1995), Morocco (1999), Tunisia (2000) and Yemen (1998). Further, handy numerical techniques are now available for the treatment of data gaps and the empirical estimation of social accounting matrices (Robinson and El-Said (1997)) that may be employed by CGE modelers to address data deficiencies in the region.

3.2A Review of Country Studies with Poverty Focus

3.2.1 Morocco

Morocco is among the earliest Arab countries to start implementing structural adjustment and economic reform programs. The structural adjustment program was introduced in September 1983 in the face of a growing internal and external imbalances aggravated by stagnating economy coupled with a fall in phosphates prices and a drain on foreign exchange reserves.

The essential features of these programs include short-term stabilization measures such as fiscal and monetary restraints and exchange rate management, and medium to long-term structural measures such as tax reforms and trade and financial sector liberalization. Two CGE studies that have looked into these issues with a primary focus on poverty are Morrisson (1991) and Löfgren et al. (1999).

3.2.1 (a) Morrisson (1991) Study

i. Objective

The study reviews the performance of the Moroccan structural adjustment program and its impacts on employment, incomes, household living standards, and poverty in contrast to the impacts of alternative policy measures and a more focus on poverty.

ii. The CGE Model

A recursive dynamic macro-micro model that includes a representation of both the standard real side and the financial side of the economy. This representation is intended to capture the short-run effects of the stabilization measures and the medium-term effects of the structural adjustment policies. The model includes 6 production activities, 5 labor markets and 3 asset markets. The 6 production activities are primary exports, agriculture, consumer goods, intermediate and capital goods, non-traded formal goods, and informal non-agriculture. The household sector is categorized into 6 groups according to occupation and economic activity of which 3 groups are rural and the other 3 are urban. The 3 rural household groups are medium-to-large farmers, small farmers, and agricultural rural workers. The 3 urban groups are wage earners in the modern sector, entrepreneurs in the modern sector, and informal sector workers. Incomes are mapped from factors to household groups with entrepreneurs owning the specific factor in the primary export sector and the greater part of the capital in the other sectors, in addition to their holding of foreign securities. Among the other household groups only medium-to-large farmers have capital and domestic securities. The informal production sector does not employ capital and uses labor as the only factor of production. Imperfect competition and mark-up pricing are allowed in the modern sector markets, whereas perfect competition and marginal-cost pricing are assumed in the other markets. The model is calibrated on the 1980 database and solved recursively for 1980-1986 in the base simulation.

iii. Modeling and Measuring Poverty

Poverty is accounted for in the CGE model through the detailed socioeconomic and geographical classification of the household sector and the detailed representation of the factor markets in the model. Income inequalities are measured by the Theil inter-group values. The poverty indices used are the head count measured by the percentage of the poor and poverty intensity measured by the poverty gap. The intra-group distributions are provided by the 1985 household expenditure survey. In measuring the poverty indices, intra-group variances are assumed to be constant, the national average number of 6 dependents is assumed for all household types, and the poverty line is taken as exogenous.

iv. Policy Scenarios

A base simulation with the adjustment policies that actually have been implemented is conducted for 1980-1986 to validate the model and to investigate the poverty impacts of the Moroccan structural adjustment program. Next, several stabilization scenarios are simulated for 1981 to test the poverty impacts of alternative policy measures that the Moroccan government could have introduced to reduce the current account deficit. These stabilization measures include public expenditure policies such as cuts in operating expenditure, capital expenditure, wages or public sector employment; fiscal measures such increasing import tariffs or indirect taxes; and monetary policy options such as reducing money supply or devaluing the exchange rate.

v. Results

The main results from the base simulation with respect to poverty are the cut in social spending, a decrease in urban-rural income gap, an increase in poverty among urban households, and a decrease in poverty among rural households. Overall, both poverty indices showed national poverty to increase in 1983-1984 and to return to the base level in 1985-1986. The study apts the smaller social cost of the Moroccan structural adjustment program to the good management of the program, the good rainfall in 1985 and 1986, and the increase in foreign remittances.

The results on the alternative stabilization scenarios showed that, among the different policy options, devaluation and wage cuts are the most effective shorter term measures for Morocco with respect to the different social criteria. Hence, the study underscores their use by the Moroccan government as major policy tools in its stabilization program during 1983-1984.

3.2.1 (b) Löfgren et al. (1999) Study

i. Objective

The study aims at assessing the distributional impacts of alternative trade and domestic policy scenarios for implementing the Moroccan-EU partnership agreement during the period 1998-2012.

ii. The CGE Model

A standard recursive dynamic general equilibrium model with a detailed sectoral representation. The detailed representation is intended to capture the various distributional aspects of trade liberalization. There are 45 production activities in the model, 38 rural and 7 urban. Most of rural production activities are either livestock or crop agriculture. All production activities use labor and capital as factor inputs. In addition to these two factors, agriculture also uses agriculture-specific factors such as land and water. Production technologies are represented by nested CES functions. Specific technology features such multiple commodity output, excess supply in abundant factors, and technique change are incorporated in the model. The model includes 7 types of factors: irrigated land, water, rainfed land, pasture, skilled labor, unskilled labor, and capital. There are four types of households: rural poor, rural non-poor, urban poor, and urban non-poor. The breakdown of the factor account and the household sector in the initial SAM is based on data from various sources including disaggregated agricultural information from the Moroccan government and disaggregated population, consumption, and labor force data from the Word Bank. A very detailed representation of foreign trade with particular emphasis on trade between Morocco and EU is incorporated in the model. Two international markets are distinguished, the EU and the rest of the world. The international trade assumption of small open economies is assumed to govern trade between Morocco and these two markets. An exception is the treatment of Moroccan agricultural exports to the EU market, where a dual-regime formulation is adopted . According to this formulation the EU responds negatively to a Moroccan price increase but purchases the same base-year quantity when the Moroccan price decreases. The model is calibrated on a disaggregated SAM for 1994, updated to the model base year of 1998, and solved recursively for the period 1998-2012. A cross-entropy technique is used to handle data gaps and reconcile the various data sources, as well as in disaggregating and balancing the SAM.

iii. Modeling and Measuring Poverty

Poverty concerns are expressed in the modeling framework through the detailed representation of the activities in the rural sector as well as in the disaggregation of the household sector and the factor accounts. With respect to measurement, no direct poverty measures are computed. Instead, policy impacts on poverty are assessed indirectly through the policy effects on factor incomes and household welfare.

iv. Policy Scenarios

The policy simulations are intended to explore both the distributional consequences of trade liberalization and the potential role of complementary public policy to mitigate their negative impacts on the poor.

First, four alternative trade policy scenarios under the Moroccan-EU agreement have been considered: no change in other tariff and non-tariff barriers (status quo), a tariff unification on all commodities except industrial imports from the EU at the 1994 average rate, an elimination of non-tariff barriers in addition to tariff unification, and a trading liberalization scenario that reduces the unified tariff from 29% to 10%. Second, two complementary policy scenarios aim at compensating rural-vulnerable losers under the trade liberalization regime are considered: a transfer program aims at fully compensating the owners of rainfed agricultural resources and a skill-upgrading program aims at augmenting the stock of rural skilled labor each period by 5% to be transferred from the stock of rural unskilled labor.

v. Results

The main result with respect to the different trade liberalization measures is the negative income and growth effects in agriculture and the increase in the rural-urban income gap in Morocco. Alternatively, the results from the two complementary domestic policy scenarios underscore the role of public policy in redistributing the gains from trade liberalization. Further, the political feasibility of the different outcomes have also been assessed in the study.

The single most important result is that trade liberalization with complementary redistributive policies can lead to win-win outcomes.

3.2.2 Tunisia

Like Morocco, Tunisia is also among the earliest reformers in the Arab region. The implementation of economic reforms and structural adjustment programs in Tunisia dates as early as the mid-1980s. In addition, Tunisia is a member of WTO and has signed a partnership agreement with EU. The Tunisian commitment to gradual liberalization of trade during the period 2000-2010 under these two agreements would doubtlessly have impacts on income distribution and poverty in the country. In particular, the gradual liberalization of trade in agricultural products between Tunisia and the EU will expose the domestic market that has been protected for long time to competition and international price fluctuations. Given the close links between agriculture and poverty and the importance of the agricultural sector in Tunisia, such opening up of the domestic market would have critical implications for the rural poor. A recent study (Chemingui and Thabet, 2001) has addressed these implications:

i. Objective

The study aims at quantifying the distributional impacts of alternative scenarios of agricultural trade liberalization in Tunisia.

ii. The CGE Model

A standard recursive dynamic general equilibrium model with a detailed representation of agriculture. The model includes 57 production activities of which 26 related to agriculture or food production. Production technologies are described by nested CES functions. There are two factors of production in the model, labor and capital. Labor is distinguished by skill and geographical mobility into 5 types: 3 rural, 1 urban, and a perfectly mobile labor type. The model distinguishes three forms of capital: physical capital, reserves of natural resources (crude oil and phosphates), and land. Land is classified into 6 categories based on the degree of permanence of its cultivation, the level of irrigation, and the type of crop variety. Physical capital is vintaged into an old type and a new type, with the new type being more substitutable for other primary factor types. Further, full employment and flexible factor prices are assumed in the model.

The household sector is disaggregated into 10 types, 9 rural distinguished by type of activity, and one urban. The breakdown of the factor accounts and the household in the rural sector is based on the 1994/1995 agricultural farmers survey released by the Ministry of Agriculture and the 1998 household expenditure survey.

Foreign trade is modeled following the small open economy assumption. Two international markets are distinguished: the EU and the rest of the world. Export supplies are determined by transformation elasticities that differ across markets. Import demands are determined by a nested CES structure that differentiates between goods of domestic origin and goods of foreign origin on one hand, and among goods from different foreign origins on the other hand.

The model also includes a detailed description of the different types of taxes, subsidies and tariffs as well as non-tariff barriers. The model is calibrated on a Tunisian SAM for 1992 and solved recursively in 3-year steps for the period 1992-2010.

iii. Modeling and Measuring Poverty

Poverty aspects in the rural sector are captured in the model through the detailed representation of rural production activities, rural household groups, and the types of rural factor earnings. No direct measures of poverty is computed by the study. Instead, policy impacts on rural poverty is assessed through the distributional implications of the policy shock.

iv. Policy Scenarios

The study considered a base simulation with the status-quo trade and agricultural policies provided the Tunisian commitments under the WTO and the EU partnership agreements, and six alternative policy simulations to explore the effects of liberalizing trade in agricultural products. The six policy scenarios are: a unilateral reduction in agricultural tariffs, a unilateral cut in government agriculture support, a reciprocal reform of agricultural trade between Tunisia and the EU, a scenario which combines the three previous scenarios, a rise in the world price of food prices, and a scenario considering a progressive increase in the GDP share of public expenditures aimed at improving yields in agriculture.

v. Results

Overall, the different liberalization scenarios, whether unilateral, bilateral or multilateral, are found to aggravate the urban-rural income gap, with most of the gains accruing to the urban household group. Both the unilateral and the bilateral measures result in income and welfare losses to most of the rural household groups, namely the most poor households such as those practicing the activities of field crops, livestock, and vegetable production. Fruit and olive growers and agricultural workers are the main rural winners from the Tunisian-EU bilateral agricultural trade reform scenario. Multilateral trade liberalization, however, is found to lead to a win-win outcome, in which both the urban household group and the rural households as one group gain from trade liberalization. Nonetheless, the majority of gains are captured by the urban household group. The agricultural productivity enhancement scenario along with trade liberalization is also found to lead to a win-win situation. In particular all rural household groups practicing farming are experiencing income and welfare gains under this scenario. In a sense, the scenario demonstrates the role of public policy (e.g. public expenditure on infrastructure and research and development) in poverty alleviation among the rural household groups.

3.2.3 Egypt

Economic reforms and structural adjustment programs have been introduced in Egypt since early 1990s. The implementation of these programs has put increasingly harder constraints on the government budget. This in turn creates pressing needs to better manage the government budget and at the same time increase the effectiveness of its social spending programs to ameliorate the social costs associated with the adjustment programs. Food subsidies constitute for long time one of the largest spending items in the Egyptian government budget. In 1980/1981 the Egyptian food subsidy system covered more than twelve commodities and accounted for 14% of the total government spending. With the implementation of the structural adjustment program the coverage was reduced to only four items (bread, floor, cooking oil, and sugar) in 1996/1997 and with a total spending accounted for only 5.5% of the total government expenditure. An essential problem with the existing Egyptian food subsidy system is the poor targeting of the needy families which has resulted in substantial leakage. Löfgren and El-Said (1999) study has addressed this issue:

i. Objective

The study aims at exploring the short-term effects of a set of alternative options for operating the Egyptian food subsidy system. These options include targeting, reducing, and reorganizing the subsidy system.

ii. The CGE Model

A food-agriculture focused static general equilibrium model. The model includes 28 production activities of which 19 relate to agriculture and food processing. The crop activities are differentiated according to period of land occupation into winter crops, summer crops, and perennial crops. Production technologies are modeled as nested CES functions. Features such as multiple outputs, excess factor supplies, and technique change are included in modeling the agricultural activities. There are 5 factors, 2 of which are used by all sectors (capital and labor) and 3 are agriculture-specific factors (water, summer land, and winter land). Capital and labor are differentiated into agricultural and non-agricultural types. The agricultural capital is further differentiated into crop-specific capital and animal-specific capital. In modeling the crop production activities, land, water, and crop-specific capital are assumed freely mobile across the different crops varieties. Outside agriculture, non-agricultural capital is differentiated according to the type of activity whereas non-agricultural labor is mobile across sectors. All factors are inelastically supplied. For land and non-agricultural labor, prices are differentiated across activities on the basis of fixed ratios. With exception to land and water, one of which may be in excess supply, all other factors are assumed to be fully employed, i.e. all other factors have flexible prices.

The household sector is broken down into rural and urban household groups, each of which is further disaggregated by quintile. Household incomes consist of factor earnings, foreign transfers (fixed in foreign currency), and government transfers. Disaggregated consumption is determined by a nested demand system with income and price elasticities coming from actual econometric estimates.

The model is calibrated on a disaggregated SAM for 1996/1997. The SAM was constructed by IFPRI on the basis of various official publications and the most recent official Social Accounting Matrix for Egypt. Data on household consumption and benefits from food subsidies is provided by Egypt Integrated Household Survey (EIHS) for 1996/1997.

iii. Modeling and Measuring Poverty

Poverty concerns are addressed via the detailed classification of household groups, factors used by agriculture, and rural production activities as well as via the detailed modeling of household consumption options. With respect to measurement, no direct poverty measures are computed by the study. Instead, poverty impacts are implicitly addressed by assessing the welfare impacts of the policy in question on the different socioeconomic groups in the model.

iv. Policy Scenarios

The study considers two sets of simulations. The first set addressed the implications of targeting or eliminating food subsidies. The second set addressed the leakage issue. The first set of scenarios include targeting oil and sugar subsidies, targeting total food subsidy, eliminating oil and sugar subsidies, and eliminating the food subsidy system and replacing it with direct transfers. The second set of scenarios consider the introduction of a wheat-maize mixed flour to replace the pure wheat flour along with cracking down on subsidy leakage. The last of the simulations in this second set focuses on totally eliminating the leakage and transferring the money saved to the needy families. In all scenarios, except the one dealing with eliminating subsidy and the one dealing with eliminating leakage, savings from subsidy reforms are used to reduce direct taxes.

v. Results

The targeting of all food subsidies has pro-needy and pro-rural effects, with the greatest gains accrued to the lowest two quintiles in rural areas. The distributional consequences of a full elimination of subsidies in combination with a tax cut is still pro-rural but no longer pro-needy. The non-needy households are found to experience considerable welfare gains whereas the needy households are found to suffer losses. In contrast when the subsidy elimination program is combined with direct transfers to the needy, the program is found to lead to large welfare gains for the lowest two rural quintiles with minimal losses for the urban and the non-needy households. Favorable welfare effects and reduced subsidy costs are achieved when pure wheat flour is replaced by a wheat-maize mix, specially if the program is combined with elimination of leakage. Finally, entire reforms of the subsidy system are found to have a positive impact on Egypt foreign trade account.

4. A Framework for Modeling Public Policy Impacts on Poverty in Arab Countries

4.1 Overview

The objective of this section is to outline a common framework to guide country studies aiming at assessing public policy impacts on poverty in the Arab region.

Specifically, the framework should take into account the socioeconomic characteristics of the Arab countries, data availability and data gaps problems, and the common public policy objectives in the region for the next two decades. The components of this framework are a database, a standard CGE model, a methodology for modeling public policies, a methodology for modeling and measuring poverty, and a set of scenarios describing the future policy environment.

4.2 Database

Availability of a Social Accounting Matrix (SAM) is essential for building a CGE model. Like other developing countries, many Arab countries don't have either SAMs or the necessary data to construct appropriate ones. Some Arab countries have SAMs but are either old or highly aggregated ones. Only a few countries (e.g. Morocco and Egypt) do have recent and detailed SAMs. The construction of a SAM that is appropriate for policy analysis requires in addition to national income accounts and bilateral trade data, survey data on industrial establishments, labor types and earnings, and on household incomes and expenditures. With exception to national income accounts and trade data, many countries in the region seem to have problems with survey data. These problems range from the simple lack of survey data to the various sorts of statistical inconsistencies, data gaps, and time lags problems. Given these sorts of data availability problems some kind of guess work and estimation are unavoidable in SAMs construction. Fortunately, numerous numerical techniques and methods are now available for constructing, updating, and reconciling SAMs (see for examples, www.IFPRI.org).

The procedure to be followed in assembling a SAM, then, is to start with identifying all sorts of available data for the country in question. If a recent SAM exists then that SAM constitutes the first step. If an old SAM exists, recent national income accounts and trade data may be used to update it. If a SAM does not exist but some kind of survey data (at least sufficient to construct an Input-Output (I-O) table) exist, then recent national income accounts and trade data may be combined with this data to construct a SAM for the country. If neither a SAM nor a sufficient survey data exist, for the country, then the easiest way is to borrow the I-O structure of a similar country and use it along with national income accounts and trade data to construct a SAM for the country in question.

The next step is to adapt the SAM to poverty analysis. This requires the various sorts of disaggregations for the production activity, the households, and the factors accounts in the SAM. The objective here is to make the maximum use of whatever available data to breakdown as detailed as possible these accounts. Ideally, these disaggregations would be carried following any of the criteria outlined in section 2 of the paper, but in practice available data may not permit doing so. Further illustrations on the disaggregation aspects will be provided in the CGE modeling subsection.

In addition to a disaggregated SAM, the model database also requires exogenous projections of GDP, population, labor force, and capital stock as well as data on intra-group distributions, poverty line, and elasticity estimates.

4.3 The CGE Model

The standard CGE model described in section 2 provides the basic building block. The essential additional features that need to be incorporated to suit the model for poverty analysis include:

4.3.1 Disaggregation and Modeling of Production Activities

The focus here should be on the detailed disaggregation of the activities associated with the poor and the vulnerable groups in the economy. In most Arab countries agriculture and the informal sector are the major sources of incomes for the poor households. Hence, a proper specification of these sectors in the CGE model appears essential. In particular, for countries such as Egypt, Morocco, Tunisia, Syria, Yemen, Mauritania, and Sudan, the model should include detailed representation of crops, vegetables, livestock and fishing activities. This is usually accomplished at the SAM level by using agricultural survey data. In addition to disaggregation, specific features such as subsistence production, multiple output, technique change, and excess factor supply need also be incorporated in modeling the agricultural sector activities. The IFPRI's studies (for Morocco and Egypt) and the Tunisian study reviewed in section 3 provide good examples.

Outside agriculture, in a number of countries such as Egypt and Syria, the public enterprise sector provides an important source of income for the lower middle class (a group that is vulnerable to poverty). In addition, it is the sector that is directly affected by government employment and privatization policies.

Within the manufacturing sector at least two sets of detailed activity representations need to be made. The first is a detailed representation of the consumer goods sector and the second is the detailed representation of the activities producing the export goods in the economy. The rest of the manufactured goods sectors may be aggregated in one sector. Finally, if possible, the public services sector may be disaggregated into the different forms of services provided by public utilities, such as electricity, gas distribution, and water.

4.3.2 Disaggregation of the Household Sector

Detailed household classification is a key to poverty analysis. As outlined in section 2, several classification schemes are used in the literature. The choice among these schemes, in addition to the availability of data, depends on the socioeconomic and geographical characteristics of the population and on the type of policy analyses proposed in the study. With respect to geography it is essential at least to distinguish between rural and urban households in the model. Since agriculture is the major source of income for poor families in many Arab countries, rural households may be classified by land holdings, e.g., landless, small land, and medium and large land holders; by type of activity, e.g., crop farmers classified by crop, vegetable farmers, livestock owners, and fishers; or alternatively by income quintiles. The classification of households by quintiles is, however, appropriate only for analyzing policies that have little effects on intra-group distributions, e.g. it is generally not suitable for policies whose effects are transmitted through the factor markets. Since the largest urban groups vulnerable to the risk of poverty for many Arab countries are junior public sector employees, the informal workers, and the private sector workers, urban households may be classified according to occupation, e.g. informal workers, private sector employees, public sector employees, professional and self employed, and capitalists or alternatively by income quintiles.

Bearing in mind the later poverty measurement exercise, it is important that the above classifications be made as detailed as possible. A special focus should be on the homogeneity of the socioeconomic groups (the intra-group variance) and on the ability to map public policy to targeted groups (poverty targeting).

4.3.3 Disaggregation of Factors

Because factors are the primary channel for transmitting the impacts of many types of policy shocks to incomes, the CGE model should include a detailed representation of the structure of factors ownership in the economy. In the Arab countries context, a detailed classification of land and labor is of a clear significance for poverty analysis.

Land may be categorized according to the permanency of cultivation (e.g. summer, winter, and fallow) or according to fertility (e.g. marginal, low, and high). Labor may be classified according to occupation and skills (e.g. agricultural workers, informal labor, unskilled labor and skilled labor). The skilled labor category may further be classified by level of education. The other factors (water and capital) may also be categorized. Water can be classified as rainfed or irrigated. Capital may be distinguished by sector (e.g. agricultural vs. non-agricultural) or by malleability (e.g. old vs. new vintage capital).

4.3.4 Dynamics

Many economic policies such as those associated with poverty reduction and structural adjustment may have quite different effects on poverty when comparing the short-run to the medium and the long-run. To capture the dynamic effects of such policies, a dynamic model is obviously needed. There are different methods for representing dynamics in a CGE model. The simplest method to suggest is the recursive dynamic method. This method involves solving the CGE model for each period separately, connecting the different periods through updating the exogenous variables in the model, e.g. factor supplies, investment, balance of payment deficit, government expenditure, and world prices. For each period, the values of the exogenous variables are either derived from the previous periods solutions or completely determined exogenously.

For examples, the investment and capital stock paths may be based on previous periods rates of return on capital and sectoral output growth rates, the government expenditure path may be based on previous periods GDP growth rates, and the net capital flows (balance of payment deficit) may be based on previous periods rates of return on capital and GDP growth rates.

4.4 Modeling Public Policies

Variety of economic policies, such as tax, trade, industrial, employment, and public spending policies are likely to have important impacts on poverty. The clear specification and representation of such policies in the

CGE model, thus, constitutes an essential component in the poverty analysis exercise. The incorporation of tax, trade, and industrial policies in the CGE model is more or less standard in the literature. This usually involves adjusting the price and quantity instruments in the model, e.g. tax rates, exchange rates, and trade volumes (quota), exogenously or endogenously to meet the policy constraint under the simulated shock. The incorporation of employment policies is a bit more involved and may require some modeling tricks in terms of elasticities, factor mobility, and production techniques. In contrast, as reviewed in section 2, modeling the aspects of public spending policies in the CGE framework is more challenging. Nevertheless, public spending is the focal instrument in any poverty reduction program and therefore need to be somehow incorporated in the poverty analysis exercise. In principle, two difficulties involved in modeling the poverty impacts of public spending in the CGE framework. The first relates to the breakdown of government spending by type, e.g. education, healths, infrastructure, and social spending. The second difficulty relates to the mapping from the functional spending categories to the socioeconomic groups in the model.

The conventional Benefit Incidence and Incremental Incidence analyses provide the first step for constructing such mappings. The Benefit Incidence Analysis (BIA) deals with the distribution of benefits from public services and spending programs among different groups in the population classified by income quintile, ethnicity, geographical region, or by illiteracy. The Incremental Benefit Analysis (IBA), in contrast, is concerned with how the new public spending (excluding fixed spending) is distributed among these socioeconomic groups. These analyses are usually based on information from household surveys on utilization of education and health facilities, the use of infrastructure facilities such as roads, water and electricity, and on the consumption patterns of certain subsidized goods.

Unfortunately, detailed benefit incidence or incremental benefit mappings may not be possible for many countries in the region due to lack of such survey data. In such cases, approximations and judgment need to be used to assess the distribution of benefits from the public spending programs among the socioeconomic groups in the country.

Provided the mappings of benefit ratios and abstracting from the dynamics and externality aspects of public spending, one may directly allocate the proposed change in public spending (in monetary terms) among the representative households in the model based on these benefit ratios. On the source side, the proposed change in public spending could involve either adjusting the tax structure or the composition of public spending in the model depending on the option to be taken by the policy maker.

On the use side, the allocated portion of the change in public spending to each representative household in the model may take the form of direct transfers, change in consumer prices, or change in factor incomes depending on the nature of the public provision. General social spending programs such as social security nets usually take the form of financial transfers and commodity subsidies. Education and health spending may either be represented as factor-augmented technical change (e.g., enhancing labor endowment) or be represented as commodity-specific subsidies for these services in the household consumption bundle. Public spending on infrastructure, e.g. roads, electricity and water may also be represented as capital-enhancing technical change or as commodity-specific subsidies to consumer prices of transport, electricity and water in the CGE model.

4.5 Measuring Poverty

The key to poverty measurement is whether a survey with classifications consistent with those in the CGE model does exist. Though, as mentioned earlier, a number of Arab countries have household survey data, they may not be good enough to support completely integrated CGE-MS modeling exercises. A reasonable option, then, is to use the representative household approach outlined in section 2. If survey data permits, the intra-group distributions of incomes or expenditures may be directly generated from the data; otherwise parametric distributions such as the Beta or the Lognormal need to be specified. The national poverty line may be generated endogenously if the national basic- needs basket exists; otherwise the national poverty line may be deflated using the aggregate consumer price index computed from the model. To allow assessing poverty impacts at the aggregate level as well as at the groups level, the F-G-T poverty indices need to be computed at both levels. Finally, to facilitate comparability, poverty measures need to be computed on the basis of both incomes and expenditures if existing data would permit that.

4.6 Policy Scenarios

Many of the countries in the region have various types of policy commitments over the next ten to twenty years. Among these are the country-specific obligations under the WTO and the EU partnership agreement, in addition to the domestic policy commitments under the structural adjustment programs. The poverty impacts of such policy commitments may be simulated as a part of a baseline scenario covering the period 2000-2015. Additional policy scenarios may also be thought. One such a set of scenarios includes those regarding future economic reforms and/or those relating to future poverty-reduction policies. Another and a more obvious candidate is the set of scenarios relating to the achievement of the UN third-millennium development objectives. In terms of modeling, the most relevant among these objectives are those with respect to poverty, health, and primary education.

5. Concluding Remarks

Worldwide concerns about poverty issues in developing countries have increasingly drawn the attention of both the international organizations and the domestic politicians. At the international level, many developmental and funding organizations started to question the impacts of their operations in developing countries on poverty. At the domestic level politicians are becoming more watchful on the poverty consequences of their economic policies as well as on the need to devise public policies and measures to alleviate the incidence of poverty in their countries. The assessment of the impacts of such policies and measures necessarily requires some methodological tools. Computable General Equilibrium (CGE) models have been for long time important tools for assessing economy-wide impacts of economic policies. Nevertheless, for poverty assessments, these models need to include some additional features. Some of the most important features that need to be incorporated in the CGE model are the detailed representations of household's activities, groups and factor earnings. The additional data needed for the incorporation of such representations as well as for computing poverty measures are usually obtained from household income and expenditure surveys.

This paper has attempted a focused review of poverty modeling and data issues in a typical developing-country CGE model. A special emphasis in the paper has been devoted to the status quo of data and poverty-related CGE modeling in the Arab region. The paper concludes its review by offering some guidelines and modeling tips to guide country CGE-studies aiming at assessing the poverty impacts of public policies in the Arab region.

References

Adelman, I. and S. Robinson (1979), "Income Distribution Policy: A Computable General Equilibrium Model of South Korea," in Adelman, I., The selected essays of Irma Adelman, V.1, Dynamic and Income Distribution, Economists of the Twentieth Century Series, Aldershot, U.K., 256-89.

AKA, B. (2003), "Fiscal Adjustment, Poverty, Inequality and Welfare in Côte d'Ivoire: A CGE Model Analysis," Memo, Développement et Insertion Internationale (DIAL), Paris.

Alarcon, R. Heemst, J. Keuning, S., de Ruijter, W. and R. Vos (1986), "The Social Accounting Framework for Development concepts, Construction and Applications," Memo, Institute of Social Studies, The Hague.

Armington, P. (1969), "A Theory of Demand for Products Distinguished by Place of Production," IMF Staff Paper No. 16, 159-76.

Chemingui, M. and C. Thabet (2001), "Internal and External Reforms in Agricultural Policy in Tunisia and Poverty in Rural Area," Memo.

Chia, N., Wahba, S. and J. Whalley (1994), "Poverty Reduction Targeting Programs: A General Equilibrium Approach," Journal of African Economies, 3(2), 309-38.

Cogneau, D. and A-S. Robilliard (2000), "Growth, Distribution and Poverty in Madagascar: Learning from a Microsimulation Model in a General Equilibrium Framework," TMD Discussion Paper No. 61, IFPRI (http://www.cgiar.org/IFPRI), Washington.

De Janvry, A., Sadoulet, E. and A. Fargeix (1991), "Adjustment and Equity in Ecuador," OECD Development Center, Paris.

Decaluwé, B. Patry, A., Savard, L. and E. Thorbecke (1999), "Poverty Analysis Within a General Equilibrium Framework," Cahier de Recherche, CREFA, University of Laval, Canada.

Dervis, K. DeMelo, J. and S. Robinson (1982), General Equilibrium Models for Development Policy, Cambridge University Press, London.

El-Said, M., Löfgren, H., and S. Robinson (2001), "The Impact of Alternative Development Strategies on Growth and Distribution: Simulations with A Dynamic Model for Egypt," TMD Discussion Paper No. 78, IFPRI, Washington.

Foster, J., Greer, J. and E. Thorbecke (1984), "A Class of Decomposable Poverty Measures," Econometrica, 52, 761-66.

Hertel, T., Preckel, P., Granfield, J. and M. Ivanic (2001), "Multilateral Trade Liberalization and Poverty Reduction," Memo, Purdue University.

Jensen, H. and F. Tarp (2003), "Trade Liberalization and Spatial Inequality: Methodological Innovations in Vietnamese Perspective," Working Paper, Institute of Economics, University of Copenhagen.

Konan, D. and K. Maskus (1997), "A Computable General Equilibrium Analysis of Egyptian Trade Liberalization Scenarios," in: Regional Partners, Global Markets: Limits and Possibilities of the Euro-Mediterranean Agreements, Ahmad Galal and Bernard Hoekman, editors, London, Center for Economic Policy Research in Europe (CEPR) and Brookings Institute.

Löfgren, H. and M. El-Said (1999), "A General Equilibrium Analysis of Alternative Scenarios for Food Subsidy in Egypt," TMD Discussion Paper No. 48, IFPRI (http://www.cgiar.org/IFPRI), Washington.

Löfgren, H., El-Said, M. and S. Robinson (1999), "Trade Liberalization and Complementary Domestic Policies: A Rural-Urban General Equilibrium Analysis of Morocco," TMD Discussion Paper No. 41, IFPRI, Washington.

Maskus, and D. Konan (1997), "Trade Liberalization in Egypt," Review of Development Economics, 1, 275-93.

Morrisson, C. (1991), "Adjustment, Incomes and Poverty in Morocco," World Development, 19(11), 1633-51.

Pyatt, G. and A. Rose and associates (1977), Social Accounting for Development Planning with Special Reference to Sri Lanka, Cambridge University Press, Cambridge.

Pyatt, G. and J. Round (1979), "Accounting and Fixed-Price Multipliers in a Social Accounting Matrix Framework," Economic Journal, 89, 850-73.

Ravallion, M. (1994), Poverty Comparisons, Harwood Academic Publisher.

Ravallion, M. and M. Huppi (1991), "Measuring Changes in Poverty: A Methodological Case Study of Indonesia During an Adjustment Period," World Bank Economic Review, 5(1), 57-82.

Robinson, S. and M. El-Said (1997), "Estimating a Social Accounting Matrix Using Entropy Difference Methods," Memo, IFPRI, Washington.

Rutherford, T., Rutstrom, E., and D. Tarr (1995), "The Free Trade Agreement Between Tunisia and the European Union," Memo, World Bank.

Rutherford, T., Rutstrom, E., and Tarr (1993), “Morocco’s Free Trade Agreement with the European Community: A Quantitative Assessment,” Memo, World Bank.

Stifel, D. and E. Thorbecke (2003), “A Dual-Dual CGE Model of an Archetype African Economy: Trade Reform, Migration and Poverty,” Journal of Policy Modeling, 5317, 1-28.

Thorbecke, E. (1991), “Adjustment, Growth and Income Distribution in Indonesia,” World Development, 19(11), 1595-614.

Chapter Five

Public Spending, Growth, and Poverty Reduction in Egypt: A Multi-level Analysis

Shenggen Fan ,Perrihan Al-Riffai, Moataz El-Said,
Bingxin Yu, and Ahmed Kamaly

1. Introduction

Egypt is a lower middle-income country with a per capita GDP of US$ 3,949 in 2003 measured in international dollars (or purchasing power parity) (World Bank 2005). Over the 1975 to 1985 decade, Egypt enjoyed rapid economic growth. However, with the collapse of oil prices after 1986, Egypt faced a period of economic slowdown. Mounting poverty, unemployment and significant macroeconomic imbalances, led to the adoption of economic reform programs. Following these reforms, the Egyptian economy showed signs of steady improvement from, 1994 to 2004, with an annual GDP growth of 4.6% (World Bank, 2005).

Still, poverty remains a serious problem in Egypt today. About 16% of the Egyptian population was poor in 2000, most of whom live in the rural sector. Moreover, Egypt still lags behind many middle income countries in key social indicators. In order for Egypt to achieve the Millennium Development Goals of halving the number of poor between 1990 and 2015, a radical approach has to be taken.

Government expenditures are important instruments for promoting economic growth, reducing poverty, and for improving the distribution of income. As Egypt is undergoing macroeconomic adjustments and facing tight budgets, it is critical to analyze the relative contributions of various expenditures to growth and poverty reduction. Valuable insights can thus be gained to further improve the allocative efficiency of limited, even declining public resources.

The overarching objective of this report is to use a multi-level analysis approach to assess the ex-post effects of various government expenditures on growth and poverty reduction and their trade-offs between these two goals and to offer future policy options to achieve the Millennium Development Goals (MDGs). The study will involve analyses and simulations at the different levels: household, sectoral and regional as well as macro levels. Different analytical tools will be used at the different levels. Analyses at each level will be initially executed independently, but a final synergy will be drawn through an integrated macro-micro framework.

This study is organized as follows: The next section reviews the trends in economic and agricultural growth as well as poverty in Egypt. In the third section, the major trends in public expenditures in various sectors are discussed. Section four models the effects on income and poverty status of access to infrastructure and technology and human capital at the household level using the integrated household budget surveys conducted by IFPRI in 1997. Section five estimates the effects of public spending on growth and poverty reduction using the governorate level data. Section six simulates the effects of government spending and its allocation on economic growth and poverty reduction at the macro-level using an economy-wide approach. In particular, it will simulate how Egypt can achieve its MDGs by reforming its public spending policy. Finally, we conclude the report by providing a summary and synergy across different levels of analysis

2. Growth and Poverty in Egypt

This section offers a brief review of Egypt's economy, its agricultural sector, and its poverty trends. The associated changes in institutions and policies are also highlighted, in order to provide an analytical base for the evaluation of the impact of public investments on growth and poverty reduction.

Economic Growth

Egypt's economy has undergone significant transformation over the past four decades. During the 1960s and early 1970s, Egypt followed an inward looking economic strategy, characterized by a complete reliance on the domestic market and extreme skepticism of private foreign investment. GDP grew by 3.24% per annum from 1965 to 1974 (Table 1).

In 1974, an official open door policy was initiated, marking a shift towards greater integration into the world economy. Egypt increasingly liberalized foreign trade, increased private foreign investment, and became more open to modern technology. As a result of these reforms and with the oil sector booming, GDP grew quickly by an impressive rate of 8% per annum between 1975 and 1985 (Table 1).

However, Egypt suffered from the crash in oil prices in the mid-1980s. Economic performance slowed down, and GDP grew by a slower rate of 3.8% per annum between 1985 and 1994. The inflation rate was high and the total debt service accounted for over 20% of the exports of goods and services, and for 7% of the GNI. Facing a series of crises, the country embarked on a structural adjustment program in the early 1990s. As a result, inflation slowly reduced and markets opened to greater competition (El-Laithy, Lokshin, and Banerji, 2003). Since the mid-1990s, Egypt experienced rapid economic growth, with GDP increasing by an annual rate of 4.6% per annum between 1994 and 2004.

Agriculture

Like many low middle-income countries, the reliance of the Egyptian economy on agriculture declined over the past 3 decades from about 30% in 1970 to 16% in 2004. The agricultural sector, however, remains an important sector of the economy as it provides employment to 33% of the country's labor force.

Covering only 3% of the country's total land, Egypt agriculture takes place essentially in the Nile Valley and the Delta region. The mild climate, assured water supply and fertile soil, allow Egyptian farmers to produce in one of the most productive agricultural systems. Nevertheless, Egypt is highly dependent on imports for its food supply due to the relative scarcity of arable land and water resources, high population growth, the relatively low investments directed to agricultural development, and insufficient funds for agricultural research and development agencies. One of the prominent characteristics of Egypt's agricultural sector is the dominance of small-scale farmers (Esfahani, 1987; Faris, 1995).

Agriculture GDP grew at a sustained growth rate of 2.7% per annum throughout the mid-1960s to the mid-1990s, and accelerated at 3.3% per annum after 1994 (Table 1). According to Nassar and Mansour (2003), a combination of technological progress (improved irrigation, drainage, fertilizers and crop varieties) and institutional reforms has contributed to this sustained growth. Policy changes have also taken place, moving from inward-looking policies, until 1986, to more liberalized reforms aimed at opening the agricultural sector to increase production and productivity. Some of the most important reforms were the gradual removal of governmental crop prices, the elimination of input subsidies, the reduction of tariffs and other protection measures, and the liberalization of the land tenure system (Nassar and Mansour, 2003; Shousha and Pautsch, 1997).

Poverty

To formulate poverty reduction strategies, measuring and tracking poverty trends over are crucial. To examine the poverty trends over time, we rely on the poverty estimates published in two studies. Adams (1985) assessed rural poverty in Egypt between 1958/89 and 1982 based on consumer budget surveys. Adams (2003) assessed the change in rural, urban, and total poverty during the 1980s and 1990s using the results from national household budget surveys. In both papers, the author measured poverty by estimating the percentage of population living below the poverty line. The poverty line was defined as the level of expenditures needed to meet the minimum food and non-food requirement. Although the poverty incidence estimates from the two studies are not directly comparable due to differences in sample size, methodology, and expenditure level benchmark, it provides some indication on the changes in poverty over time.

One noticeable trend is the large regional variance that marks poverty in Egypt. As Table 2 shows, poverty is the worst in Upper Egypt.[1] More than 20% of the population was poor in seven out of the nine governorates located in the Upper Region in 1999-2000. In contrast, poverty is the lowest in the Metropolitan region where only 5.1% of households are poor and constitute only 4% of all poor in Egypt. Between 1995-96 and 1999-2000, poverty incidences declined by more than half in the Metropolitan region during the late 1990s, but increased significantly in Upper Egypt. In the Frontier region and in Lower Egypt, urban poverty declined during the 1990s whereas rural poverty increased. In addition to these regional variances, Datt, Jolliffe and Sharma (2001) further characterize the poor based on 1997 household survey data, revealing that the poor in Egypt tend to come from large, female-headed households that depend on agriculture and trade services for their livelihood.

3. Public Expenditures: Trends and Composition

Egypt's public spending is an important instrument for achieving economic growth and equity goals. It includes long-term investment on R&D, education, infrastructure and social spending Public Investment and Provision.

Agriculture

Public spending in agriculture in Egypt increased from $1.82 billion (international dollars at 1995 prices) in 1980 to $3.32 billion in 1998, or an average growth rate of 3.4% per annum (Table 3). Growth in agriculture expenditure stagnated during the 1980s, averaging a rate of 1.28% per annum, but accelerated in the 1990s at 7.51% per annum. As a percentage of AgGDP, public spending in agriculture declined in Egypt during the 1980s, a period of economic slowdown, but increased in the 1990s.

Historically, public investment in Egyptian agriculture has been geared mainly towards the provision of irrigation and drainage, in addition to agricultural research. Today, the Agricultural Research Center (ARC), under the Ministry of Agriculture, is the most important research

---

[1] These poverty estimates are based on the Household Income, Expenditures, and Consumption Surveys conducted by the Central Agency for Public Mobilization and Statistics of Egypt (CAPMAS) in 1995-96 and 1999-2000. The data are reported in a World Bank report published in 2002.

organization in Egypt, consisting of 16 research institutes, six central laboratories, 46 agricultural research stations, and account more than 2,500 PhD researchers (ARC, 2004). Academic institutions also play a role in agriculture research in Egypt, with 16 faculties of agriculture and 8 faculties of veterinary medicine in the country.

Health

In the past several decades, health status and conditions have improved in Egypt as shown by several indicators of health. Life expectancy has increased from 45 years in 1960 to 68 years in 2001, whereas the percentage of children under twelve years old that are immunized to measles increased from 41 percent in 1980 to 97 percent in 2001. Moreover, infant mortality per 1000 birth declined from 189 to 35 between 1960 and 2001 (WDI, 2003).

Public expenditures in health increased from $0.87 billion (international dollars, 1995 prices) in 1980 to $2.12 billion in 1998, averaging an annual growth rate of 5.07% (Table 3). Despite the fiscal austerity imposed by the structural reforms, health expenditures increased sharply during the 1990s, at an average growth rate of 8.42% per annum. Nevertheless health accounts for only 3.6% of total public expenditures in 1998. For comparison purpose, nearly 10% of public spending was devoted to the military sector.

A larger portion of Egypt's health care is privately financed. In 2000, public health expenditures represented 1.75% of GDP, whereas the corresponding share for private health expenditures was 2.05% (World Bank, 2003). Thus, total health expenditure represents 3.80% of GDP.

Education

Education expenditures grew at 6.57% per annum form 1980 to 1998. But public spending on education as a percentage of GDP falls short of similar figures in low middle income countries by just under 1%. During the early 1990's, the emphasis was on increasing the supply of education, between 1992 and 1996, the number of classrooms rose by 53% across Egypt and by 1997, nearly all of Egypt's villages had access to primary schools (El Saharty et al. 2005). Up until the mid nineties there was a significant and unchallenged gender bias in schooling and education in Egypt. In order to address that problem, and in an attempt to improve the quality of education in Egypt, the Egyptian government initiated the Basic Education Enhancement Program. Between 1992 and 2002, female literacy rose by 10% from 57 to 67%, and whilst that falls short of required objectives, however, it is considered a significant stride towards narrowing the existing gender gap in education (UNDP, 2004)[2]. Female illiteracy amongst the 15-24 age group fell by 10%, from 28% in 1990 to 18% a decade later (World Bank).

Infrastructure

From 1980 to 1998, public expenditures on transportation and communication grew significantly from 0.4 billion dollars to 3.1 billion with an annual growth rate of 11.64% (Table 3).

Whilst across Egypt there is no difference between the poor and non poor's access to electricity, there does seem to be a gap in availability of piped water and connection to a public sewerage systems between the poor and non poor. The rural areas have the least access to indoor drinking water and connections to public sewerage (World Bank). Within that regional discrepancy the poor are even more disadvantaged. Despite the improvements that have occurred in addressing this shortcoming in the late nineties, the figures still show a bias against the poor and inhabitants of the rural areas over urban areas.

Today, a rapidly growing population poses a daunting challenge for Egypt to boost the productivity of its infrastructure, particularly, its water systems. With 70 percent of the poor living in rural areas, boosting water use efficiency could result in substantive increase of on-farm and off-farm income and employment. With water services accounting for 10 percent of the government's total public expenditures, reforming water management has become critical to accelerating the country's economic growth.

To address the problem of inefficient water resources, the Ministry of Water Resources and Irrigation has launched a reform agenda for water management in collaboration with major donors. In May 2005, the World Bank approved a $120 million loan for an Integrated Irrigation Improvement and Management Project in Egypt. The project has set a target of increasing water productivity by 15 percent and increasing farm-related income for the 380,000 families in the project area, at least two-thirds of whom are living on less than $2 a day (World Bank 2005).

Spending on Social Safety Nets

Subsidies in Egypt have a history as far back as the Second World War when food rations and price ceilings were placed on staples to alleviate the pressures of scarcity. Subsidies on major consumer items such as sugar, coarse cotton fabric, kerosene, edible oil and tea were introduced

[2] Whilst there remain large regional gender gaps in education in general,specifically in rural Upper Egypt, over a five year period – between 1996/97 and 2001/2002, the national gender gap in primary education fell by 50%, from 7% to 3.5%. Discrepancies in the male/female literacy rates, however, have not yet petered out, whilst female literacy rates in 2002 vary from one source to another, they are close to 50% of the female population were still illiterate vis a vis 29% of their male counter parts (El Saharty et al. 2005).

and never removed (Alderman et al, 1982). With the start of the socialist era, housing, transportation, education and other social service subsidies were introduced. By the beginning of the eighties, the subsidy bill had reached it highest. Torn between maintaining the subsidy program for social equity, and a rapidly ballooning fiscal deficit, President Mubarak and his cabinet realized that reducing the subsidy bill was a necessity (Alderman et al, 1982). By the turn of the century, the government was successful in constricting the subsidy program to include only four food items – *baladi* bread, *baladi* flour, cooking oil and sugar. More recently, the subsidy program was expanded to include rice, pasta, tea, fava beans, margarine and lentils[3] (Morrow, 2004). As a result, the subsidy bill is expected to reach L.E. 6.5 billion, almost double its previous level (Morrow, 2004).

Despite the universal agreement that social safety nets play a prominent role in alleviating poverty amongst society's vulnerable, it has been acknowledged that the effectiveness of these programs in the absence of the appropriate targeting is questionable at best. Due to shortcomings such as inclusion and exclusion errors, high administrative costs and widespread "operational" inefficiencies, the introduction of a cross breed of safety nets is now becoming popular. This type of reform seeks to break poverty cycles by alleviating transitory and chronic/intergenerational poverty through monetary disbursements conditional upon education and health improvements[4].

The Egyptian government has acknowledged the necessity of reform as far back as the mid 70's. At that time, due to Egypt's mounting external debt, a standby agreement with the IMF was struck and reforms in the subsidy system were implemented. The consequences were the infamous 1977 food riots that have continued to set a political straitjacket to all food price reforms in Egypt. From then onwards, any food price reform initiatives had to take into account the political as well as the economic and social ramifications involved.

Today, two types of safety net programs are currently present in Egypt: development programs and welfare programs. Development programs refer to the Social Fund for Development (SFD) which is supported by the government (World Bank). Originating in the early nineties, it is considered the main poverty alleviation tool for the government.

[3] Reversal in subsidy allocations is a common side effect behind a more gradual reform the subsidy structure (Gupta et al, 2000).

[4] A well cited example of such a program is Mexico's PROGRESA. Initiated in 1997, it initially targeted only Mexico's rural poor, two years later, the program had reached 40% of the rural poor (Coady and Harris, 2004). PROGRESA provides, cash transfers, family health care, and nutritional supplements to the poor. However, this provision is tied to the child(ren)'s school attendance. So far, there has been a marked improvement in child nutrition, school attendance and school drop out rates (Al Riffai, 2004).

However, despite its more than 14 years of operation, the SFD's impact on poverty alleviation in Egypt has yet to be determined. Welfare programs refer to the provision of subsidies on a multitude of private (food, electricity and fuel) and public goods (health and education). The subsidies are classified as implicit - revenue lost by the government for the provision of certain goods (and services) at below market prices to the consumer[5] - and explicit subsidies in the form of cash and commodity subsidies. For the purpose of this study, we will focus on the consumer food subsidy program, the largest component of all explicit subsidies existing in the Egyptian economy.

4. Household Level Analysis

In this section, we use the 1997 *Egypt Integrated Household Survey (EIHS)* conducted by IFPRI to link household income and poverty status to their endowments in human and physical capitals and their access to infrastructure, health services and agricultural technology. The household level analysis follows the framework in the Tanzania study by Fan, Nyange, and Rao (2003), and provides an opportunity to apply and adapt existing methods to the MEDA region.

Model

To model the impact of infrastructure access, education, and health on the welfare of households, we estimate three separate equations: income, expenditure, and poverty determination.

Since many households in Egypt engage in both agricultural and non-agricultural activities, it may be difficult to separate income sources between these two activities. On the one hand, even in urban areas a substantial share of many households' income comes from agriculture. On the other hand, nonagricultural activity has also gradually become an increasingly important source of income for rural residents (about two-thirds of total income). Therefore, total income, instead of agricultural income, is used in our estimation to reflect the whole picture of the household welfare.

Household income for a typical household depends on agricultural production assets, household characteristics such as household members' age, sex, education, and characteristics of the community where the household resides.

(1) TOTALIPP = f (HA, HC, CC, Z),

---

[5] The government of Egypt provides implicit subsidies on energy products.

where *TOTALIPP* is total income per capita, *HA* is a set of household production assets used for agricultural production; *HC* is a set of household characteristics, like education and telephone access; and *CC* is a set of community characteristics, including public facilities availability at the community level. The variable *Z* represents other factors that are not included in the equations, for example, regional agro-climatic conditions, and social and economic policies. Since these variables are not easy to quantify, regional dummy variables are used to control for the effects of such variables.

Similar to total income, household expenditure is also determined by households' production assets, household characteristics, and community characteristics.

(2) EXPPP = f (HA, HC, CC, Z),

where *EXPPP* is total expenditure per capita. For a particular household, whether it is under or above the poverty line is defined based on household per capita expenditure. As described above, the poverty line is defined either using per capita total expenditure or per capita food expenditure. How much a household can spend in turn, to a large extent, depends on how much the household can earn. Therefore, poverty can be modeled in terms of per capita income.

(3) POVERTY = F(TOTALIPP) or
= F(AGRIIN, NAGRIIN).

Through equations (1) and (3), we can link a household's poverty status to household assets and characteristics, and community characteristics through estimated income equations (both agricultural and non-agricultural). For example, the impact of certain community characteristics, say distance to public transport (DISPT), can be derived as:

(4) $\partial POVERTY/\partial AGRIIIN\ (\partial AGRIIN/\partial DISPT) + \partial POVERTY/\partial NAGRIIIN\ (\partial NAGRIIN/\partial DISPT)$

However, we can also model poverty directly as a function of *HA*, *HC*, and *CC*.

(5) POVERTY = F (HA, HC, CC, Z).

This is the so-called reduced form of the poverty determination. Since poverty is a binary variable at the household level, the OLS estimation will result in biased estimates. Therefore, a PROBIT model is used to estimate the poverty determination equation.

(6) Prob (POVERTY=1) = F (β'X),

(7) Prob (POVERTY=0) = 1-F (β'X).

Here βs are the parameters to be estimated. However, as for any other nonlinear regression model, parameters of the model are not the marginal effects of the variables on the right-hand side (Greene, 1999). If we assume F (.) is normally distributed, the marginal effect is:

(8) $\partial E[POVERTY]/\partial X = \Phi((\beta' X)\beta$

where Φ(.) is the standard normal density. STATA (A statistical and econometric software developed by StataCorp) gives the marginal effects of each independent variable through the command of DPROBIT. This will both avoid the bias by using the OLS and allow us to calculate the marginal effects of the independent variables directly.

Model Specification

As pointed by Datt and Jolliffe (IFPRI, 1999), before discussing what variables should be included among the set of explanatory variables, it is helpful to consider the issue of potential heterogeneity of the models of income and expenditure, i.e., whether we expect the models to be different across strata or regions. While there can be different levels of heterogeneity, the metropolitan and urban areas are sufficiently different from the rural areas in the Egyptian context, and lower rural area could be different from the upper rural area as well. Therefore, it is feasible to use different models for each stratum. For instance, it could be argued that public investment has different returns in rural and urban areas, and hence has different implications for income and expenditure patterns in different stratum.

Another practical reason for distinguishing separate models for the five strata is that while we can make use of a number of community-level variables available for the rural strata (lower rural and upper rural), such variables are unavailable for the metropolitan and urban strata, because the complete community module was not conducted in urban areas. Thus, when we estimate the model without community variables, we separate the whole sample into five strata: Metropolitan, Upper Rural, Upper Urban, Lower Rural and Lower Urban. But when we include community variables in our model, we only estimate equations for two strata: Upper Rural and Lower Rural.

In selecting potential determinants of living standards, a key consideration is to choose variables that are exogenous to current income or expenditure level. Fan, Nyange, and Rao (2003) purposed to select potential determinants that include education attainment, health status of household members, access to telecommunication and transportation. These variables either depend on household previous income or they are at the community levels and therefore exogenous to the household. The selected variables can be grouped broadly into household- and community-level variables.

The household-level variables include a set of demographic variables, household assets, variables related to education attainment, and variables related to their distance to roads and telecommunication. The demographic variables included are ages of the household head, ratios of dependents to income-earners, and two binary variables for the gender and marital status of the household head. The household asset is measured as the area of cultivated land that is owned by the households and value of livestock. In the education category, completed school years of the household head is used. The infrastructure variables are the access to electricity and telephone. The electricity variable is later dropped due to its non-significance (95% of households in the sample had access to electricity, and this percentage is even higher in metropolitan and urban regions). Another variable, the time normally needed to reach closest paved road by foot from the household location, is also included as a measure of access to public infrastructure. Two binary variables for the usage of fertilizer and improved seed are used as proxies for technology. Improved seed is dropped later since it is highly correlated with fertilizer usage (average correlation is above 0.8 in most strata).

At the community level, a set of dummy variables related to the availability of a range of public facilities or services, including post offic , public telephone, bus stop, paved road, dirt road, local shop, market center, grain/oil mill, agricultural extension office, agricultural cooperative, commercial bank, village bank, primary school, preparatory school, high school, health post, hospital, clinic, private pharmacy, private doctor, visit of agricultural extension worker and veterinary, public canal, community canal, private canal, and tube well. Although there are no significant correlations among those variables, it is both confusing and infeasible to include all these variables in the model: a model with all community characteristics indicates severe multi-collinearity among these variables.

With the help of statistical testing, we include the following variables in our final specification: Whether the community has a post office (*postoffice),* a commercial bank service *(commbank),* a market *(market),* a primary school *(prepschool),* a bus stop *(busstop),* access to paved roads *(pavedroad),* access to extension service *(agextn),* a clinic *(clinic),* access to a public canal *(pubcanal),* and whether it has access to a private canal (*privcanal)*. Other variables are not included because the null hypothesis of zero effects could not be rejected.

There may also be some concerns of potential bias in parameter estimates due to endogeneity or omitted variables. For instance, it could be argued that agroecological factors that determine the productivity of land are omitted from the regression, and hence implicitly included in the error term of the model. If these factors are a significant determinant of income or expenditure, the mean of error term will not converge to zero in probability limit, and the parameter estimates for the included explanatory variables will be inconsistent.

Another variant of this problem could be described by the argument that some of the determinants themselves depend on some omitted variables. For instance, whether there is a market in the village may depend on the omitted agroecological factors. Because the omitted factors are subsumed by the error term, these determinants are now correlated with the error term, and hence give rise to inconsistent parameter estimates.

One solution to the potential problem of omitted variables is the use of a fixed effects model. Thus, a fixed effect at the governorate level is introduced. There are 20 governorates in our sample. A governorate fixed effect model views the governorate not only being distinct in entities administration or institutions, but also differ in natural endowments (agroclimatic conditions, soil fertility, etc.).

Data Description

The primary data used in this paper are from the Egypt Integrated Household Survey (EIHS), a multi-topic, nationally representative household survey carried out by the International Food Policy Research Institute (IFPRI) in collaboration with the Ministry of Agriculture and Land Reclamation (MALR) of the Government of Egypt (GOE) and the Ministry of Trade and Supply (MOTS) of the GOE. Fieldwork began during the first week of March 1997 and concluded in the third week of May 1997.

The questionnaire was administered to 2,500 households from 20 governorates using a two-stage, stratified selection process. In the first stage, 125 primary sampling units (PSU) were randomly selected with probability proportional to size. The second stage of the process entailed randomly selecting 20 households from each PSU. The advantage of a two-stage process over a pure random selection process is that it dramatically reduces the scope of fieldwork and therefore reduces the cost of the survey. The disadvantage is that standard errors resulting from two-stage samples tend to be significantly larger than those resulting from pure random samples. Details on this questionnaire are available in the EIHS 1997 documentation (IFPRI, 1999).

The design of the survey also stratified selection on the following five regions of Egypt: Metropolitan, Lower urban, Lower rural, Upper urban, and Upper rural. This regional classification for Egypt has been used often in the tabulation of data from the Household Income and Expenditure Surveys conducted by the Central Agency for Public Mobilization and Statistics (CAPMAS). It has also been commonly deployed in the literature on poverty in Egypt (see, for instance, El-Laithy and Osman 1996, Korayen 1994, and Ali, El-Laithy, Hamza, et al. 1994).

The survey questionnaire consisted of 18 sections on a series of topics that integrated monetary and non-monetary measures of household welfare and a variety of household behavioral characteristics. There are both household level and community level data.

The household data contain responses from the male and female household questionnaires, while the community data contain overall characteristics of the community/villages containing the surveyed households. The variables used in our model are defined and explained as follow:

agipp. Agricultural income per capita (in Egyptian pounds) measures yearly income per person from agricultural products or agricultural activities, which is calculated as the sum of market value of homegrown products consumed within household, income from crop sale, livestock and livestock products sale.

Market value of homegrown products includes food that the household has grown and received from other sources over the past 7 days, which is converted to yearly consumption. Income from crop sale is the summation of total values for both sale and remaining crops produced in the past agricultural year. Livestock and livestock products sale are computed from the female questionnaire of section 13. Livestock sale is the value received for selling animals over the past 12 months. Livestock products sale includes milk, butter, cheese that were sold, consumed at home, or given as gifts. It also includes eggs and slaughtered animals for sell, consumption or for gifts over the past 12 months.

nonagipp. Nonagricultural income per capita (in Egyptian pounds) measures yearly income per person derived from non-agricultural activities. It includes sources from dwelling rent income, short-term wage income, long-term salary income, land rent income, miscellaneous agricultural activity income, enterprise income, asset rent income, remittance and transfer income, and other incomes.

Dwelling rent is the monthly amount the household received for renting out part of the dwelling unit, and it is converted to yearly rent income. Information on wage income for casual or temporary labor is obtained from the wage employment section for all persons 10 years or older. It is the product of three components: average daily wage and non-cash benefits, average working days per month, and average working months during the last 12 months. Salary income is the sum of take-home pay and bonuses, tips, incentives, and allowances minus contribution to an employee providence fund, over past 12 months. Land rent income includes all cash and in-kind a household received for renting out any land that it owned over the past agricultural year.

Miscellaneous agricultural revenues include incomes both from selling crop by-products (straw, husk, etc.) and from renting draft animals, tractors, threshers, other machineries, and other miscellaneous income over the past agricultural year. Income from enterprises activities is computed as the share of net revenues over past 12 months that is kept by the household. Income from asset renting is the amount a household received from renting the land or property, which is neither cultivated or lived in by the household, or from any other real assets, over the past 12 months.

totalipp. Total income per capita (in Egyptian pounds) is the yearly sum of agricultural and nonagricultural income per person.

exppp. The measure of total yearly expenditure per capita (in Egyptian pounds) is taken from the research of Datt, Jolliffe, and Sharma (IFPRI, 1998) and Datt and Jolliffe (IFPRI, 1999), which is quite extensive and draws upon responses to several sections of the household survey. Total expenditure is the sum of total food consumption (including tobacco and alcohol), total nonfood non-durable good expenses, estimated use value of durable goods and an actual or imputed rental value of housing. This monthly total expenditure is converted to yearly expenses for consistency.

Estimated Results

Table 4 presents the estimated total income per capita determination equations controlling for the fixed effect at the governorate level. The estimated results show that the dependent ratio affects per capita household income significantly. The more dependents or the less income earners a household has, the lower income per capita tends to be in the household. Gender or marital status of a household head is not a significant factor in affecting household income. The coefficient of household head marital status is marginally significant at the 10% level. Age of household head is found significant in Lower urban and Lower rural Egypt.

Education level achieved by the household head contributed most significantly to per capita household income, and the coefficients are significant in all strata. Access to telephone is also an important influence on income improvement in urban areas. The coefficients of improved seed usage are statistically significant and of the expected sign in both Upper and Lower rural strata, implying that improved policy with a focus on new seed availability could boost rural income substantially.

Estimated results of per capita household expenditure are also summarized in Table 4. Education of household head, dependent ratio, and telephone access are found to be significant and they are positively correlated with per capita expenditure. Consistent with Datt and Jolliffe (1999) we found that school attainment and reducing the number of unemployed individuals are the main beneficial effects from policy changes.

Table 5 provides estimated results from the probit model of the reduced form for poverty status. Again, education, dependent ratio, and telephone availability are revealed as determinants of household poverty status.

As mentioned before, community characteristics could be well exploited when we consider rural sectors only. Similar to the case of strata, education attained by household head and dependent ratio are universally related to total income, expenditure, and poverty status in both Lower and Upper rural Egypt, as shown in Table 6. In general, the community characteristics do not provide significant welfare effects on expenditure or poverty, except for the existence of preschool, paved roads in Lower rural areas. In Lower rural Egypt, infrastructure, such as post office, bus stop, and agricultural extension, help residents to increase their total incomes, while canal service (both public and commercial canals) decrease incomes. Some of the community level variables may have high correlation with the household access to public services such as distance to paved roads, telephone, and the use of modern seeds.

The household level analysis gives us information on how household and community characteristics correlate with household income and poverty status. But there are several disadvantages. For example, it is difficult to control for endogeniety and multicollinearity problems unless there is a long time series of a household panel. As well, household level analysis can not capture the market, regional, and macro-level effects due to various government interventions. Finally, it is difficult to link improved public provisions to meaningful government investment programs. Therefore, regional and macro analyses are required to complement the household level analysis.

5. Regional Level Analysis

This section of the report evaluates the impact of various government investments on agricultural growth and on poverty reduction using the data from different governorates over 1980-2000. This level of analysis captures some of the effects that the household level analysis can not capture, for example effects on labor and product markets.

Model

Public investment affects rural poverty through many channels. It increases farmers' income directly by increasing agricultural productivity, which in turn reduces rural poverty. Indirect impacts include higher agricultural wages and improved nonfarm employment opportunities, In addition to its productivity impact, public investment directly promotes rural wages, nonfarm employment and migration, thereby reducing rural poverty.

Public investments in rural sectors not only contribute to growth, employment, and wages in rural areas, but also help the development of the national economy by providing labor, human and physical capital, cheaper food, and markets for urban industrial and service development. Growth in the national economy reduces poverty in both rural and urban sectors. In an era of macroeconomic reforms, understanding these different effects provides useful policy insights to improve targeting efficiencies, budgeting and ultimately the effectiveness of government poverty reduction strategies.

Few studies have linked poverty reduction to the driving forces behind economic growth and income distribution. The determination of rural poverty adds a greater complexity. Rural residents draw their income from multiple sources. Farm activities are still major sources of income for many rural residents, but increasingly nonfarm activities such as rural industry and services have also become important. Another important income source is seasonal migration and employment in the urban sector. Building on earlier work by the senior author on India (Fan, Hazell and Thorat, 1999), we model the rural poverty determination as follows:

(9) $P = f(LP, RWAGE, NFE)$

Equation (9) models the determinants of rural poverty (P), which is defined as the percentage of the rural population living below the poverty line. They include agricultural labor productivity (LP), nonagricultural employment (NFE), rural wages (RWAGE).

Equation (10) models the agricultural labor productivity function. The dependent variable is gross value of agricultural production per agricultural worker in the agricultural sector (LP). The independent variables are a set of technology, infrastructure, and education variables that are used to capture their impact on labor productivity growth. These variables include agricultural research stock variables constructed from past government expenditures on agricultural research and development (RDS); irrigated areas (IRRIA) per agricultural worker; illiteracy rate of the rural population (ILIT); length of rural roads per agricultural worker (ROADS); and number of rural telephone sets per agricultural worker (PHONE).

(10) $LP = f(RDS, IRRIA, ILIT, ROADS, PHONE)$

Equations (11) and (12) are wage and nonfarm employment determination functions. Rural nonfarm wages and employment are determined by development in infrastructure, improved education and growth in agricultural productivity. Growth in agricultural productivity is included to model the linkage between growth in the agricultural sector and nonfarm employment and rural wages.

(11) RWAGE = f(LP, ROADS, PHONE, ILIT)

(12) NFE = f(LP, ROADS, PHONE, ILIT)

The marginal impact of public capital expenditures on poverty can be derived from this system of equation by taking the total derivatives as follows, taking agricultural research and rural education as examples:

(13) $$dP/dRDS = (\partial P/\partial LP)(\partial LP/\partial RDS) + (\partial P/\partial NFE)(\partial NFE/\partial LP)(\partial LP/\partial RDS) + (\partial P/\partial RWAGE)(\partial RWAGE/\partial LP)(\partial LP/\partial RDS)$$

(14) $$dP/dILIT = (\partial P/\partial LP)(\partial LP/\partial ILIT) + (\partial P/\partial NFE)(\partial NFE/\partial LP)(\partial LP/\partial ILIT) + (\partial P/\partial RWAGE)(\partial RWAGE/\partial LP)(\partial LP/\partial ILIT) + (\partial P/\partial NFE)(\partial NFE/\partial ILIT) + (\partial P/\partial RWAGE)(\partial RWAGE/\partial ILIT)$$

Equation (13) measures the marginal effect on poverty reduction of the research stock variable. It also decomposes the different pathways through which impacts occur (see Fan, Hazell and Thorat (1999) for a more detailed discussion). The first term on the right hand side is the direct poverty impact of growth in agriculture due to agricultural research and extension, while the remaining terms measure the effects of agricultural research and extension through improved nonfarm employment and wages.

Equation (14) is the marginal poverty reduction effect of improved education. Similar to equation (13), the first three terms on the right hand side are poverty reduction effects of improved education through growth in agricultural production directly and indirectly by improving nonfarm employment opportunities and rural nonfarm wages. The last two terms capture the impact on poverty reduction by directly improving nonfarm employment and nonfarm wages.

To convert annual government expenditures on public capital into stocks in monetary terms, we use the following procedure:

(15) $$K_t = I_t + (1-\delta)K_{t-1}.$$

Where K_t is the capital stock in year t, I_t is gross capital formation in year t, and δ is the depreciation rate (5%). To obtain initial values for the capital stock, we used a similar procedure to Kohli (1982).

$$(16) \qquad K_0 = \frac{I_0}{(\delta + r)}.$$

Equation (16) implies that the initial capital stock in year 0 (K_0) is capital investment in year 0 (I_0) divided by the sum of real interest rate (r) and depreciation rate. In the case of Egypt, we assume a real interest rate of 3%. Sensitivity analyses were conducted to see whether different depreciation rates and real interest rates would affect our final results. We found the impact of different real interest rates to be negligible. But different depreciate rates do express some difference.[7] But the ranking of returns among different types of investment and among regions remains the same.

After we obtained stocks for various types of public investment, we ran the following regressions to determine the relationship between these stocks in monetary terms and physical stocks:

$$(17) \qquad P_{i,t} = f(K_{i,t}, Z_{i,t})$$

where $P_{i,t}$ is physical stock of public investment i in year t , for example road density, years of schooling, rural literacy rate, electricity consumption, or irrigated areas; and $K_{i,t}$ is capital stocks in monetary terms for investment i in year t constructed from *equation* (15). To control other factors that may be omitted from the equation ($Z_{i,t}$), both year and regional dummies are added during the estimation.
To calculate the marginal return in terms of poverty reduction of different types of government spending such as roads, education, and irrigation, we use derivatives of the following form, using education as an example:

$$(18) \qquad dP_t / dK_{e,t} = dP_t / dILIT_t * \partial ILIT_t / \partial K_{e,t}$$

Equation (18) implies that marginal return to capital stock in education ($K_{e,t}$) is the product of marginal return to improved literacy (derived in Equation (14)) and marginal impact of capital stock on the years of schooling.

Data

Most of the data used in this study come from various agencies of the Egyptian government.

[7] Sensitivity analyses of different interest rates and depreciation rates for roads were conducted for the following scenarios: (a) 3% real interest rate and 10% depreciation rate, (b) 5% real interest rate and 10% depreciate rate, (c) 3% real interest rate and 5% depreciation rate, and (d) 5% real interest rate and 5% depreciation rate. The estimated marginal returns were 0.86, 0.84, 0.61 and 0.63, respectively.

Poverty

The poverty variable is measured as the percentage of the rural population living below the poverty line.

Agricultural labor productivity.

Agricultural labor productivity is measured as gross agricultural production value per agricultural worker.

Nonfarm employment

Rural nonfarm employment is measured as the percentage of the rural abor force engaged in nonfarm activities such as manufacturing, construction, trading, and services.

Wages.

Rural wages are the average daily compensation for rural workers.

Agricultural research

Agricultural research in Egypt is conducted at the national level. But national research affects production throughout the country through so-called spillover effects. Therefore, we include the same agricultural research stock variable constructed from past expenditures in all regions. When we calculate returns to agricultural research investment, we also add agricultural extension to determine total investment in agricultural R&D.

Infrastructure

Most of the infrastructure and education variables used in the model are defined in physical terms and data for suitable measures are available at the national and regional levels. The greatest difficulties arose in collecting data on government expenditure by type of investment and region, which are needed for calculating the value of the existing stocks of these investments and their unit costs. Like many countries, Egypt compiles data on public spending by different types of investments at the national level, but there is much less data on how these expenditures are allocated to different regions and by rural and urban areas. Therefore, some techniques and assumptions had to be used to make these allocations.

Irrigation.

Both irrigated areas and investment costs are available at the regional level.

Rural education

Illiteracy rate is used to proxy the improvement in education.

Roads

Road length and public expenditure data on roads are available by region from the government office.

Rural telephones

Number of telephone sets are used as proxy for improved telecommunication.

Model Estimation

We use the double-log functional forms for all equations in the system.

More flexible functional forms such as translog or quadratic impose fewer restrictions on the estimated parameters, but many coefficients are not statistically significant due to multicollinearity problems. Regional dummies are added to equations of poverty, productivity, employment, migration, and terms of trade to capture the fixed effects of regional differences in agroclimatic and socio-economic factors. The time trend variable is also added to these equations except for the poverty equation to control for any macroeconomic polices that have the same impact on every region. The model is estimated for the period of 1981 to 2000.

There are two approaches in estimating an equation system: the single equation approach and the multiple equations system approach. Single equation techniques such as instrumental variable estimators, two-stage least squares, and limited information maximum likelihood are easy to estimate and requires only limited information. However, the single equation technique often neglects information contained in the other equations of the system. For this reason, we use the full information maximum likelihood (FIML) estimation technique. Among all estimators, FIML is the most efficient. The only disadvantage is its estimation complexity but with the rapid development of econometric softwares, this task has become increasingly easier and more accessible.[8]

The estimated results are shown in Table 7 Rural poverty is negatively correlated with labor productivity, rural wages and the level of nonfarm employment (Equation 1). But rural wages is not statistically significant. The insignificance of rural wages on nonfarm employment is similar to the findings in many Asian countries (Thailand and Vietnam). This may indicates that there is an inelastic supply of rural labor or there is large

[8] We use SAS window version 8.0 in our estimation.

labor surplus in these economies. Rural nonfarm employment has the largest poverty reduction elasticity among all explanatory variables.

The estimated agricultural labor productivity equation indicates that improvement in telephone and rural education has large impact on labor productivity. In particular, higher illiteracy rate is strongly correlated with lower labor productivity with an elasticity of -1.16. The roads variable is also correlated with labor productivity, but not statistically significant.

Equations 3 and 4 show that development in telecommunication (proxied by telephone) and improvement in education are statistically significant in promoting rural wages and nonfarm employment. But rural roads are not statistically significant. Improved labor productivity is also not statistically significant in helping to increase rural wages and nonfarm employment.

Marginal returns in agricultural growth

We first calculate the marginal returns in agricultural growth per additional physical unit. Then, using the parameters estimated through equations 9-12, we are able to calculate the unit cost of public capitals. Comparing the unit cost with the marginal benefit, we can easily estimate the benefit-cost ratios, presented in Table 8.

For telephone, the benefit-cost ratio is 3.13 for the national average. However, in Metropolitan area, the ratio is less than one, i.e., return from the telephone investment can not cover its cost. For Lower Egypt, the ratio is more than 6, which indicates that even return from agricultural production is 6 times larger than its cost. If we include the effect on nonfarm GDP and rural GDP, the benefit-cost ratio would be much larger. The Upper Egypt has a ratio of 4.36. The benefit-cost ratio of road investment is 2.84 at the national average. Again it is the metropolitan area where the benefit-cost ratio is less than one. The largest return is from the Upper Egypt where the ratio is 4.8. The Lower Egypt has a ratio of 3.7. Education investment has the highest return among all types of investment with a benefit-cost ratio of 4.8 for the nation as a whole.

Lower Egypt has the highest marginal return with a benefit-cost ratio of 5.8. Upper Egypt has a ratio of 4.4, 75% of the effect in Lower Egypt. Irrigation has the lower benefit-cost ratio among all types of investments with a ratio of 1.94. It suggests that irrigation is still a good investment, and compared to Asia, this ratio is high.[9] Among all investment, education ranks first followed by agricultural R&D, telephone, roads and irrigation at the national level. For Lower Egypt, telephone and roads have high returns, followed by education and irrigation. For

---

[9] In the case of India, the benefit-cost ratio of irrigation is less than one (Fan et al, 1999). For China, the ratio is just marginally above one (Fan et al 2002).

Upper Egypt, roads rank first, followed by phone and education which have similar marginal returns. Irrigation has the lowest returns similar to other regions.

Marginal Returns in Poverty Reduction

Similar to returns in agricultural growth, we calculate returns in poverty reduction in terms of both physical and monetary units. From this, Table 8 presents the estimated number of poor reduced per thousand LE. At the national level, Education has the largest impact per unit of investment. Every million LE investment, more than 200 poor would be lifted above the poverty line. Agricultural research follows education effect closely. The poverty reduction effect is 176 for every million LE invested. Two infrastructure variables, telephone and roads have similar poverty reduction impact per unit of spending. Irrigation investment has the smallest marginal impact on poverty reduction, and its effect is only 40% of education and 47% of R&D.

There exists large regional difference on the marginal effect of different investments. It is the Upper Egypt where all kinds of investment except irrigation have the largest impact. Except for irrigation, all kinds of investment in Metropolitan area have the lowest marginal impact.

6. Macro-level Analysis

The CGE model used in this report is a dynamic computable general equilibrium (CGE) model of the Egyptian economy and is used to quantify the effect of public spending on promoting pro-poor growth, equity, and poverty. It follows Lofgren and Robinson (2004) and Al-Riffai et al. (2005) in its explicit formulation of the potential channels through which different kinds of government spending influence productivity and economic performance and is set to analyze alternative public policy spending scenarios and alternative subsidy treatments in terms of their potential impact in promoting growth, poverty alleviation, and an egalitarian distribution of income. The model is solved simultaneously for all time periods. However, in the current version, its structure is dynamic recursive, making it possible to describe the model as being composed of within-period and between-period modules. The dynamic-recursive nature of the model is manifested in that economic agents are treated as "myopic", making their decisions on the basis of current conditions.

What follows provides a description of the model, its extension to explicitly introduce price subsidies, and cash transfers, as well as a presentation of the Egypt 1997 SAM. Also a discussion on the approach used to analyze the distribution and poverty implications is considered.

Model Structure

In a dynamic recursive CGE model, it is typical to follow a two-stage approach. In the first stage, a within-period static CGE model is solved for a new equilibrium, where as in the second stage, a between-period model provides the necessary linkages to update variables that drive growth in the static first stage model.

Within-period Module

The production technology is represented by a nested CES (constant-elasticity-of substitution) and Leontief (fixed-coefficient) functions. Domestic output in each sector is a CES function of value added and an intermediate input aggregate. In turn, value added is a CES function of primary factors, while intermediate input use is determined by sector specific fixed input-output coefficients multiplied by sectoral activity levels. Producers seek to maximize their profits yielding sector-specific factor demand. The model solves for long-run equilibrium in that all factors of production (agricultural labor, nonagricultural labor, capital, and land) are assumed to be sectorally mobile. Factor supplies are fixed for each product activity. Even though economy-wide wages adjust to clear the factor markets, each activity pays an activity-specific wage rate that is the product of the economy wide wage rate and a term that captures activity-specific wage “distortions” (or differentials).

The markets of goods and services are competitive: economic agents take all output prices as given. Each production sector is assumed to produce differentiated goods for the domestic and foreign (export) markets, allocating their goods between these two markets in a revenue-maximizing manner subject to imperfect transformability (captured by a CET [constant-elasticity-of-transformation].[11] For sales to foreign markets, the prices paid to producers depend on world prices, the exchange rate, transactions costs, and an export tax.

Similarly, domestic demanders differentiate between domestic products and imports. For each commodity, the composite commodity that is demanded is modelled as a CES aggregate of imports and domestic products. Domestic demanders minimize the cost of obtaining a given amount of this composite good. The price paid for imported goods depends on the world price, the exchange rate, import tariffs, and transaction costs (of moving the imported good into the domestic market). The price of domestically produced goods used domestically is a function of the supplier price and transaction costs (of physically moving the good from the supplier to the demander. Such product differentiation permits two- way trade, gives some realistic autonomy to the domestic price system, and allow for a continuum of tradability

[11] Domestic markets and foreign markets (exports).

and two-way trade, which is commonly observed even at very fine levels of disaggregation (de Melo and Robinson, 1981)[12]. Households maximize a Stone-Geary utility function subject to a budget/spending constraint, yielding linear expenditure system (LES) demand functions. Household income is made up of factor income and transfers from the government. The typical household spends on commodity consumption, taxes (income, sales) and savings.

Government income is made up of direct and indirect taxes. The government spends this income on consumption, investment and interest payments (domestic and foreign). Real government consumption and investment are exogenous (varying across the different simulations) and disaggregated by spending type into agriculture, human capital (education and health), infrastructure, social security, defense, and other).

The model follows the small-country assumption under which the world prices of exports and imports are given. For domestically produced goods; prices are flexible and market-clearing. The economy earns foreign exchange from exports, net transfers from abroad to domestic institutions, public foreign borrowing, foreign grants, and foreign direct investment (FDI). These foreign exchange earnings are spent on imports (of goods and services), interest payments on foreign and domestic debt, and repatriation of domestically earned profits of foreign investors (which depend on capital rents, and the share of the private capital stock that is owned by foreigners, in its turn a function of FDI. In this model, exports, imports, interest payments on all debt – foreign and domestic – and repatriation of foreign investors' profits are all endogenous. The rest of the items in the balance of payments are exogenous.

"Closure rules" or "system constraints" are constraints that have to be satisfied by the economic model, but are not considered in the optimizing decision of any micro agent (Robinson 1989) [13]. These include three macroeconomic balances (associated with the accounts for the government, the rest of the world, and savings-investments) and supply-demand balances in the product and factor markets. The "closure rules" of the model indicate the mechanisms on the basis of which the model satisfies these constraints. For these three macro balances, receipts/revenue earned must equal spending from that account. According to the closures used in the simulations, for the government balance, flexible government savings ensure the equality between government receipts and government spending. A flexible real exchange rate equilibrates foreign exchange earnings and receipts through its influence on exports and imports. In the savings-Investment balance, the value of investments is determined by available savings, i.e. investment is savings-driven.

---

[12] For a more detailed description of the features of the model see: Lofgren et al. (2002).
[13] For a discussion on macro balances see Lofgren et al 2002 *pp. 13-17*.

Between-period Module

The between period module in a dynamic recursive CGE model provides the changes in parameters and variables in the economy over successive periods. In this model, the stocks of production factors, population, and debts (domestic and foreign) change over time. The stocks of labor, land, and population are exogenous whereas, as noted above, capital stocks are endogenous along with TFP. Debt stocks are endogenous: the stock of foreign borrowing in time period t+1 is a function of the stock of foreign borrowing in previous time periods and "new borrowing".

The between-period module then passes the updated information to the within-period module allowing it to solve under an updated "information set" for the consecutive period. The model is solved in a single pass for the period 1997-2015. Given the dynamic-recursive structure, the solution values for each time period (year) represents an equilibrium for that year that depends on the current and past parameters and relationships, not the future. For each period, the model solution generates a rich set of economic indicators, ranging from national accounts to sectoral and household level information. The baseline growth path is then used as a benchmark (a counterfactual) for comparing the effect of a policy reform that generates a new growth path with a comparable set of results.

Poverty Module

In addition to the within-period and the between-period modules discussed above, a separate poverty module is used to compute the inequality and poverty indicators[14]. The poverty module follows a representative-household (RH) approach along the lines described in Lofgren et al (2002). It is used at two different stages, once after the within-period module is solved for the baseline growth path, and once after every policy simulated growth path. Initially, the module generates benchmark inequality and poverty indicators for comparison with new ones generated when the module is used for the second time.

Using data from the within-period module on mean consumption and a CPI for each household group, the poverty module computes a poverty line to replicate exogenous poverty rates. For the case of Egypt, rural and urban poverty rates using the head count index are obtained from the World Bank's Poverty Reduction Study (2002). In addition, the poverty module permits the user to choose between two approaches to the specification of the within-group distribution, a parametric approach based on a log-normal distribution and a non-parametric approach, which is directly based on household survey data.

---

[14] Inequality and poverty indicators include Atkinson, Gini, and Theil inequality measures and the FGT poverty measures (P_0, P_1, P_2).

Earlier examples of studies using the first approach include Adelman and Robinson (1978) and de Janvry et al. (1991). In this case, a log-normal distribution is used to specify the distribution of income within each household group. According to this approach, only the first moment, the distribution mean, would shift to the right or to the left as a result of a policy change, while higher moments are fixed. Empirically, poverty and inequality indicators are generated from the overall distribution which is generated by summing up the within-group and the between-group distributions.

The second approach offers a relatively straightforward method for linking the CGE model with a household survey data. Poverty and inequality indicators are computed using a distribution from a sample of actual household consumption expenditure. Each household observation is mapped to one of the RH groups in the CGE model. In the case of the Egypt model, the observations are mapped to ten household groups by quintiles for both rural and urban households to form a within group distribution. When a new policy is introduced (for example change in the composition of public spending) relative prices and the pattern of each RH income and consumption expenditures is altered. Measuring the percentage change in a RH group consumption and applying the same rate of change to each household observation in the survey yields a new distribution following the new policy. Comparing the difference between a new set of poverty and income inequality indicators (computed using the endogenously adjusted poverty line and the new distribution of per-capita consumption expenditure) to the baseline ones is a measure of the effect of a policy reform on distribution and poverty[15].

Egypt SAM

The Egypt social accounting matrix (SAM) for 1997 is the main database for the CGE model. A SAM is a snapshot in time that, most importantly, portrays the flow of incomes from production activities, in the form of factor payments to the households, and the consequent flow back to product markets through household spending on goods and services. The SAM is a square matrix whose row totals have to equal its column totals. Each cell in the SAM can either represent the payments from a column account to a row account, or, an income received by an activity account from a column account.

The accounts included in the SAM may be divided into production activities, commodities, institutions, and factors of production. Subject to data availability the SAM accounts in each category may be disaggregated appropriately to address the policy questions explored by the underlying model. In this paper, the disaggregation of production

[15] For more description of the approach see Agénor, Izquierdo and Fofack (2003). A similar method is followed by Löfgren, Robinson and El-Said (2002), and Coady and Harris (2001).

sectors, households, and the government has been informed by the objective of the paper, to explore the impact of government spending on poverty[16].

In addition to the SAM, the model requires information about elasticities (for production, consumption, trade, and the productivity effects of government capital stocks), base-year stocks of factors and debts, as well as data showing anticipated trends for government policies and other exogenous elements that may change over time (international prices, population, and selected factor stocks).

Modeling of Subsidies

The Egypt CGE model has been extended to explicitly account for subsidies as included in the 1997 SAM for Egypt. According to the SAM, subsidies include transfers to households as payments for four commodities, bread, flour, transportation, and electricity. For the model to account for the subsidy data, a number of equations in the model had to be modified to as to ensure that the model's base solution replicates the initial data in the SAM. That entails calibrating the subsidy data into the model. In addition to including existing subsidy data, the model was also extended to include a cash transfer treatment. What follows provides a brief description of these modifications.

Subsidy Rate Treatment

In the model, the household demand is modeled as a Stone-Geary LES functional form. Given the commodity prices and incomes, a typical household would optimize its objective function by choosing an optimal consumption basket. After introducing the subsidy rate, the first order conditions explicitly include an endogenous subsidy rate that can apply to the different commodities in the model. Following the 1997 data in the SAM, these apply to existing subsidized commodities (bread, flour, transportation, and electricity). The subsidy rate can be easily modified (for existing commodities as well as added to new ones) as needed for the purpose of implementing a particular policy scenario.

Cash Transfer Treatment

The cash transfer is a lump sum that the government decides to spend to target needy household groups. In contrast to the subsidy rate treatment which operates through prices, the cash transfer treatment amounts to an increase to the recipient's total income. The lump sum transfer comes out of the government budget, where financing the transfer may be coming from increasing the fiscal deficit, increasing tax revenue, or reducing expenditures. Alternatively, financing could be associated with foreign grants, which would be reflected as part of the

---

[16] A micro version of the SAM that is used is available upon request.

current account[17]. However, this will have different implications as it depends on the assumptions introduced for the current account equilibrium. Typically this would tend to appreciate the exchange rate and a potential Dutch disease story can be analyzed.

Policy scenarios

Two sets of policy experiments are implemented using the Egypt-CGE model. The first analyzes the restructuring of the subsidy system and uses the resultant savings from targeting along with a reallocation of public investment towards one specific sector (agriculture, infrastructure and human capital [education and health]) at a time. The other policy scenario eliminates the price subsidy program completely and instead, introduces a targeted cash transfer program with a similar use of saved resources and a reallocation of public funds towards one of the above-mentioned sectors. The effects on poverty, growth and efficiency in the economy will be assessed and compared to BASE line growth path. Table 9 provides a brief description of all the simulations under the two sets of policy experiments.

The Distribution of Subsidies

The model solution generates a baseline growth path for the economy with a consistent general equilibrium set of results in each period. The baseline growth path serves as a benchmark for comparing the results from the two sets of policy experiments. Results from the baseline growth path are listed under the second column of Tables 10 and 11.

Targeting Through Restructuring the Current Subsidy System

Currently, the subsidy system is untargeted and thus inefficient hence exerting an unnecessary strain on government funds. This set of policy scenarios will remove subsidies altogether from society's upper two quintiles in an attempt to remedy the problem of inclusion errors in a subsidy system. At the same time, subsidies for the middle quintile are halved, whereas the lowest two quintiles, who are considered the most vulnerable, will still receive the full subsidy.

The results are summarized in Tables 10 and 11 and are compared to the BASE scenario, the economy's growth path where existing subsidies remain. Relative to the BASE scenario, a reallocation of government spending towards a specific sector, combined with additional investment from restructuring the subsidy program entails a positive increase in GDP. Overall, it seems that fiscal prudence pays off only when the government targets infrastructure and human capital development. The results of the macro indicators are quite disappointing when the

[17] These are alternatives the model can address through a change in the closure rules related to how the government account maintains a new equilibrium.

government decides to invest heavily in the agricultural sector. Heavy government investment in the agricultural sector has led to such interesting results in this exercise that it was deemed worthwhile to conduct a sensitivity analysis to show the movement of key macro and household indicators when the agricultural sector is targeted for investment by the government.

Looking at the household and welfare indicators (Table 11), it can be found that, except for the scenario for agricultural sector investment, consumption per capita rises across quintiles and regions. However, under the scenario of agricultural sector investment, it is clear that any increases in per capita consumption are biased in favour of the urban households. Exclusive investment in the agricultural sector does not improve poverty figures (over the base results) for the rural sector. This result implies that the negative poverty impacts on the rural poor hampers the government's policy efforts to significantly reduce nationwide poverty.

The consistent results in these three scenarios are that public investment in agriculture show relatively poorer results relative to public investment in human capital and infrastructure. These results are especially true when evaluating growth.

Targeting Through Cash Transfers

Cash transfers have several advantages over subsidies such as their allowance for existing price mechanisms and choice in consumption patterns. There are, however, disadvantages to cash transfers, namely the requirement for overly extensive information about the needy than other social protection programs, in addition to the high administrative costs of setting up such programs. This study does not take into account the administrative costs incurred in the initiation and expansion of a cash transfer program in Egypt.

In this scenario, subsidies are completely eliminated and cash transfers – equivalent in amount to the value of the subsidy received before its elimination - are distributed amongst the lowest two income quintiles, and amongst the third income quintile. However, the cash transfers distributed amongst the middle income group are only half the value of the subsidies that group received under the eliminated subsidy program. The highest two quintiles do not receive any cash transfers under this scenario. Again, the savings accruing to the government are in turn invested exclusively, once in agriculture, once in infrastructure and once in human capital along with an investment reallocation from the government's "other" investments. Looking at the macro economy, Table 12 shows that GDP growth achieves its highest growth with human capital development and public investments in infrastructure - a 7.22% annual increase over the period vis a vis a 3.98% increase under the base run and 4.4% - respectively. Total factor productivity, across all scenarios rises. However the largest increases are under the TRHH+QG-HUM+-2 scenario followed by TRHH+QG-AGR+-2 and TRHH+QG-TRN+-2 scenarios. Total factor income rise by less than 1% over the base run with public spending in the infrastructure and agriculture and by slightly less than 3% when the government develops human capital. However, with the deterioration in the agricultural terms of trade, one can see a fall in agricultural labour income and land rent.

Looking at nationwide and regional per capita consumption and the welfare indicators (Table 13), one can see again that due to the deterioration in the agricultural terms of trade, welfare indicators are favourable for urban lower income groups and unfavourable for the rural lower income groups. Throughout this scenario it may be concluded that despite the unfavourable results of the exclusive public spending in the agricultural sector, overall poverty reduction and growth have been successful, albeit within a narrow margin.

Sensitivity Analysis to Public Investment in the Agricultural Sector

Throughout this study, it was found that increased investment in the agricultural sector does not bring about growth and poverty reduction to that sector. Despite the increase in factor productivity in that sector, results indicated that agricultural labour and land incomes deteriorated and so did certain welfare indicators, such as per capita consumption and an across the board worsening of rural poverty.

In order to further explore this result a sensitivity analysis was conducted across the two main safety net programs, subsidy restructuring vs cash transfers. The level of investments in the agricultural sectors varied. For the first set of sub experiments, all of the subsidy savings accruing to the government from, either, restructuring the existing subsidy program or replacing it with a cash transfer program, where injected into the sector. The second set of sub experiments entailed reducing public investment in the sector to three quarters of the savings accruing to the government from modifying the consumer subsidy program. Finally, to complete the picture, one half of the savings were targeted for the agricultural sector. Table 14 shows total factor productivity falling with lower investments in the agricultural sector, however, there is a negative relationship between the level of investments in the agricultural sector and nationwide growth, absorption, and agricultural factor income. On the micro level, there seems to be a steady improvement in rural per capita consumption and rural poverty incidence when less investments are allotted to the agricultural sector.

These results may be explained through the link between productivity increase and the inelastic demand for food in Egypt. Productivity increases raise agricultural production, coupled with low demand elasticities of agricultural products, and an almost nonexistent outlet for a higher volume of agricultural exports in Egypt (agricultural exports were only 0.5% of total exports in 1995/96), domestic prices of agricultural goods fall. Agricultural terms of trade deteriorate and the net buyers of agricultural goods reap the benefits, whilst the net sellers are harmed.

One can therefore argue that a cash transfer scenario may be superior over a restructuring of the current subsidies. Cash transfers increase real incomes and do not interfere with the consumer's utility maximization and seem to compensate ruralites for their loss of revenue as a result of the agricultural sector's deteriorating terms of trade.

Conclusion, Policy Recommendations and Areas for Future Research

Overall, targeted social safety nets not only reduce the fiscal burden and make available funds that could be used to promote growth and alleviate poverty, but also help promote efficient use of resources and are more equitable. The latter is of significant importance in the case of Egypt as they correct for a long overdue bias, towards higher quintiles, in the subsidy program.

The analysis showed the benefits from restructuring the existing price subsidy program in favor of the lowest household quintiles (minimizing the inclusion error) and at the same time using the resultant savings to promote and target public spending. In a similar approach, the existing subsidy program was contrasted with an alternative cash transfer program.

Aside from achieving a more equitable distribution of benefits, the results indicate that a targeted cash transfer program promotes higher GDP growth, and higher aggregate household consumption, than targeted subsidies. Both macro as well as micro indicators, are higher under a cash transfer program than under a program targeting subsidies, with the exception of poverty which maintains similar figures under both. It was also found that, given the structure of the agricultural sector in Egypt, the rise in productivity is translated into lower domestic prices of agricultural goods and lower agricultural factor incomes ultimately driving down rural consumption per capita and raising its urban equivalent. By conducting a sensitivity analysis on the level of public investment in the agricultural sector, it was found that the lower the investments are in that sector the higher the macro and micro indicators become. However, given the inelastic demand for agricultural goods, it was found that cash transfers compensate the rural sector for its loss of revenue than does the existence of consumer subsidies. Another common finding is that across the board, government spending on human capital development circumvents the deterioration in agricultural terms of trade and thus produces higher growth and more substantial poverty alleviation than investment in infrastructure or agriculture.

It is difficult to argue that the present state of the subsidy program in Egypt is fiscally unsound, and neither can it be said that the program, as it stands, is efficient in providing the truly needy with a social safety net. The merits of undertaking a subsidy reform policy using any of the above scenarios have to take into account an administratively-feasible program and factor in the stylized socio-political dimension.

Even with a means proxy test available for Egypt, a geographical targeting of subsidies may prove to be beneficial given that the majority of the poor live in rural areas. One can argue further that geographical targeting of public spending on the social services sector and infrastructure would more likely reap greater benefits given the structure of the Egyptian agricultural sector. Especially that the highest illiteracy rates and least access to health care are concentrated in specific regions in Egypt[18].

Another area of potential gain from targeting is the provision of support based on gender. Female headed households compromise 15% of total Egyptian households. If we add illiteracy, social intolerance, poor access to capital and gender bias in the workplace, female headed household end up amongst the most vulnerable groups of society. Gender targeting can therefore help. Supplementing the analysis with data on gender is likely to yield positive results.

7. Summary and Synergy

This study differs from previous ones by analyzing the effects of public spending on growth and poverty reduction at different levels of analysis. It involves analyses and simulations at the levels of household, sectoral, regional and macro levels. Different analytical tools are used at the different levels. The approach we followed has enabled us to gain additional knowledge as well as new policy insights.

1. Our findings conform with results from earlier studies that universal subsidies are inefficient and usually achieve the intended goals at a much higher cost. A targeted approach is preferred since it is more effective in reducing poverty and attaining an equitable distribution of income. Moreover, saved government resources can be used for productive investments in human capitals, infrastructure, and agricultural technology that would have long term impacts on growth and poverty reduction. Among all types of targeted programs, direct income transfer as well as targeting to the aged, women and children deserve special attention.

[18] Extending the current CGE model to incorporate regional/governorate breakdowns may provide additional analyses and useful results.

2. In order to achieve economic growth and higher poverty reduction, public investment needs to be better prioritized. Investing in human capital and infrastructure, particularly in rural Egypt, offers the highest return in terms of both growth and poverty reduction. Regionally, investment in Upper Egypt would lead to larger poverty reductions as the poor are increasingly concentrated here

3. Investing in agriculture is potentially pro-poor and can contribute to long term national food security. But the current trade policy that isolates domestic market from the international one leads to lower returns to these investments, particularly in terms of rural income and rural poverty reduction. Most of the benefits from agricultural investment, under an autarky economy, are reaped by urban consumers and majority of rural population may suffer and they account for majority for Egyptian poor population. In summary, investing in agriculture and in rural areas is a must to lift rural poor out of poverty, but free trade in agriculture is a pre-condition for this to happen.

References

Adams, Jr. R.H. 2003. Evaluating development, 1980-1997. Chapter 2 in *Egypt in the twenty-first century, challenges for development*, M.R. El-Ghonemy ed. London and New York: Routledge Curzon.

Adams, Jr. R.H. 1985. Development and structural change in rural Egypt, 1952 to 1982. *World Development*, vol.13 (6): 705-723.

Adams, Jr. R.H. and J. Page. 2003. Poverty, inequality and growth in selected Middle East and North African countries, 1980-2000. *World Development*, vol.31 (2): 2027-2048.

Agenor, R., A. Izquierdo and H. Fofack. 2003. "The Integrated Macroeconomic Model for Poverty Analysis: A Quantitiative Macroeconomic Framework for the Analysis of Poverty Reduction Strategies." World Bank Policy Research Working Paper No. 3092.

Agricultural Research Center (ARC). 2004. http://www.claes.sci.eg/arc/arc.htm.

Alderman, Harold, Joachim Von Braun and Sakr A. Sakr. "Egypt's Food Subsidy and Rationing System: A Description." International Food Policy Research Institute October 1982.

Ali, S., H. El-Laithy, A. Hamza, et al. 1994. "Food policy reform in Egypt: Its impact on the poor." In *Maintaining food security in Egypt during and after agricultural and food policy reform.* Cairo: Ministry of Agriculture and Land Reclamation

Al Riffai, Perrihan, Hans Lofgren, ands Moataz El-Said. "Public Spending, Growth, and Poverty Reduction in Egypt, A Dynamic General Equilibrium Analysis" Jan 2005. Paper prepared for presentation at the 25th Annual Conference of the Middle East Economic Association (MEEA) in conjunction with the Allied Social Sciences Association (ASSA) meetings in Philadelphia, January 7-9, 2005.

Al Riffai, Perrihan. "Lecture Notes for Course on Development Economics." Spring 2004. The George Washington University, Washington, DC.

Cardiff, P.W. 1997. Poverty and Inequality in Egypt. In *Research in Middle East Economics, Volume 2,* K. Pfeifer editor. Greenwich and London: JAI Press.

Cardiff, P. 1997. "The 1995/1996 Household Income, Expenditure and Consumption Survey: Final Analysis Report." Washington, D.C.: USAID/Egypt and US Bureau of the Census.

Coady, David and Rebecca Harris. "Evaluating Targeted Cash Transfer Programs:
A General Equilibrium Framework with an Application to Mexico." Research Report 137, International Food Policy Research Institute, Washington D.C., 2004.

Coady, David, Margaret Grosh and John Hoddinott. "Targeting of Transfers in developing countries: Review of lessons and Experience". World Bank, Regional and Sectoral Studies. 2004

Datt, G., and D. Jolliffe. 1999. "Determinants of Poverty in Egypt: 1997" FCND Discussion Paper No. 75. IFPRI. Washington, D.C.

Datt, G., D. Jolliffe, and M. Sharma. 2001. A profile of poverty in Egypt. *African Development Review*, vol.13 (2): 202-37.

DeMelo, J. and S. Robinson. 1981. Trade Policy and Resource Allocation in the Presence of Product Differentiation. The Review of Economics and Statistics, Vol LXIII (2): 169-177.

Department for International Development (DFID). "Making Connections: Infrastructure for Poverty Reduction." UK, 2002.

El-Laithy, H., and O. M. Osman. 1996. "Profile and trend of poverty and economic growth in Egypt." Research Paper Series, Egypt Human Development Report. Cairo: Institute of National Planning.

El-Laithy, H., M. Lokshin, A. Banerji. 2003. *Poverty and economic growth in Egypt 1995-2000.* World Bank Policy Research Working Paper 3068. Washington DC: World Bank.

El-Saharty, Sameh, Gail Richardson and Susan Chase. "Egypt and the Millennium Development Goals: Challenges and Opportunities." Health, Nutrition and Population Discussion Paper, The World Bank, February 2005.

Esfahani, H.S. 1987. Growth, employment and income distribution in Egyptian agriculture, 1964-79. *World Development*, vol.15 (9): 1201-17.

Estache, Antonio. "Emerging infrastructure Polcy Issues in Developing Countries: A Survey of the Recent Economic Literature." Background paper for the October 2004 Berlin meeting of the POVNET Infrastructure Working Group. The World Bank. http://econ.worldbank.org/files/39967_wps3442.pdf

Fan, S., P. Hazell and S. Thorat. 1999. *Linkages between government spending, growth, and poverty in rural India.* IFPRI, Washington, D.C.

Fan, S., L. Zhang and X. Zhang. 2002. "Growth, inequality, and poverty in rural China: The Role of Public Investments." Research Report 125, IFPRI, Washington, D.C.

Fan, S., D. Nyange, and N. Rao. 2003. "Public Investment and Poverty Reduction in Tanzania: Evidence from Household Survey Data." working paper, IFPRI, Washington, D.C.

Faris, M.A. 1995. *Structural adjustment policies and changes in the agricultural research system in Egypt.* Ste Anne de Bellevue, Quebec:Canada-Egypt-McGill Agricultural Response Program, CEMARP.

Galal, Ahmed. "Social Expenditure and the Poor in Egypt." The Egyptian Centre for Economic Studies. Working Paper No. 89 November 2003

Greene, H. 1999. Econometric Analysis (4th Edition). Prentice Hall.

Gupta, Sanjeev, Marijn Verheoven, Robert Gillingham, Christian Schiller, Ali Mansoor and Juan Pablo Cordoba. "Equity and Efficiency in the Reform of price Subsidies: A guide for Policy makers." IMF 2000.

IMF. 1997. *International Financial Statistics*. Vol. L, No. 7. Washington, D.C.

Korayem, K. 1994. *The impact of structural adjustment and stabilization policies on the poor in Egypt, and how do they adapt.* United Nations Children's Fund, New York.

Lowe, M. 2000. *Social security in Egypt: an analysis and agenda for policy reform.* Working paper 2024. Cairo: Economic Research Forum.

Lofgren, H. and M. El-Said. 2001. Food subsidies in Egypt: reform options, distribution and welfare. *Food policy,* vol. 26: 65-83.

Lofgren, Hans and Sherman Robinson. (Draft, May 21, 2004). "Public Spending, Growth, and Poverty Alleviation in Sub-Saharan Africa: A Dynamic General Equilibrium Analysis." International Food Policy Research Insitute.

Lofgren, Hans, Rebecca Lee Harris, Sherman Robinson, Marcelle Thomas and Moataz El Said (2002). "A Standard Computable General Equilibrium (CGE) Model in GAMS." International Food Policy Research Institute.

Morrow, Adam. "Best of Times, worst of Times." Business Monthly Online: December 2004. http://www.mafhoum.com/press7/218E14.htm.

Nassar, S and M. Mansour. 2003. Agriculture – An assessment of past performance and the task ahead. Chapter 6 in *Egypt in the twenty-first century, challenges for development*, M.R. El-Ghonemy ed. London and New York: Routledge Curzon.

Robinson, S. 1989. Multisector Models. *Handbook of Development Economics*. North-Holland, Amerstdam. 885-947.

Shousha, F.M., G.R. Pautsch. 1997. Economic reform and aggregate cropping patterns for Egypt. *Agricultural Economics*, vol. 17: 265-75.

UNDP. Egypt Human Development Report. 2004

Willoughby, Christopher. "Infrastructure and Pro Poor Growth: Implications of Recent Research." UK Department for International Development (DFID), January 2002.

World Bank. 2002. *Arab Republic of Egypt – Poverty reduction in Egypt, Diagnosis and strategy, Volume I: Main report.* Report 24234-EGT. Washington, DC: World Bank.

World Bank. 2002. *Arab Republic of Egypt – Poverty reduction in Egypt, Diagnosis and strategy, Volume II: Annex tables.* Report 24234-EGT. Washington, DC: World Bank.

World Bank. 2002. *Arab Republic of Egypt – Education sector review: Progress and priorities for the future, Volume I: Main report.* Report 24905-EGT. Washington, DC: World Bank.

World Bank. "Social Safety Nets in Egypt: Review and Future Options." Mimeo Washington D.C., 2005.

World Bank. "The Budgetary Cost of Subsidies in Egypt: Structure and Trends." Mimeo Washington D.C., 2005. http://www1.worldbank.org/publicsector/pe/peanalysis.htm

World Bank. 2003. World Development Indicator 2003. Washington, D.C.

Table (1)
Economic and Agricultural Growth in Egypt

	GDP	AgGDP	GDP per capita	Ag GDP per worker
	Million of 1995 constant US$		International dollars per person, 1995 prices	
1965	13,398	4,382	1,199	618
1970	15,785	4,684	1,273	617
1975	18,731	5,622	1,385	702
1980	29,896	6,302	2,020	743
1985	41,410	7,232	2,480	885
1990	50,915	8,263	2,723	1,091
1995	60,159	9,452	2,785	1,182
2001	80,093	12,177	3,129	1,447
Annual Growth Rate (%)				
1965-1974	3.24	2.63	1.27	1.38
1975-1984	7.99	2.78	5.78	2.39
1985-1994	3.85	2.68	1.26	3.12
1995-2001	5.06	4.02	2.13	3.14
1965-2001	5.56	2.84	3.20	2.61

Sources: GDP and Agricultural GDP are from the World Bank, World Development Indicators (WDI) database. Population and economically active agricultural population data used to calculate GDP per capita and AgGDP per worker are from FAOSTAT.

Table(2)
Poverty Incidence in Egypt by Governorates, Headcount Index

	1995/96				1999/00		
	Urban	**Rural**	**All Egypt**		**Urban**	**Rural**	**All Egypt**
Metropolitan							
Cairo	9.42		9.42		5.01		5.01
Alexandria	23.15		23.15		6.24		6.24
Port Said					0.90		0.90
Suez	6.45		6.45		1.91		1.91
Lower Egypt							
Damietta	3.74	11.53	9.10		0.25		0.07
Dakahlia	1.57	10.90	8.67		7.79	17.55	14.88
Sharkia	10.5	17.83	16.55		9.12	13.71	12.70
Qaliubia	0.57	34.11	26.14		6.05	9.09	7.94
KafrEl-Sheikh	4.55	18.74	16.27		3.77	5.90	5.42
Gharbia	2.75	10.26	8.17		4.51	7.84	6.85
Menufia	20.00	26.68	25.48		9.81	21.12	18.96
Beheira	13.81	37.59	33.12		6.16	8.36	7.85
Ismailia	2.03	8.01	4.93		0.90	11.12	6.02
Upper Egypt							
Giza	3.42	5.49	4.34		9.43	16.97	12.89
Beni-Suef	17.44	32.97	29.57		32.35	51.66	47.26
Fayoum	6.56	32.10	27.22		19.76	34.27	31.18
Menia	14.71	27.58	25.64		9.12	24.03	21.41
Assiut	22.79	51.96	44.78		39.21	56.76	52.08
Sohag	17.98	26.79	24.87		35.61	41.09	39.88
Qena	14.22	33.65	29.52		13.3	24.85	22.46
Aswan	9.73	9.97	9.89		18.33	18.81	18.61
Louxor	na	na	na		25.35	34.8	29.20
Frontier							
Red Sea		4.96	2.46		7.52	12.22	9.52
El Wadi El-Gedid	3.83	4.55	4.13		4.85	10.94	7.36
Matrouh	2.90		1.40		5.43	26.21	14.13
North Sinai	15.05	43.52	29.55			36.49	16.17
South Sinai	na	na	na			2.70	1.16
Total	**11.02**	**24.8**	**19.41**		**9.21**	**22.07**	**16.74**

Source: Table A2.4a&b from: World Bank. 2002. *Arab Republic of Egypt: Poverty Reduction in Egypt - Diagnostic and Strategy Volume 2: Annex Tables.*
Notes: n.a. refers to non available. In 1995/96, North Sinai includes poverty incidence estimates of South Sinai.

Table (3)
Public Expenditure in Egypt

Year	Total	Capital	Agriculture	Defense	Education	Health	Social Security and Welfare	Transportation and Communication
	Billions of international dollars, 1995 prices							
1980	41.78	8.95	1.82	3.72	3.03	0.87	3.49	0.42
1981	39.29	7.76	1.96	5.32	3.36	0.88	4.76	0.53
1982	52.87	10.25	1.95	6.73	4.87	1.27	5.89	0.89
1983	47.14	6.56	2.21	7.39	5.03	1.34	5.81	0.91
1984	50.61	6.95	2.2	9.29	5.31	1.31	6.14	1.02
1985	51.92	7.14	2.2	9.68	5.86	1.35	6.01	1.17
1986	54.06	7.69	2.21	9.54	5.91	1.27	5.87	1.63
1987	42.49	7.24	1.77	8.27	5.11	1.05	4.71	1.58
1988	46.6	7.42	2	6.63	5.46	1.13	6.03	1.85
1989	41.69	6.62	2.04	5.28	5.58	1.16	5	1.03
1990	39.36	6.81	1.86	4.52	5.51	1.11	5.07	1.13
1991	45.65	7.82	1.91	5.07	6.13	1.26	5.11	1.2
1992	58.69	18.26	2.21	4.84	6.07	1.24	5.33	1.4
1993	54.87	10.31	2.32	4.79	6.76	1.34	6.02	1.65
1994	59.69	11.42	2.58	4.87	7.64	1.41	7.14	2.02
1995	56.3	10.84	2.47	5.14	7.79	1.41	7.46	2.4
1996	56.93	12.41	2.57	5.32	8.07	1.59	2.53	2.33
1997	56.74	13.64	2.99	5.35	8.38	1.87	2.67	2.58
1998	58.9	14.16	3.32	5.36	9.52	2.12	2.44	3.05
Annual Growth Rate (%)								
1980-1989	-0.02	-3.30	1.28	3.97	7.02	3.25	4.08	10.48
1990-1998	5.17	9.58	7.51	2.15	7.07	8.42	-8.74	13.21
1980-1998	1.93	2.58	3.40	2.05	6.57	5.07	-1.97	11.64

Source: Total Expenditures, capital expenditures are from the World Bank, World Development Indicators 2000; All other data are from issues of the International Monetary Fund's Government Finance Statistics Yearbook.

Table (4)
. Estimated results of total income and expenditures equations

Income per capita equation, lgtotipp										
	metropolitan obs=322 R-squared=0.1810		lower urban obs=349 R-squared=0.2841		lower rural obs=647 R-squared=0.3117		upper urban obs=357 R-squared=0.3886		upper rural obs=630 R-squared=0.2737	
	coefficient	t-value	coefficient	t-value	coefficient	t-value	coefficient	t-value	coefficient	t-value
landpp					0.02	3.88			0.03	2.09
lglvskvalue					0.04	3.73			0.05	4.57
hhhsex	0.23	1.16	0.18	0.73	-0.13	-1.00	-0.10	-0.49	-0.24	-2.22
hhhmarr	-0.28	-1.46	-0.45	-1.90	0.11	0.90	-0.17	-0.89	-0.12	-1.04
hhhedu	0.03	3.71	0.06	4.28	0.04	6.75	0.04	4.20	0.04	6.13
hhhage	0.00	1.42	0.01	2.68	0.01	3.09	0.01	3.32	0.01	2.25
dependratio	-0.09	-4.00	-0.18	-5.20	-0.12	-7.27	-0.18	-6.35	-0.09	-6.56
telephone	0.30	3.33	0.26	1.58	0.08	0.87	0.41	3.85	0.12	0.83
improvedseed					0.49	5.99			0.52	6.54
walkroad	-0.37	-0.42	-1.18	-1.34	-0.27	-0.81	-0.39	-0.57	0.19	1.05
constant	6.63	20.23	6.09	14.91	5.87	28.94	6.54	21.20	5.39	20.75
Expenditure per capita equation , *lgexpp*										
	metropolitan obs=321 R-squared=0.3122		lower urban obs=346 R-squared=0.3968		lower rural obs=636 R-squared=0.3135		upper urban obs=355 R-squared=0.4373		upper rural obs=624 R-squared=0.2938	
	coefficient	t-value	coefficient	t-value	coefficient	t-value	coefficient	t-value	coefficient	t-value
landpp					0.00	0.40			0.02	1.81
lglvskvalue					0.02	3.08			0.02	3.29
hhhsex	0.04	0.33	0.16	1.20	-0.21	-2.44	-0.10	-0.76	0.01	0.18
hhhmarr	-0.07	-0.57	-0.33	-2.29	0.15	1.77	-0.17	-1.38	-0.01	-0.18
hhhedu	0.04	5.52	0.04	5.95	0.04	9.70	0.03	5.35	0.03	7.30
hhhage	0.00	0.39	0.01	2.34	0.01	5.18	0.00	1.56	0.00	1.97
dependratio	-0.09	-5.12	-0.09	-5.51	-0.07	-6.66	-0.05	-3.77	-0.05	-5.28
telephone	0.22	3.01	0.35	5.02	0.31	4.93	0.42	6.08	0.33	3.78
improvedseed					-0.04	-0.76			0.00	-0.01
walkroad	-0.81	-1.24	-0.53	-1.44	-0.26	-1.50	-1.63	-3.72	-0.06	-0.44
constant	7.90	28.66	7.00	29.77	6.91	47.53	7.85	40.11	6.84	47.51

Table (5)
Estimated results of the poverty equation, the reduced form.

poor	metropolitan obs=320 Pseudo R2=0.2270		lower urban obs=327 Pseudo R2=0.2244		lower rural obs=636 Pseudo R2=0.2207		upper urban obs=349 Pseudo R2=0.3345		upper rural obs=624 Pseudo R2=0.1888	
	coefficient	z-value	coefficient	z-value	coefficient	z-value	coefficient	z-value	coefficient	z-value
landpp					-0.07	-1.99			-0.14	-3.85
lglvskvalue					-0.07	-3.25			-0.05	-2.57
hhhsex	-0.40	-0.95	-0.55	-1.74	0.34	1.32	0.42	0.98	-0.13	-0.66
hhhmarr	0.21	0.48	0.40	1.19	-0.27	-1.14	0.04	0.12	-0.10	-0.49
hhhedu	-0.09	-3.87	-0.10	-4.74	-0.11	-6.52	-0.08	-3.67	-0.06	-4.13
hhhage	0.00	-0.33	-0.01	-1.22	-0.02	-3.28	0.00	-0.02	0.00	-0.18
dependratio	0.16	2.97	0.19	3.43	0.01	0.07	0.09	2.01	0.08	0.47
telephone	-0.61	-2.58	-0.66	-2.02	0.14	4.60	-1.46	-3.14	0.10	3.97
improvedseed					-1.40	-2.91			-1.04	-2.96
walkroad	1.97	0.95	1.47	1.26	0.23	0.38	0.95	0.55	-0.28	-0.85
constant	-0.56	-0.72	-1.07	-1.63	0.33	0.80	-0.61	-0.83	-0.72	-1.75

Table(6)
Estimates of total income per capita, total expenditure per capita and poverty status with community variables

	lgtotipp				lgexppp				poor			
	lower rural obs=416 R-squared=0.3868		upper rural obs=503 R-squared=0.3147		lower rural obs=406 R-squared=0.2961		upper rural obs=499 R-squared=0.3111		lower rural obs=406 Pseudo R2=0.2748		upper rural obs=499 Pseudo R2=0.2229	
	coefficient	t-value	coefficient	t-value	coefficient	t-value	coefficient	t-value	coefficient	t-value	coefficient	t-value
landpp	0.03	3.07	0.02	1.77	0.01	1.08	0.01	1.56	-0.13	-1.78	-0.14	-3.67
lglvskvalue	0.05	3.64	0.05	4.50	0.01	1.39	0.03	3.03	-0.08	-2.36	-0.07	-3.01
hhhsex	-0.04	-0.24	-0.22	-1.76	-0.18	-1.61	0.06	0.75	0.16	0.46	-0.09	-0.39
hhhmarr	0.02	0.12	-0.20	-1.50	0.13	1.19	-0.09	-1.07	-0.17	-0.53	0.04	0.15
hhhedu	0.04	5.65	0.04	4.46	0.03	6.63	0.03	5.65	-0.09	-4.00	-0.07	-3.68
hhhage	0.01	2.43	0.01	2.06	0.01	3.22	0.00	1.48	-0.02	-2.35	0.00	-0.50
dependratio	-0.13	-6.86	-0.08	-5.57	-0.06	-4.33	-0.05	-4.84	0.13	3.09	0.11	3.57
telephone	0.05	0.45	0.27	1.93	0.22	3.07	0.37	3.78	-1.21	-2.85	-1.06	-2.76
Improvedseed	0.40	4.47	0.49	5.84	0.09	1.64	-0.01	-0.19	-0.28	-1.11	0.17	0.90
walkroad	-0.73	-1.81	0.11	0.61	0.09	0.46	-0.09	-0.60	-0.91	-0.90	-0.28	-0.74
Postoffice	0.37	2.47	-0.06	-0.29	0.01	0.12	0.09	0.59	0.02	0.06	-0.01	-0.02
commbank	-0.19	-0.67	-0.27	-1.19	0.23	1.26	0.19	1.04	-0.20	-0.27	-0.74	-1.44
market	0.26	1.35	-0.48	-1.99	0.14	1.07	-0.04	-0.33	-0.56	-1.04	-0.93	-1.96
prepschool	-0.83	-3.51			-0.38	-2.96			1.62	2.93		
busstop	0.39	2.48	0.16	0.93	0.09	0.97	0.13	1.11	-0.63	-1.84	-0.13	-0.39
pavedroad			-0.28	-1.64			-0.19	-2.07			0.36	1.22
agextn	0.30	1.72	-0.13	-0.71	0.15	1.28	-0.06	-0.48	-0.40	-0.87	0.26	0.77
clinic	0.27	1.50	0.00	-0.03	-0.13	-1.16	-0.02	-0.20	0.10	0.23	-0.18	-0.72
Pubcanal	-0.68	-2.46	0.23	1.04	0.05	0.35	0.09	0.59	-0.03	-0.04	-0.14	-0.33
Commcanal	-0.56	-2.62	0.06	0.42	-0.24	-1.81	-0.10	-1.22	0.68	1.14	0.29	1.18
Constant	6.90	21.56	6.30	13.66	7.39	20.88	6.80	22.21	0.21	0.23	-1.39	-1.56

Note: Pavedroad and prepschool are dropped due to collinearity.

Table (7)
Estimated Results Using the Regional Level Data

(1)	P	= –	0.232 LP (–2.78)*	–	0.109 RWAGE (–0.95)	-	1.068 NFE (-2.56)*	R^2 = 0.303
(2)	LP	= +	0.239 PHONE (2.21)*	+	0.046 ROADS (1.56)	-	1.62 ILIT (4.68)*	R^2 = 0.298
		+	0.247 RDS (2.13)*	+	0.254 IRRI (3.45)*			
(3)	RWAGE	= +	0.054 PHONE (2.04)*	+	0.01 ROADS (0.00)	+	3.38 ILIT (6.49)*	R^2 = 0.312
		+	0.232 LP (1.56)					
(4)	NFE	= -	0.151 PHONE (4.82)*	+	0.017 ROADS (0.37)	+	3.38 ILIT (6.49)*	R^2 = 0.833
		-	0.001 LP (-0.002)					

Note: Explanation of variable abbreviations found in text.

Table (8)
Effects of Public Investment on Agricultural Growth
Benefit-Cost Ratio

Region	Phone	Roads	Education	R&D	Irrigation
Metropolitan	0.25	0.31	n.a.		7.89
Lower Egypt	6.37	3.73	5.81		1.85
Upper Egypt	4.36	4.79	4.43		1.97
Egypt	3.13	2.84	4.86	4.12	1.94
Poverty Reduction Effect, number of poor per 1 million LE					
Metropolitan	17.31	21.19	9.98		545.16
Lower Egypt	129.68	75.97	59.15		37.56
Upper Egypt	335.27	368.40	170.53		151.42
Egypt	133.95	121.47	208.26	176.31	83.16

Table(9)
Assumptions for Non-Base Simulations

Simulation name	Description
Set 1: Targeting the price subsidy program	
SUB1+QG-AGR+-2	Increasing government spending by amount equivalent to government savings upon restructuring the price subsidy program and shifting government spending from "other" to agriculture
SUB1+QG-TRN+-2	Increasing government spending by amount equivalent to government savings upon restructuring the price subsidy program and shifting government spending from "other" to infrastructure
SUB1+QG-HUM+-2	Increasing government spending by amount equivalent to government savings upon restructuring the price subsidy program and shifting government spending from "other" to human capital
Set 2: A cash transfers program	
TRHH+QG-AGR+-2	Increasing government spending by an amount equivalent to net savings from eliminating the price subsidy program and introducing a cash transfers program (which is equal in value to the price subsidy program) and from shifting government spending from "other" to agriculture
TRHH+QG-TRN+-2	Increasing government spending by an amount equivalent to net savings from eliminating the price subsidy program and introducing a cash transfers program (which is equal in value to the price subsidy program) and from shifting government spending from "other" to infrastructure
TRHH+QG-HUM+-2	Increasing government spending by an amount equivalent to net savings from eliminating the price subsidy program and introducing a cash transfers program (which is equal in value to the price subsidy program) and from shifting government spending from "other" to Human Capital

Notes: In all public spending simulations, expansion or reallocation refers to a change in 1998 corresponding to 10 percent of 1997 government demand (or 1.9 percent of GDP). Starting from 1998, all government demand areas grow at a uniform annual real rate of 1.9 percent. Unless otherwise noted.

Table(10)
. Subsidy Restructuring Scenario and Reallocation of Public Spending: Summary Results

	1997	BASE	SUB1+QG-AGR+-2	SUB1+QG -TRN+-2	SUB1+QG-HUM+-2
	Annual growth rates, 1998-2015 (%)				
Absorption	266.32	4.03	3.98	4.41	6.80
Household consumption	195.10	3.90	4.01	4.24	6.60
Gov. consumption & inv'ment	26.00	4.58	5.06	5.06	4.83
Private investment	45.22	4.27	3.16	4.73	8.85
Exports	59.42	4.17	3.61	4.59	7.89
Imports	66.77	4.32	3.84	4.69	7.66
Real exchange rate	100.00	-0.65	0.43	-0.59	-1.08
Total GDP (at factor cost)	241.09	3.98	3.96	4.38	7.18
TFP index		2.53	2.85	2.84	4.29
Total factor income	241.84	3.58	4.02	3.97	6.48
Private capital	153.82	3.37	4.32	3.80	6.19
Land	19.40	5.89	1.54	5.93	8.76
Agricultural labor	11.23	3.76	-0.46	3.87	6.76
Non Agricultural labor	57.38	3.14	4.48	3.66	6.23
Ratios to GDP	**Percentage point deviations from 1997 values**				
Investment	22.48	0.38	0.14	0.68	2.14
Government expenditure	22.61	-2.92	-1.22	-2.88	-5.44
Private saving	16.96	-1.02	-1.15	-1.16	-1.41
Government saving	8.59	-1.64	-1.74	-1.19	0.50
Foreign saving	-3.07	3.03	3.03	3.04	3.05
Poverty headcount rate (P0)	16.77	-11.16	-11.72	-12.08	-15.47

Table (11)
Subsidy Restructuring Scenarios For Reallocation of Public Spending: Welfare Indicators

	1997	**BASE**	**SUB1+QG-AGR+-2**	**SUB1+QG-TRN+-2**	**SUB1+QG-HUM+-2**
Annual growth rates, 1997-2015 (%)					
Household consumption per capita					
Rural upper income	8.25	2.70	1.78	2.97	5.65
Rural lower income	0.98	3.53	3.17	3.88	6.79
Urban upper income	18.78	1.04	1.57	1.45	3.84
Urban lower income	1.23	2.83	4.05	3.36	6.18
Average, all households	3.20	2.22	2.36	2.60	5.23
Rural	2.43	2.89	2.22	3.19	5.93
Urban	4.22	1.65	2.46	2.10	4.65
Percentage point deviations from 1997 values					
Poverty headcount, P0					
Total	16.77	-11.16	-11.72	-12.08	-15.47
Rural	22.03	-14.66	-14.26	-15.59	-20.15
Urban	9.78	-6.52	-8.35	-7.43	-9.25
Elasticity		-1.37	-1.34	-1.23	-0.61
Poverty gap, P1					
Total	5.34	-3.92	-4.07	-4.17	-5.07
Rural	7.28	-5.35	-5.30	-5.66	-6.89
Urban	2.75	-2.01	-2.44	-2.20	-2.65
Elasticity		-1.52	-1.46	-1.33	-0.63
Squared poverty gap, P2					
Total	2.41	-1.87	-1.93	-1.97	-2.32
Rural	3.37	-2.61	-2.60	-2.74	-3.24
Urban	1.14	-0.87	-1.04	-0.95	-1.11
Elasticity		-1.60	-1.53	-1.40	-0.64

Notes: Household consumption is real per capita consumption. Elasticities for P0, P1, and P2 are the ratios between the percent change in the poverty indicator and the percent change in aggregate per capita consumption.

Table (12)
Cash Transfers Scenario for Reallocation of Public Spending: Summary Results

	1997	BASE	TRHH+QG-AGR+-2	TRHH+QG-TRN+-2	TRHH+QG-HUM+-2
	Annual growth rates, 1998-2015 (%)				
Absorption	266.32	4.03	4.01	4.43	7.17
Household consumption	195.10	3.90	4.08	4.31	7.01
Gov. consumption & inv'ment	26.00	4.58	5.06	5.06	4.83
Private investment	45.22	4.27	3.00	4.55	8.72
Exports	59.42	4.17	3.63	4.60	7.93
Imports	66.77	4.32	3.85	4.70	7.70
Real exchange rate	100.00	-0.65	0.40	-0.62	-1.11
Total GDP (at factor cost)	241.09	3.98	3.99	4.40	7.22
TFP index		2.53	2.85	2.84	4.29
Total factor income	241.84	3.58	4.06	4.00	6.52
Private capital	153.82	3.37	4.33	3.80	6.22
Land	19.40	5.89	1.73	6.11	8.94
Agricultural labor	11.23	3.76	-0.29	4.02	6.93
Non Agricultural labor	57.38	3.14	4.50	3.68	6.27
Ratios to GDP	Percentage point deviations from 1997 values				
Investment	22.48	0.38	-0.47	0.05	1.65
Government expenditure	22.61	-2.92	-1.20	-2.86	-5.42
Private saving	16.96	-1.02	-1.00	-1.02	-1.30
Government saving	8.59	-1.64	-2.49	-1.96	-0.09
Foreign saving	-3.07	3.03	3.02	3.02	3.04
Poverty headcount rate (P0)	16.77	-11.16	-11.72	-12.03	-15.47

Table (13)
Cash Transfer Scenarios for Reallocation of Public Spending: Welfare Indicators

	1997	BASE	TRHH+QG-AGR+-2	TRHH+QG-AGR+-2	TRHH+QG-AGR+-2
Annual growth rates, 1997-2015 (%)					
Household consumption per capita					
Rural upper income	8.25	2.70	1.80	2.98	5.67
Rural lower income	0.98	3.53	3.35	4.03	6.93
Urban upper income	18.78	1.04	1.54	1.44	3.85
Urban lower income	1.23	2.83	4.28	3.52	6.33
Average, all households	3.20	2.22	2.41	2.63	5.28
Rural	2.43	2.89	2.29	3.24	5.98
Urban	4.22	1.65	2.49	2.13	4.69
Percentage point deviations from 1997 values					
Poverty headcount, P0					
Total	16.77	-11.16	-11.72	-12.03	-15.47
Rural	22.03	-14.66	-14.26	-15.59	-20.15
Urban	9.78	-6.52	-8.35	-7.30	-9.25
Elasticity		-1.37	-1.33	-1.22	-0.61
Poverty gap, P1					
Total	5.34	-3.92	-4.06	-4.14	-5.06
Rural	7.28	-5.35	-5.28	-5.61	-6.87
Urban	2.75	-2.01	-2.43	-2.18	-2.64
Elasticity		-1.52	-1.45	-1.32	-0.62
Squared poverty gap, P2					
Total	2.41	-1.87	-1.92	-1.96	-2.32
Rural	3.37	-2.61	-2.59	-2.72	-3.23
Urban	1.14	-0.87	-1.04	-0.94	-1.11
Elasticity		-1.60	-1.52	-1.38	-0.63

Notes: Household consumption is real per capita consumption. Elasticities for P0, P1, and P2 are the ratios between the percent change in the poverty indicator and the percent change in aggregate per capita consumption.

Table (14)
Sensitivity Analysis of Agricultural Spending or Cash Transfer

		Subsidy Restructuring Scenario			Cash Transfer Scenario		
		Allocation of Subsidy Savings to Agricultural Sector					
	Base Scenario	Full	Three Quarters	Half	Full	Three Quarters	Half
Growth, 1998-2015 (%)							
Per Capita Consumption							
R1	3.53	3.17	3.27	3.37	3.35	3.27	3.55
R2	3.14	2.93	3.01	3.10	3.07	3.01	3.24
R3	2.98	2.22	2.33	2.45	2.30	2.33	2.53
R4	2.68	2.03	2.13	2.24	2.05	2.13	2.25
R5	2.70	1.78	1.90	2.02	1.80	1.90	2.04
U1	2.83	4.14	4.14	4.13	4.28	4.14	4.28
U2	2.55	3.58	3.60	3.61	3.68	3.60	3.71
U3	2.17	3.15	3.16	3.16	3.19	3.16	3.20
U4	1.49	2.38	2.39	2.39	2.37	2.39	2.38
U5	1.04	1.55	1.58	1.61	1.54	1.58	1.60
Total	2.22	2.36	2.42	2.47	2.41	2.42	2.52
Rural	*2.89*	*2.22*	*2.33*	*2.44*	*2.29*	*2.33*	*2.51*
Urban	1.65	2.46	2.48	2.49	2.49	2.48	2.52
Poverty Incidence							
Total	-11.16	-11.72	-11.93	-12.09	-11.72	-11.93	-12.09
Rural	-14.66	-14.26	-14.64	-14.91	-14.26	-14.64	-14.91
Urban	-6.52	-8.35	-8.35	-8.35	-8.35	-8.35	-8.35
Macro Economy							
GDP at Factor Cost	3.98	3.96	4.03	4.09	3.99	4.03	4.09
Absorption	4.03	3.98	4.05	4.12	4.01	4.05	4.12
Total Factor Productivity	2.53	2.85	2.83	2.81	2.85	2.83	2.81
Factor Income							
Land	5.89	1.54	1.97	2.43	1.73	1.97	2.43
Agricultural Labour	3.76	-0.46	-0.03	0.42	-0.29	-0.03	0.42
Non Agricultural Labour	3.14	4.48	4.51	4.51	4.50	4.51	4.51

Source: Simulation Results

Chapter Six

Public Expenditure, Economic Growth and Poverty in Morocco: Moving Towards a Multi-Level Analysis

Touhami Abdelkhalek and Marc Rockmore

I. Introduction

Morocco's macroeconomic situation in the early 1980s was quite difficult for a variety of reasons including a high external debt and budget deficit. As a result of a Structural Adjustment Plan (SAP), the macroeconomic situation greatly improved. Moreover, social indicators also noticeably improved. For instance, by 2004, the net primary school enrollment rate was 87% while the life expectancy at birth was 70 years. (WDI, 2006) Poverty rates and inequality, however, did not similarly improve.

Between 1984/85 and 2000/01, the poverty rate slightly decreased while the absolute number of poor increased.[1] More broadly, since independence, inequality has remained stable and high in both urban and rural areas. This is partly the result of weak economic growth which has been poorly distributed across time and between sectors. Moreover, at times, it has been accompanied by increases in the unemployment and poverty rates.

The level and orientation of the public expenditure played an important role in the evolution of poverty and inequality during this period. The importance of community infrastructure and of its spatial distribution in the determination of poverty has been widely noted.[2] Infrastructure, or the lack thereof, may determine access to various markets. While poverty in Morocco is predominately rural, rural areas have relatively less profited since independence from the public investment in economic and social infrastructure. As a result, clear disparities in access to infrastructure and social services have accumulated across time. In order to decrease poverty and inequality, future public expenditure should create conditions favorable to equalizing access to social and physical infrastructure. This work uses an economic and statistical approach to examine the impact of public policies on the evolution of poverty in Morocco.

---

[1] Authors' calculations based upon data from the Direction de la Statistique.

[2] Several articles related to Morocco, in particular the one from Touhami Abdlekhalek, appear in the contributions to the "*50 ans de Développement Humain au Maroc*". **http://www.rdh50.ma/fr/contributions.asp**

In the second section, the synthesis of the macroeconomic evolution over the past decade reveals a healthy but not dynamic economy. is generally healthy, it is not very dynamic. Section 3 examines the evolution of poverty over the past forty years. Due to the inter-linkage between poverty and inequality, several measures of inequality and its evaluation are also presented. The analysis shows that the high inequalities in expenditure, monetary poverty and access to basic services have remained rather stable. Section 4 addresses the link between economic growth and the evolution of the poverty rate. Section 5 looks at public expenditure and analyzes its role as a tool of economic policy and, in particular, the fight against poverty. We discuss its evolution across time and its distribution across sectors.

Section 6 analyzes the determinants of poverty in Morocco. A limited number of variables are significant. In urban areas, the variables which increase household well-being are: male head of household, the level of education, electricity, possessing a telephone and having access to drinking water. The dependency ratio and having a work activity at home are negatively linked to household well-being. For rural areas, the variables which increase household well-being are access to drinking water, owning a telephone, the area of land owned and the total salary received. The dependency ratio is negatively linked to well-being.

Section 7 proposes an original approach to the analysis of the links between economic policy, poverty, inequality and economic dynamism at the regional level. The method consists of two related stages. The first is a model with simultaneous equations for the different regions (or relevant geographical level) which explains measures of poverty, inequality, and economic dynamism (such as economic growth). The simultaneity is due to economic theory and empirical work which show that the usual measures of poverty and inequality can be linked. These measures are, in turn, linked to measures of economic growth. Within the explanatory variables, a large role is left for the different public sector expenditures since this expenditure theoretically influences poverty, inequality and regional economic activity through a variety of channels.

The second stage of this approach is a closed optimization model which integrates the first stage and which explicitly takes into account the objectives of policies on poverty, inequality and regional economic growth. A criterion of economic policy to optimize is therefore introduced. This approach is then applied to the specific case of Morocco. The last section concludes.

II. Macroeconomic Context[3]

The structure of the gross domestic product (GDP) largely determines the overall performance of the economy. On the whole, the share of agriculture remains high (almost 15%) while that of industry remains low (less than 18%). Moreover, the economy is largely dependant upon the agricultural sector and its output. Consequently, the erratic production patterns and the volatility of the agricultural sector explain much of the real economic growth. Reductions in agriculture growth due to insufficient rainfall may have broad repercussions.[4]

Morocco experienced relatively low levels GDP growth (3.2% annual growth) between 1980 and 2001. Due to the low levels of rainfall and the weak growth of the value-added sectors, particularly the service sector, economic growth essentially stagnated between 1993 and 2001. Since the 1980's, the Moroccan economy has gone through several interlinked phases to strengthen itself. While macroeconomic and financial stability are generally positive, the growth rates were not sufficient to absorb the surplus labor.

For a variety of reasons, Morocco was in a difficult economic and financial situation in the early 1980's. Between 1981 and 1983, the real growth rate of GDP never exceeded 2% while inflation was close to 10%. At the same time, the budget deficit reached 12% of the GDP and the current account of the balance of payments was in deficit by more than 10%. As a result, the reserves of foreign exchanges decreased until they could not even pay for one month of imports. As the external debt reached new heights, the servicing of the debt represented more than 40% of the receipts from exports. Due to the general deterioration, Morocco undertook, with the help of international financial institutions, a SAP to stabilize and liberalize the economy.

The SAP appears to have greatly benefited the macroeconomic situation. Decreases in national public expenditure (as a % of GDP) have returned the budget deficit to manageable levels. A positive primary balance was even achieved in 1987. The current account balance decreased from more than 12% in 1982 to close to 8% in 1985 before stabilizing at less than 2% in 1992. Furthermore, since the end of 2003, foreign exchange reserves are equivalent to more than 12 months of imports while inflation has rarely exceeded 4% over the past several years. This improvement occurred despite unfavorable international conditions such as decreased demand and prices for phosphates and low overall levels of rainfall.

---

[3] The analysis in this section is based upon data from official statistical sources, primarily the Direction de la Statistique and the Ministry of Finance.

[4] A more detailed analysis can be found in Sagou (2005).

Adjustment and poverty:

The economies policies associated with the SAP (and which have since continued) should, a priori, have increased the poverty rate. The suppression of subsidies along with the liberalization of prices of selected goods should decrease the purchasing power of the population. The new taxation system, the severe control of public deficits and the rigorous monetary policy to suppress inflation may also increase unemployment and poverty. Yet, in the short run, poverty declined to 13.1% in 1990/91. In the medium run, however, monetary poverty increased to 19% according to the 1998/99 *National Survey of Household Living Standards* (ENNVM). Other measures of poverty such as access to a number of basic services (food, housing, health and education) show a weak overall improvement.

While the SAP and the associated policies generally did not reduce nominal expenditures on social sectors, real per capita social expenditures decreased by more than 23% between 1982 and 1990. Despite efforts by the government, expenditure on education and health decreased from 6.5% to 5.3% and from 1.1% to 0.9% of GDP respectively between 1982 and 1991.

Transfers and poverty:

While no serious analysis on the matter exists, transfers from abroad are likely to have reduced poverty levels. Using the 1990/91 ENNVM, we estimate that approximately 500,000 persons received transfers from abroad. A back of the envelope calculation shows that without these transfers an additional 180,000 persons, or roughly 5% of the poor in 1991, would have been below the poverty line. For this and other reasons, the government has initiated a number of policies to support remittances from abroad.

III. Poverty and Inequality in Morocco: Measurement, Evolution and Profile

We follow the official Moroccan methodology for calculating poverty using a living standards approach based upon per capita consumption. We are, however, aware of the numerous critiques of using only monetary measures to assess poverty. Consequently, several other dimensions of poverty are also briefly discussed.

A. Measurement and Evolution of Poverty in Morocco

Since independence in 1956, poverty rates have generally decreased. As can been seen in Table 1, the poverty rate decreased from more than 55% in 1959-1960 to 13% in 1990-91 before rising to 18% in 2000-2001.

While poverty rates have generally fallen, population growth has outpaced these reductions.[5]

Table (1)
Number of Poor and Poverty Rates in Morocco across Time
(The Number of Poor in 1,000)

	1959-60		1971		1984-85		1990-91		1998-99		2000-01	
	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%
Urban	1,750	43.8	2,072	38.3	1,300	13.8	912	7.6	1,814	12.0	1,560	9.6
Rural	3,995	60.0	4,457	44.7	3,300	26.7	2,448	18.0	3,496	27.2	3,622	28.2
Total	5,745	55.7	6,529	42.4	4,600	21.1	3,360	13.1	5,310	19.0	5,182	17.8

Source: Authors' calculations based upon data from the Direction de la Statistique

The evolution of the national economy and the economic policies, particularly those during and after the SAP (1983-1991), largely explain the evolution of poverty.As previously noted, the weak economic growth was both volatile and unevenly distributed between different segments of society. The few years of positive growth did not compensate for the low overall growth nor for its weak impact of poverty reduction. The trends also reflect the associated unemployment, the frequent years of low rainfall and the absence of effective and coordinated polices to fight poverty.

B. *The Profile of Poverty*

There are several important characteristics to highlight about poverty in Morocco.

Spatial distribution of poverty

As previously noted, poverty is primarily a rural phenomenon in Morocco. However, due to the links between the economy, demography, and poverty, it has become increasingly urbanized over at the past decade.

At the regional level, monetary varies greatly as some regions have rates several times higher than others. As can be expected based upon the levels of economic growth, the North-West and Center regions generally have the lowest levels of poverty. The spatial dimension of poverty is even clearer when rural/urban status and economic regions are taken into account. Poverty rates vary between 4% in certain urban areas to close to 40% in some rural areas.

---

[5] The poverty rate is the only measure which can be calculated upon all the surveys since independence. Other monetary measures of poverty which they could be calculated tend to confirm these trends.

The 1998-1999 ENNVM (Table 2) shows that 5 of the 16 regions account for almost half of the poor. [6] Other areas, such as Grand Casablanca, Oriental, Rabat-Salé-Zemmour-Zaeïr and Gharb-Chrarda-Beni Hssen, have relatively low shares of national poverty relative to their share of national population.

Table (2)
Distribution of Poor and Poverty Rates, by Region and Rural/ Urban in 1998-1999

Region	Total Poor (%)			Poverty Rate (%)		
	Urban	**Rural**	**Total**	**Urban**	**Rural**	**Total**
Southern Regions[1]	5.2	13.1	10.4	6.0	23.2	15.6
Marrakech-Tensift-Al Haouz, Doukala-Abda	12.9	25.7	21.3	13.1	29.8	23.6
Chaouia-Ouardigha, Tadla-Azilal	2.7	11.9	8.7	4.2	22.7	15.4
Grand Casablanca	8.6	-	2.9	5.4	-	5.0
Rabat-Salé-Zemmour-Zaeïr, Gharb-Chrarda-Béni Hssen	19.3	11.4	14.1	13.1	29.8	18.6
Oriental	10.8	4.4	6.6	16.0	19.0	17.2
Meknès-Tafilalet	13.1	8.7	10.2	22.8	36.0	28.7
Fès-Boulemane, Taza-Al Hoceima- Taounate	20.3	16.4	17.8	24.1	31.0	27.9
Tanger-Tétouan	7.1	8.4	8.0	10.4	30.5	19.2
Total	**100.0**	**100.0**	**100.0**	**12.0**	**27.2**	**19.0**
Total Poor in 1,000	1 814	3 496	5 310	-	-	-

[1] The Southern regions are Oued-Ed-Dahab-Lagouira, Souss-Massa-Darâa, Laâyoune-Boujdour and Guelmim-Es-Semara.
Source: Direction de la Statistique

Poverty and household size

The incidence of poverty increases with household size particularly in female headed households. This is partially because the method of calculating poverty does not use adult equivalence scales nor take economies of scale into account. A comparison of poor and rich households shows that the former tend to be larger, have a greater number of dependents and a smaller number of people with income generating activities. In part, this explains why household size is a determining factor of poverty in Morocco. Better access to health services, education, and to family planning methods, could therefore contribute to a reduction of poverty.

Health and poverty

Good health is generally viewed as basic element of individual well-being. (*inter alia*, Fazouane, 1999) Some argue that poverty can be measured by

[6] Meknès-Tafilalet, Fès-Boulemane, Taza-Al Hoceïma-Taounate, and Doukala-Abda, Marrakech-Tensift-Al Haouz

low life expectancy, elevated mortality and child-mortality rates, and therefore by generally low access to healthcare.[7] While health insurance may be relevant criteria in certain countries, the majority of health services, especially for the poor, are delivered by the public sector. Consequently, access to health services is perhaps a more relevant criterion.

The primary indicator of accessibility may be the average time needed to reach a public health infrastructure. Clear differences exist between urban and rural areas and between the poor and non-poor. While the average time is generally high, it is twice as high in rural areas. Additionally, the average time increases as expenditure decreases.

Education and poverty

Access to formal schooling is another fundamental element of individual welfare. Schooling and poverty may have mutually reinforcing mechanisms. The size of immediate costs, particular those related to opportunity costs, prevents the poorest parents and households from making investments in human capital. The difficult access to adequate school infrastructure, particularly in rural areas, adds an additional cost to schooling.

Various surveys indicate that the majority of the poor do not have any formal schooling and that only a small proportion can read and write. This situation is reversed in non-poor populations. Two factors seem to explain this: differences in family budgets and the difficult access to schooling in certain regions. Different surveys show that poverty is highly correlated with lack of enrolled. Furthermore, children in families with low levels of schooling often cite poverty, its causes and consequences, as the reason for their lack of schooling. Comparing annual per capita expenditure on education, the poorest 20% spend on average four times less than the richest 10%. In addition to cost, distance may be important as certain surveys show that the average distance for rural children from their residence to a primary school exceeds 2 kilometers. For certain expenditure groups, it may exceed 3 kilometers. The distance to school may also partially explains differences for in schooling for girls, particularly in rural areas. As a result, since the 1960's, differences in illiteracy rates between rural and urban areas have grown. Beginning in this period, rural areas have lagged behind. This problem has been amplified by the unequal distribution of the benefits of economic growth.

[7] Other potential measures of overall or individual poverty include high person to doctor or hospital bed ratios and indicators for the various difficulties (distance, cost or lack of availability) in obtaining vaccinations, emergency care, follow-up care after a pregnancy or an assisted birth.

Women and poverty

Any analysis of poverty in Morocco must consider gender since women are likely to be disproportionately affected by negative shocks. For instance, women are often the weakest and most fragile link in society, negative shocks which affect men may be transmitted, directly or indirectly, to women. Furthermore, despite the increasing proportion of working women, women tend to be underpaid and therefore cannot contribute as much to helping families leave poverty. Moreover, and almost systematically in rural areas, Moroccan women are dually burdened by domestic work as well as work outside of the house as family help, i.e. without any wage compensation. Lack of access to drinking water or electricity further increases the burden of women, particularly rural women.

Therefore, despite the gradual and continuing participation of women in almost all aspects of economic and social life, gender-based disparities persist. The rate of illiteracy of women remains high (close to 60%) especially compared to that of men (close to 35%). The rate of schooling of women (ages 6-22) is slightly under 50% for women as compared to more than 60% for men. The unemployment rate of women in urban areas, where this statistic has more meaning, is also higher than for men. If access to public services has become more difficult for the general population, it has become more so for the poor and especially for poor women since they are both poor and women.

These ideas suggest an increasing feminization of poverty. The data, however, does not support this view. While women are disproportionately poor across all surveys, this does not necessarily indicate a feminization of poverty. This would mean that the relative share of women in the poor is increasing, or, more generally, that the evolution of the usual poverty measures (apart from the simple rate of poverty) is detrimental to women. An analysis of a series of household surveys statistically rejects for Morocco. (Abdelkhalek, 2000)

Over the past two decades, the evolution of monetary poverty for women has been broadly similar to that of men. Women and men have almost identical poverty rates in 1998/99 (18.9% and 19.1% respectively). Furthermore, while the poverty rate for women increased from 7.9% in 1990/91 to 12.2% in 1998/99 in urban areas, and from 17.7 to 27.3% in rural areas, the corresponding changes for mean are from 7.2% to 11.7% and from 18.3% to 27.0% respectively. Moreover, the average annual growth rates and number of poor for women and men were similar (1.7 vs 1.8% and 6 vs 6.6% respectively). This does not preclude a feminization of poverty among certain subgroups (single-parent families, single person households, elderly, etc…) or if different criteria for poverty are used (education, health, etc.). Likewise, even if this is true for some of these, it does not indicate a feminization of monetary poverty.

Women who are younger than 25 are more likely than the average woman to be poor. Furthermore, and with important social implications, being a widow does not necessarily result in higher likelihood of poverty; the poverty rates for married and widowed women are not statistically different in either rural or urban areas. On the other hand, as expected, there are strong differences in poverty rates for women across levels of education attainment, particularly in rural areas.

Since the lack of schooling of young girls in the past helps to determine the poverty of women today, improving the access of girls to school facilities and education are important for policies to fight female poverty.

C. The Evolution of Inequality

Although inequality and poverty are distinct concepts, they nonetheless remain linked in almost all welfare analyses. Indeed, these two phenomena are generally simultaneously evoked and analyzed based upon one or more variables of interest.

Inequality in expenditures

While inequality has increased since independence, it decreased between 1970/71 and 1984/85.[8] The share of the poorest decile went from 3.3% (1960) to 1.2% (1970/71) to 1.9% (1984/85) while that of the richest decile went from 25% to 37% to 30%. One possible explanation is the emergence or relative strengthening of a middle class during the 1970s and the early 1980s, a period during which the civil service and the wage sector most developed. The same findings emerge at the urban/rural levels although they are more pronounced in urban areas. Strikingly, the average expenditure of the richest 10% in urban areas in almost 10 times (9.75) that of the poorest 10% in rural areas.

As can be seen in table 3, the various shocks and economic policies between 1990/91 and 1998/99 appear to have negatively affected the consumption of the poor. For instance, the share of the richest household decile in total expenditure increased (+1.5 points) while that of the poorest decile declined (-1.7 points). The Gini coefficient, a better measure of inequality, slightly decreased at all levels between 1984/85 and 1990/91. The high levels of inequality remained essentially unchanged in 1998/99, 0.395 (overall), 0.378 (urban), 0.316 (rural).

---

[8] The absence of reliable data on the distribution of income in Morocco leads us to use household consumption data to examine inequality.

Table (3)
Evolution of Shares of Total Expenditure and Gini coefficient in Morocco

Household Deciles D1 and D9 (in %)												
	1960		**1970-71**		**1984-85**		**1990-91**		**1998-99**		**2000-01**	
	D1	**D9**	**D1**	**D9**	**D1**	**D9**	**D1**	**D9**	**D1**	**D9**	**D1**	**D9**
Urban	ND	ND	1.37	34.8	1.80	30.19	2.6	29.2	2.7	27.7	NA	NA
Rural	ND	ND	1.41	31.2	2.17	27.11	3.7	25.0	3.1	25.8	NA	NA
Total	3.3	25	1.24	36.5	1.90	30.45	2.8	30.8	2.6	28.8	2.5	29.7
Population Deciles D1 and D9 (in %)												
	1960		**1970-71**		**1984-85**		**1990-91**		**1998-99**		**2000-01**	
	D1	**D9**	**D1**	**D9**	**D1**	**D9**	**D1**	**D9**	**D1**	**D9**	**D1**	**D9**
Urban	4	26	NA	NA	2.4	31.8	2.6	29.2	2.9	29.7	NA	NA
Rural	4	22	NA	NA	3.2	25.3	3.7	25.0	3.3	24.4	NA	NA
Total	4	26	NA	NA	2.6	31.7	2.8	30.8	2.6	31.0	2.5	29.7
Gini Coefficient												
	1960		**1970-71**		**1984-85**		**1990-91**		**1998-99**		**2000-01**	
Urban	0.35		NA		0.412		0.382		0.378		NA	
Rural	0.32		NA		0.364		0.312		0.316		NA	
Total	0.34		NA		0.408		0.392		0.395		NA	

Source: Based upon data from the Direction de la Statistique.

The table shows that the various shocks and economic policies did not have a positive effect, and perhaps even a negative effect, on the relative share of consumption of the poor. The fiscal reforms over the past two decades have played a role by increasing indirect taxes and contributing, if only slightly, to the increasing prices of consumed goods and, therefore, to further decreasing the purchasing power of the poor.

Other forms of inequality: education, health and the environment

Inequality, however, is not limited to such monetary measures as consumer expenditure. It can be seen in a variety of social indicators across different expenditure levels (deciles and quintiles). In the 1990/91 ENNVM, the literacy rate of the poorest rural household quintile was only 22% as compared to almost 73% for the richest urban household quintile. This did not greatly improve in the 1998/99 ENNVM which shows corresponding rates of 27% and 75% respectively. This is likely linked to migration from rural areas.

Disparities in rural/urban access to health are at least as large as those for education. This is partially driven by such factors as the lack of medical insurance. While these rates are low at the national level (less than 15%), they are especially low in rural areas (less than 4% as compared to 22% in urban areas). The differences in these rates across expenditure groups are just as large: less than 1.5% of the poorest household quintile are insured as compared to more than 40% of the richest household quintile.

Inequalities in health also exist in terms of services received. The richest 20% of households account for two thirds of ancillary medical care, more than 40% of hospital nights and more than 20% of external medical consultations. Furthermore, the poorest 40% of households use less than 20% of the health services paid by the government. This raises serious questions as to the allocation of the budget of the Ministry of Health especially in light of its low levels.

Access to drinking water and to electricity exhibit similarly high levels of disparity. The 1998/99 ENNVM shows that less than 12% of rural households are connected to networks of drinking water or to water hydrants. This rate is surely lower for the poorest households. This stands in contrast to the rate of 90% in urban areas. The disparities in access to electricity are similar (15.6% vs. 86.1%).

The different surveys since independence shows that inequality, measured in a variety of ways, has remained high and relatively stable over the past 50 years.

IV. Economic Growth and Poverty in Morocco

The theoretical framework

Until recently, policy makers in Morocco and other developing countries relied on economic growth to reduce poverty. During the past several years, it has become clear that, for a variety of reasons, this may not be enough to reduce poverty. For instance, the World Bank (Deininger and Squire (1997)) studied 91 countries and found that periods of economic growth were accompanied by increases in inequality and poverty for 43 cases and by reductions in 45 cases. The study further showed that even when inequality increased, its effect on the poorest segments of society was generally compensated by the positive effect of total growth.

In some cases, economic growth has coincided with increases in poverty. This can occur when the growth rate of agriculture, the principal source of income for the rural poor, is low or negative while the overall rate of growth of the economy is positive. This occurred in Morocco during the years of drought and low rainfall during the 1980s and 1990s. While this type of situation worsens inequalities and exacerbates poverty, macroeconomic policies have also played a role (the sectoral orientation of public expenditure, incentives for investment, taxation and subsidy systems….).

The character and the type of growth as well as the distribution of gains are mainly determined by the initial distribution of capacity for human and physical production. Investments in education and health improve the capacities of the poor thereby ensuring greater growth in their share of income in the short and long runs. If economic growth is to reduce (monetary) poverty, it must increase the income of the poor and, in the best of cases, do so without aggravating inequality. When policies for long-run growth adversely short-run poverty levels, accompanying policies and other measures should be take to protect the poor.

The case of Morocco

The evolution of the national economy and of economic policies during and after the SAP (1983-1991) has likely had a continuing negative effect on certain segments of society. However, it is generally accepted that the stabilization of the economy did not lead to as serious a recession as might have been feared. Morrisson (1991) notes ”Morocco managed to decrease the principal imbalances without lowering per capita income, worsening poverty and while avoiding major social problems.” This was helped by several positive external factors such as increasing exports. GDP growth as well as total private consumption, investment all maintained acceptable levels during this period.

While there is no direct link between the policies from the SAP and poverty rates, there was likely an indirect effect. Increases in unemployment, rural or urban, increase the number of poor and underprivileged. The World Bank (1993) noted that under-employment was the main cause of poverty in Morocco and that unemployment was directly linked to poverty. The moderate growth rates during the period were not sufficient to absorb the new entrants into the labor market nor the already unemployed. The available survey data shows that the unemployment rates are higher among the poor in both urban and rural areas. The SAP and the accompanying economic policies were accompanied by increasing unemployment and therefore poverty levels, when not accompanied by a system of unemployment insurance or other efficient social insurances. (World Bank, 2004)

An analysis of consumer expenditure across time and rural/urban status provides a concrete example.[9] Table 4 shows the evolution of average annual expenditure in constant dirhams by households and by individual for each of the three surveys.

[9] This type of expenditure forms the basis of indices of monetary poverty.

Table (4)
Growth rates of average annual expenditure by household and by person, (in 1990 constant dirhams)*

	Between 1984/85 and 1990/91 Rates of growth		**Between 1990/91 and 1998/99 Rates of growth**		**Between 1984/85 and 1998/99 Rates of growth**	
	Total in %	Average in %	Total in %	Average in %	Total in %	Average in %
Household						
Urban	30.41	4.52	-18.14	-2.82	6.76	0.50
Rural	22.60	3.45	-9.04	-1.35	11.51	0.84
Total	29.70	4.43	-11.77	-1.77	14.44	1.04
Person						
Urban	35.42	5.18	-23.53	-3.76	3.56	0.27
Rural	26.51	4.00	-11.66	-1.76	11.75	0.86
Total	35.04	5.13	-15.20	-2.33	14.52	1.05

Source: Based upon data from the Direction de la Statistique
* Deflators from the Direction de la Statistique are used.

While real average expenditure increased between 1984/85 and 1998/99, poverty only slightly declined during the same period. The growth, incorrectly channeled, did not sufficiently contribute towards durably and significantly lowering poverty. During the 1990s, real average annual expenditure decreased nationally and in both urban and rural areas. This corresponds with the matching deterioration in the various indicators during the same period.

In its report in Morocco, the World Bank states that the low economic growth was responsible for 84% of the rise in poverty with the remainder due to the distribution of the growth. We use data from the two available ENNVMs (1990/91 and 1998/99) to generate a growth decomposition. An interesting property of the Datt and Ravallion (1992) decomposition is that the components[10] can be disaggregated for sub-periods. That is, if the same reference date is used for all of the sub-periods, these will sum to the total effect over the entire period.

Since Morocco has two distinct poverty lines, the rural/urban specific deflators from the Direction de la Statistique are used to make the data comparable (1.439 and 1.245 for urban and rural areas respectively). The three usual measures of poverty, FGT ((α = 0, 1, 2) are first generated before being decomposed them.[11]

[10] The two components are the growth and redistribution components. The first measures the share of the change in poverty due to economic growth while the latter the share due to the change in the distribution.

[11] The most used measures of poverty are those of Foster, Greer and Thorbecke (1984). They are generally represented by P_a. In these measures, when $a = 0$, the indicator is rate of poverty, or the *numerical poverty index*. When $a = 1$, the result is an *index of the depth of poverty*. Finally, when $a = 2$, it is an *index of the severity of poverty*. In these measures, the greater the value of a, the greater the emphasis placed on the poorest members society.

The results in table 5 correspond with the official rates for the two surveys (see Table 1). Each of the measures increased between 1990/91 and 1998/99. Table 6 presents, by rural/urban, the poverty decompositions.

Table (5)
FGT measures of poverty

	ENNVM 1990-91	ENNVM 1998-99	Overall variation	Rate of overall variation in %
Urban areas				
P_0	0.0757	0.1200	0.0442	58.52
P_1	0.0147	0.0249	0.0101	69.39
P_2	0.0044	0.0079	0.0034	79.55
Rural areas				
P_0	0.1800	0.2719	0.0919	51.06
P_1	0.0380	0.0668	0.0288	75.79
P_2	0.0115	0.0251	0.0136	118.52

Source: Authors' calculations based upon the raw data from the two surveys. The variable used is expenditure per capita.

Table (6)
Decomposition of Poverty Changes between 1990/91 and 1998/99 by rural/urban.

	Growth G	Distribution D	Residual R	Total
Urban				
ΔP_0	0.0574	-0.0260	0.0128	0.0442
ΔP_1	0.0211	-0.0067	-0.0043	0.0101
ΔP_2	0.0087	-0.0024	-0.0029	0.0034
Rural				
ΔP_0	0.0714	0.0050	0.0155	0.0919
ΔP_1	0.0206	0.0075	0.0007	0.0288
ΔP_2	0.0080	0.0050	0.0006	0.0136

Source: Authors' calculations based upon the raw data from the two surveys. The variable used is expenditure per capita.

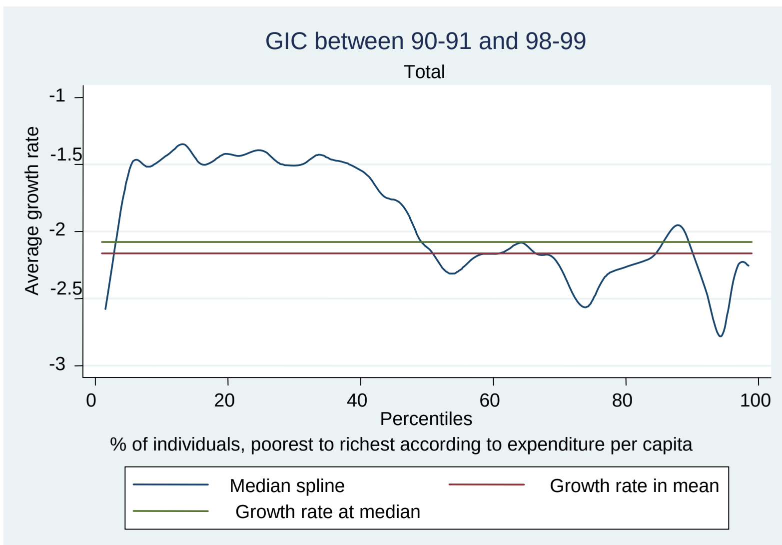
At all levels, the low nominal growth (negative in real terms) was the leading cause in the increase in poverty. In rural areas, the increased inequality further contributed (almost 30% of the increase in poverty). The variation in poverty and its accentuation is more apparent using P_1 and P_2 which, by construction, are more sensitive to the poor than P_0.

To better understand the effect of the lack of growth, we construct growth incidence curves (GIC) using the method suggested by Ravallion and Chen (2003). According to this approach, looking at the overall average growth of expenditure or the growth for poor is not enough to say whether that economic growth is beneficial. Rather, the shape of the growth incidence curves must be examined. This is done below using data from the same two surveys.

National

In the 8 years separating the two surveys, the average per capita growth rate of expenditure was -2.16% with a median of -2.08%. Since the values of the growth incidence curve are uniformly negative, poverty clearly increased over the period. The GIC is not monotonic. The bottom 2 quintiles have highest average growth rates. Therefore, at the national level, it appears that the negative real growth less seriously impacted the poor as the middle and high income classes suffered the most.

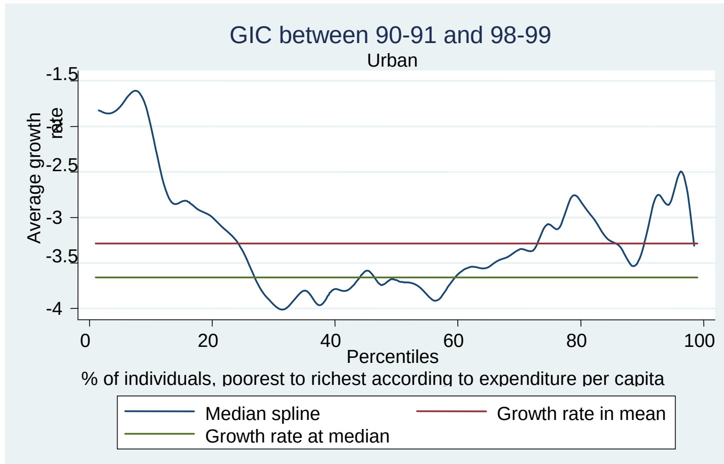
Graph (1) : National growth incidence curve between 1990/91 and 1998/99



Urban

As can be expected, when the analysis is conducted at the urban/rural level, different stories emerge. In urban areas, despite being negative, the growth rates of the poor were the highest. The richest 30% also do relatively well as their growth rates are higher than those of the middle class.

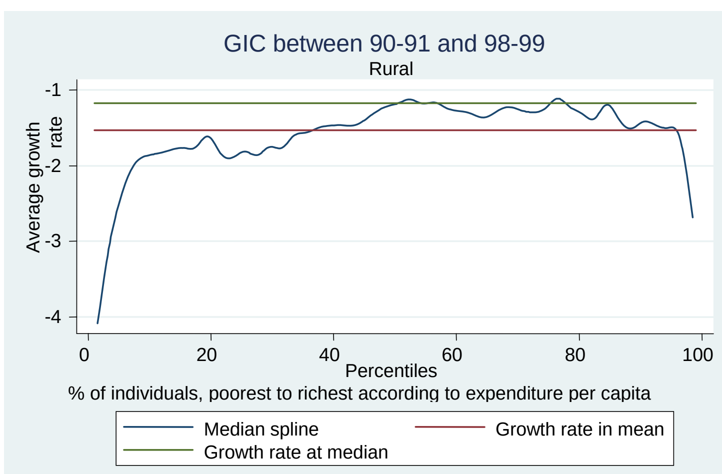
Graph (2) : Urban growth incidence curve between 1990/91 and 1998/99



Rural

The shape of the rural GIC is distinct from those of the national or urban GICs. In fact, the rural GIC is almost the inverse of the urban GIC. It is concave and resembles an inverted ”U”. The extremes – the poorest and the richest – experience the weakest growth rates. The rural middle class, unlike its urban counterpart, benefited the most despite their negative growth.

Graph (3) : Rural growth incidence curve between 1990/91 and *998/99*



In conclusion, the negative real growth between 1990/91 and 1998/99 was the main driving force of national as well as rural and urban poverty. A more detailed analysis shows that the poor in rural areas and the middle class in urban areas were the most affected. Furthermore, the negative evolution of the distribution had a greater impact on rural areas.

V. Public Expenditure in Morocco: Structure and Evolution

Well-targeted public expenditure, particularly investment, is a powerful instrument to create economic growth and to, directly or indirectly, reduce poverty. In the short run, it is very effective as a component of final demand and through the distribution of wages and incomes. In the long run, it is also effective when the investments generate growth. The sectoral and spatial distribution of this expenditure can largely influence the distribution of household income and/or expenditure.

The manner in which the government invests in infrastructure is also important. It is easy to justify and even to defend placing infrastructure in rich regions which have significant economic potential. These are the areas which attract national and foreign investors. This type of investment, however, may increase the poverty in other regions of the country (exodus) and the inequality between regions. As a result, the disadvantaged become further marginalized.

Over the past eight years, the budget deficit has remained at approximately 3% of GDP. Revenues did not increase much while expenditure continues to be structurally rigid. Fiscal revenues account for almost 90% of budget revenue while public sector wages have traditionally represented between 50 and 55% of current expenses (almost 12% of GDP).

Table (7)
Structure of Fiscal Receipts by Broad Category in Billions of Dirhams and in %

	1998-1999		**1999-2000**	
Direct taxes and similar taxes	25.1	34.67%	23.8	32.87%
Indirect Taxes (VAT and other)	30.4	41.99%	31.2	43.09%
Customs	13.0	17.95%	13.3	18.37%
Stamps, Licensing	03.9	05.39%	04.1	05.67%
Total	72.4	100	72.4	100

Source: Direction du Trésor, Ministère des Finances.

As a result of these rigidities, the investment component of the Moroccan budget has generally been the remainder of the budget. And, for the past several years, it has essentially been a variable of adjustment instead of a goal of economy policies. Its share in GDP has consequently declined in periods of economic decline. In turn, this partially explains the accumulated deficits in basic infrastructure. In the remainder of this section, the emphasis will be on the types of public expenditure which concern this analysis.

The share of the ordinary expenditure in total expenditure has increased to the detriment investment-related expenditure. Despite slight increases in the absolute levels of capital expenditures over the past several years, the share increased from 73.6% (1980-1989) to 82.6% (1996-2003). Indeed, the average annual rate of increase over the period 1996-2003 was 3% per annum as compared to 0.7% between 1990 and 1995.

Due to the structural rigidity, ordinary expenditures (excluding interest on the debt) only reduced by less than one point of GDP (from 16.1 to 15.4% of GDP) between the 1980-1989 and 1990-1995 periods. These expenses increased at almost the same rate as ordinary receipts (excluding receipts from privatizations) during the 1996-2003 period (5.6% per annum for expenditure as opposed to 5.2% per annum for receipts).

Under the guidance of the IMF, Morocco has sought to reduce the ratio of the wage bill to GDP to levels comparable to those of countries with similar levels of development (much less than 10% of GDP vs. 12.9% in Morocco). Among other aspects, this will occur through the voluntary departure or retirement of approximately 60,000 civil servants. The strategy also seeks to improve the effectiveness of the administration of human and budgetary resources and to reform the civil servant remuneration system. These reforms will likely be both controversial and difficult to implement.

Interest payments on the national debt account for a significant but decreasing share of the ordinary receipts: 16.1% in 2003 as opposed to 24.9% in 1995 and 25.9% in 1999. As a ratio of fiscal revenues, they accounted for 18.7% in 2003, down from 27.6% in 1995 and 28.4% in 1990. This downward trend is the direct result of the reduction of public debt and its improved management. While external debt servicing has decreased as a percent of GDP, payments on interest for domestic public debt has greatly increased. Since 1995, it even exceeds that of foreign debt.

Consumption-related subsidies also account for a large share of the budget. Generally regarded as a poorly targeted safety net, these subsidies have been controlled in relative terms. The IMF, among others, has always maintained that the weight of subsidies on public finances should be reduced and that these should be better targeted on the more vulnerable. As a percent of GDP, they decreased from 1.9% during 1980-1989 to 0.9% in 1996-2003 but did account for 1.9% in 2001. That year, the level of subsidies was 4.9 billion dirhams.

Broadly speaking, the search for financial stability and strict budgetary policy must face the magnitude of the accumulated social deficits and the expectations of the underprivileged. Consequently, the past decade has seen a significant expansion of "priority" social expenditure (education, health, employment, housing, wages,…). The share of these expenditures as a percent of the budget (excluding debt servicing) has increased from 39% in 1993 to more than 47% in 2002. It should be noted, however, that the share of social sectors in the budget is over-estimated as the definition includes recurring wage expenditures of the departments instead of just the expenditures allocated to the social programs themselves.

With regards to health, the efforts of the government have led to general improvements in the offer of public services or other health indicators. However, public services remain unequally distributed throughout the country. Moreover, access to care remains limited for large segments of population due to issues related to access and cost.

Dispensaries which use health auxiliaries are three times more likely to be frequented by the poor as opposed to the rich in urban areas. Inversely, in rural areas, the ratio of rich to poor patients is roughly 2:1. The low access of the population to the health care system is partly due to the associated costs and insufficiencies in the public health system (e.g inaccessibility, outdated equipment ….). According to the 1998/99 ENNVM survey, only one third of total expenditure on health care is from the government budget (approximately 131 dirhams per capita). Medical insurance accounts for 19% of the costs while households directly pay the remaining 48%.

In addition to traditional policies which fight long-run poverty, like free schooling, access to health services, or even subsidized prices of basic products, other policies aim to improve the infrastructure and economic insertion of the underprivileged. Along these lines, several agencies and institutions have been created or restructured over the past several years.

VI. Household Assets and Access to the Infrastructures: Determinants of Poverty

This section uses the 1998/99 ENNVM to examine the link between household poverty and variables related to the assets of the household in terms of human and physical capital, access to basic infrastructure, health services and to the use of certain agricultural technologies, etc… The model builds upon and extends models developed by researchers at the *International Food Policy Research Institute* (IFPRI) for similar analysis in India, China, Egypt and other countries.[12]

Structure of the models and results of the estimates

The objective of the models estimated in this section is to explain two quantitative measures of household well-being (revenue and expenditure) as well as its status relative to poverty (poor or not poor).
National

The first model examines the income of the head of the household. Since this variable does not directly exist in the survey, it is built based upon various intermediate data. After the usual adjustments to only retain variables which are statistically significant, the results of the ordinary least squares (OLS) estimation are presented in Table 8 below.[13] The log of per capita and the log of per capita expenditure are the respective dependent variables for the first and second columns under national, urban and rural.

The signs of the coefficients in the 1st column match those predicted by theory. Living in urban areas leads to higher incomes while having a female head of household reduce it. Furthermore, higher levels of education lead to higher levels of per capita income. As can be expected, the greater the wages received, the higher the income per capita. The same can be said of the ownership of farm land. Likewise, higher dependency ratios or having an activity in the household leads to lower income per capita. However, electricity was linked to higher income.

Unexpectedly, different variables are significant in the 2nd column, As expected, in the national regression, the log of the per capita income of head of the household is positively linked with per capita expenditure. Here too, living in urban areas is linked to higher household per capita expenditure. There appears, however, to be a quadratic (convex) relationship between the age of the head of the household and the household per capita expenditure with the minimum at approximately 57 years old. None of the other variables are significant.

---

[12] See for example Fan,1990, 1991, 1997, 2000; Fan and Pardey, 1997; Fan, Hazell and Thorat, 1999; Fan and Zhang, 2001; Fan, Fang and Zhang, 2001; Fan, Zhang and Robinson, 2001

[13] The variables are defined in the annexes. The Stata programs which generate these results are available upon request.

Table (8)
OLS Estimation of Log Per Capita Income and Expenditure

	National		**Urban**		**Rural**	
Variable	(1) log of per capita income	(2) log of per capita expenditure	(3) log of per capita income	(4) log of per capita expenditure	(5) log of per capita income	(6) log of per capita expenditure
Urban status	0.146***	0.274***	.	.	.	.
Female head of HH	-0.220***	.	-0.265***	.	.	.
Age of head of HH	.	-0.009**	.	.	.	.
Age of head of HH squared	.	0.000**	.	.	.	.
Head of HH, no schooling but literate	0.167***	.	0.296***	.	.	.
Head of HH, finished primary school	0.184***	.	0.253***	.	.	.
Head of HH, finished middle school	0.472***	.	0.546***	.	.	.
Head of HH, finished secondary school	0.802***	.	0.833***	.	.	.
Head of HH, finished university studies	1.021***	.	1.084***	.	.	.
Dependency ratio in HH	-0.109***	.	-0.118***	.	-0.088***	.
Economic activity in house	-0.167**	.	-0.230***	.	.	.
ln(Income of head of HH)	.	0.048***	.	0.075***	.	0.017*
ln(Total salary per active member of HH)	0.081***	.	0.086***	.	0.076***	.
ln(Total land per capita owned by HH)	0.153***	.	.	.	0.177***	.
HH connected to electricity network	0.324***	.	0.325***	.	.	.
HH connected to drinking water network	.	0.264***	-0.136***	0.303***	0.601***	.
Telephone in household	.	0.516***	.	0.508***	.	0.447***
Constant	8.044***	8.314***	8.283***	8.091***	7.868***	8.342***
Observations	4,447	5,129	2,489	2,975	1,958	2,154
R^2	0.2817	0.3164	0.2829	0.2059	0.1094	0.0083
Adj. R^2	0.2798	0.3156	0.2797	0.2051	0.1075	0.0073

*** Significant at the 1% level
** Significant at the 5% level
* Significant at the 10% level

Urban

The explanatory variables selected for the urban regressions are naturally different from those retained for the national level. The estimate which retains the most statistically significant variables is given columns 3 and 4.

For the variables selected, the signs of the coefficients are those expected and the results are quite comparable to those at the national level. A female head of household reduces the per capita income of the household while increasing levels of education leads to higher levels of income. A high dependency ratio or having an economic activity in the household reduces income. For the latter variable, the causality may be reversed as low income households may result in family members starting an (often low-income generating) economic activity within the house. Similarly, while access to drinking water and having electricity are significant and positive, the causality may be reversed. Households with higher levels of income may be able to access these more easily.

For the second measure of well-being (the log of per capita expenditure), we also estimate several different OLS specifications. Here too, only a limited number of variables are significant: log of per capita income, access to drinking water and ownership of a telephone.

Similarly to the national case, there is an implied convex relationship between the age of the head of the household and per capita expenditure. However, this relationship is no longer statistically significant. The minimum occurs around 47 years old, 10 years earlier than at the national level.

Rural

The 5th column shows the four statistical significant variables: access to drinking water, the log of per capita land owned and the log of the sum of wages earned by active members of the households all increase per capita income while the dependency ratio decreases it. The signs correspond to those predicted by theory.

Access to drinking water may have a more significant meaning in rural areas. Direct or easy access to water need may allow those household members who would otherwise have to obtain it to participate in generating other resources for the household. In part, this explains the importance of water-related equipment in rural areas.

In the OLS models for per capita expenditure, only two variables are statistically significant: the log of per capita income and ownership of a telephone. Based upon the R^2 and the value of the Fischer statistic, the model fit is quite low.

In order to take into account the possible correlations of the error terms of the two equations, a SUR model is again estimated. The results are reproduced below in table 9. In the equation for the log per capita income at the national level, all the variables remain statistically significant and maintain the same signs. However, in the equation for the log of per capita expenditure, the age of the head of household and its square are no longer significant although they keep the same sign. The other estimated parameters also keep the same signs as with the OLS estimation. The results for the urban and rural cases are not very different from those obtained with the other estimation techniques.

Table (9)
SUR Estimation of Equations for the Log of Per Capita Income and Log of Per Capita Expenditure at the National Level

	National	Urban	Rural
ln(Income of head of HH)	(1)	(2)	(3)
Urban status	0.155***	.	.
Female head of HH	-0.216***	-0.257***	.
Head of HH, no schooling but literate	0.161***	0.277***	.
Head of HH, finished primary school	0.182***	0.248***	.
Head of HH, finished middle school	0.467***	0.526***	.
Head of HH, finished secondary school	0.789***	0.830***	.
Head of HH, finished university studies	1.004***	1.083***	.
HH connected to electricity network	0.318***	0.316***	.
Economic activity in house	-0.160**	-0.218**	.
ln(Total land per capita owned by HH)	0.150***	.	0.176***
Dependency ration in HH	-0.108***	-0.116***	-0.088***
ln(Total salary per active member of HH)	0.080***	0.086***	0.076***
HH connected to drinking water network	.	-0.134***	0.597***
Constant	8.038***	8.281***	7.868***
ln(Total expenditure of total expenditure of head of HH)			
Urban status	0.308***	.	.
Age of head of HH	-0.007*	.	-0.005
Age of head of HH squared	0.000	.	0.000
HH connected to drinking water network	0.276***	0.307***	.
Telephone in household	0.519***	0.510***	0.459***
Head of HH, finished secondary school	.	0.108***	.
Head of HH, finished university studies	.	0.154***	.
Constant	8.648***	8.726***	8.578***
Obsevations	4447	2489	1958
"R²"	0.2817	0.2829	0.1094
Obsevations	4447	2489	1958
"R²"	0.313	0.1949	0.0091

*** Significant at the 1% level
** Significant at the 5% level
* Significant at the 10% level

Finally to verify the robustness of the results, we estimate a simultaneous equations (sing two stage least squares) and probit models. Since the results from the former largely confirm the previous results, we do not present them here.

The Probit models, using the same set variables, generally perform poorly. In the national sample 3 variables have the “correct” sign: access to drinking water, possessing electricity and the log per capita income. Similarly, in the urban sample, only three variables are significant: access to a source of drinking water and ownership of a telephone reduced the probability of being poor whereas an increasing dependency ratio increased the probability. In the rural model, no variable is significant with the expected sign.

In sum, only certain variables are statistically significant in the models selected. The variables which tend to augment the well-being of urban households are: a male head of household, different levels of education, electricity, ownership of a telephone and access to water. For the last three variables, however, it is likely that the causality is reversed. The primary variables which lower well-being are the dependency ratio and exercising an economic activity within the household. Once again, the latter variable may have reversed causality.

In rural areas, the variables which increase the standard of living of the households are access to drinking water, owning a telephone, the area of owned land and the sum of wages received wages. Once again, an increase in the dependency ratio reduces the standard of living.

VII. Poverty, Inequality and Economic Dynamism: A Regional Analysis

For urban and rural areas, the direct and indirect role of public expenditure and its effectiveness in fighting poverty can be examined at the household level but also at a spatial or regional level. The well-being of households is not only determined by their individual access to certain resources but also by the general availability of certain goods or collective services. It is this last dimension which is explored in the following section.

This section therefore has two objectives. The first is methodological and proposes an approach to test the effectiveness of welfare expenditure in lowering poverty and inequality at a regional level. The approach incorporates a spatial or regional optimization of public spending. The second objective is to apply it to the specific case of Morocco. Due to the difficultly in obtain the necessary data and the approximate character of those available, the results presented are only suggestive.

Structure of the model

The proposed model consists of two stages. The first is a simultaneous equations model at the regional level (or the relevant geographical spaces) which explains, at the same time, measures of poverty, inequality and economic dynamism (economic growth for example). The simultaneity arises from economic theory and various empirical work which shows that the usual measures of poverty and of inequality can be inter-linked and they are also related to measures of economic growth (*inter* alia, Laabas and Limam, 2004).

Various measures of sectoral public expenditure, whether related to their investment or functioning, are used as explanatory variables. In theory, this expenditure influences, directly or indirectly, all of the measures of poverty, inequality and regional economic activity through a variety of mechanisms (on this subject and for more details see Fan, 2004, and Fan, Hazell and Thorat, 1999).

This public expenditure can be related to the construction of rural roads, schools, dispensaries, the extension of electricity, water conveyance, agricultural advisory services, and any other public administrative expenditure. As noted above, public expenditure can generate and support economic growth, increase the productivity of factors, create jobs, ensure of the wages and incomes, etc. in urban and rural areas. The approach proposed here can be done with or without reference to the urban/rural distinction.

Formally, and at a general level, we use the three usual FGT measures of poverty, denoted by P_α ($\alpha = 0, 1, 2$), a measure of inequality such as the Gini coefficient (IG) and a variable which captures the economic dynamism of the region and which is denoted as ΔY. This selection of variables is neither exhaustive nor limiting. Some of these measures can be ignored, changed or replaced by other pertinent measures. We assume that each of these variables is linked to a vector of explanatory variables, X, which includes sectoral public expenditure or, if unavailable, their proxy. These vectors may vary from equation to equation but may also have common variables. The data is relative to each region r of the country ($r = 1, .., R$).

(1) $P_{\alpha r} = f_\alpha(IG_r, X_{\alpha r}) + e_{\alpha r}$ $\quad a = 0, 1, 2$

(2) $IG_r = f_{IG}(P_{\alpha r}, X_{IGr}) + e_{IGr}$ $\quad a = 0, 1, 2$

(3) $\Delta Y_r = f_{\Delta Y}(X_{\Delta Yr}) + e_{\Delta Yr}$

where $e_{\alpha r}$, e_{IGr}, and $e_{\Delta Yr}$ are random errors.

These equations (which may vary in number) constitute the simultaneous equations which must be specified, estimated and tested relative to the data. Only the statistically significant variables should be kept for the second part of the modeling. The result is essentially a model of the regional determinants of poverty, inequality and growth.

The models suggested by Fan (2004), Fan, Hazell and Thorat (1999), *inter alia*, stop at this first level of modeling. They infer the absolute variations or elasticities of the measures poverty and inequality relative to the different types of public expenditures and create a ranking in terms of efficiency. Only the marginal effects of the measures of poverty and inequality, which are inferred from the derivatives of the composed functions, are used. Further, by construction, these are the same across all regions. These are in fact the estimates of the parameters from the reduced model as estimated using the structural form. These elasticities and results, however, are only valid on the margin.

A model which stops on the first level is not closed. It does not account for financial or technical constraints to the poverty and inequality reduction strategies. Furthermore, it cannot account for the marginal variations of certain exogenous variables and it does not contain any real simulations of economic policies. The second stage of modeling tries to go beyond these constraints in several different ways.

The starting point is the model estimated in the first stage and the residuals of all of the equations. The residuals, along with data from the reference year, are used to calibrate the model. In order to explicitly address the relevant economic policies, a criterion to be optimized is added. The formulation and the specification of this criterion are very open. It must reflect, in the most appropriate manner, the preferences of the decision makers. Another interpretation is that this criterion is a cost index over the entirety of considered choices

Quadratics are the most used specifications in the literature on objective functions in macroeconomics. This function can be regarded as a second order approximation of any more general function. The optimal solution here will be specified by the system of equations and the specified criteria (for more details on these techniques see Petit (1990)).

In addition to the estimated equations (1), (2) and (3), and to take in account physical or financial constraints, explicit constraints are added to the optimization program. These are variables which are *endogenous* to the optimization system but *exogenous* during the estimation of the first stage of the model (for example, the levels of public expenditure by sector and by region.

Formally, the second stage consists of resolving a program of the following type:

(4) $$\underset{X_{\alpha r},X_{IGr},X_{\Delta Yr}}{Min}\ \gamma_P[\sum_{r=1}^{R}\sum_{\alpha=0}^{2}(P_{\alpha r}-P_{\alpha r}^{*})^2]+\gamma_{IG}[\sum_{r=1}^{R}(IG_r-IG_r^{*})^2]+\gamma_{\Delta Y}[\sum_{r=1}^{R}(\Delta Y_r-\Delta Y_r^{*})^2]$$

with the constraints:

(5) $P_{\alpha r} = \hat{f}_{\alpha}(IG_r, X_{\alpha r}) + \hat{e}_{\alpha r}$ *α = 0, 1, 2*

(6) $IG_r = \hat{f}_{IG}(P_{\alpha r}, X_{IGr}) + \hat{e}_{IGr}$ *α = 0, 1, 2*

(7) $\Delta Y_r = \hat{f}_{\Delta Y}(X_{\Delta Yr}) + \hat{e}_{\Delta Yr}$

(8) $b_L \leq g^j(X_{\alpha r}, X_{IGr}, X_{\Delta Yr}) \leq b_U$ *j = 1, …, J*

Equation (4) represents the quadratic criteria used. It is relative to the three dimensions of poverty studied: regional poverty according to several measures, inequality and economic dynamism. The *exogenous* weights γ_P, γ_{IG} and $\gamma_{\Delta Y}$ reflect the preferences of the policy makers. The political goals, represented by these three dimensions $(P_{\alpha r}^{*}, IG_r^{*}, \Delta Y_r^{*})$, are *exogenous* to this program. Since this measure of cost is built using the distance from some objectives, other objectives functions, such as entropy measures, can be used.

The equations (5), (6) and (7) are the (1), (2) and (3) estimated with the techniques appropriate to the first 1st stage. The residuals from these equations are $(\hat{e}_{\alpha r}, \hat{e}_{IGr}, \hat{e}_{\Delta Yr})$. They calibrate the model and are therefore exogenous to the optimization in this stage.

The J equations represented by (8) are the eventual constraints associated with this problem. They can but need not be linear. b_L amd b_U are vectors of known constants. These constraints can represent the limits on the value of certain endogenous variable (a budget of public expenditure according to sectors), limits on the sum of expenditure (a percentage of the GDP which cannot be exceeded), physical constraints, constraints of allocation, fixed values for certain endogenous variables, etc.

Data and estimation

For this analysis, a database was creating using various existing data at the national level and at the level of the 16 economic regions.

The numerical index of poverty *(P_0)*, calculated from the 1998/99 ENNVM, is the first endogenous variable. The Gini coefficient for expenditure, as calculated by the Direction de la Statistique, is used to measure inequality at the regional level.

Due to the lack of availability data on regional GDP and on its growth rate, we use the industrial production per capita and in value for 1998 (as listed in the 1999 Statistical Directory of Morocco) as proxy. The use of another proxy may result in different results than those which are presented here.

Since we are unable to obtain the theoretically relevant public expenditure variables, we try different possibilities as explanatory variables. As with other developing countries, it is difficult to obtain the data on the distribution of the budget of ”social” ministries by type of expenditure and according to economic regions. Furthermore, due to problems of co-linearity, several of the parameters are insignificant. An additional limitation is that due to inclusion of 16 regions, the number of degrees of freedoms decreases rapidly and therefore limits the number of variables which can be included.

To explain regional poverty rates *(P_{0r})* in 1998/99, the following variables were selected: the Gini coefficent 1998/99, the value of per capita industrial production in 1998, regional poverty rates in 1994 as deduced from the Poverty Map of the Direction de la Statistique, average per capita expenditure 1998/99, the number of dispensaries in 1998 and the urban illiteracy rate in 1998

The following variable are used to explain the Gini coefficient in 1998/99: regional poverty rates in 1998/99, the value of per capita industrial production in 1998, total population in 1998, urbanization rate in 1998, average per capita expenditure in 1998/99, the urban and rural illiteracy rates in 1998

For the model which explains the value of per capita regional industrial production, due to the lack of better data, the following variables are used: the number of permanent employees in the industrial sector by region in 1998, total sales of electricity in Kwh in 1998, average per capita expenditure in 1998/99, a productivity index for the industrial sector 1998 which measures the ratio of the value of industrial production to the number of permanent employees in the sector

All the functional forms used between the dependant and independent variables are linear. We use two stage least squares (instrumental variables) for the first and second equation of the system.[14] The results are presented in tables 10, 11 and 12 below.[15]

[14] OLS estimates were also initially tried.

[15] All the variables used are defined in the appendices. The Stata programs which generate these results available upon request.

Table (10)
Two Stage Least Squares Estimate of the Equation for the Regional Rate of Poverty

Gini coefficient, 1998	116.366***
Per capita industrial production, 1998	101.786
Poverty rate, 1994	0.667***
Average per capita expenditure in 1998	-0.002***
# of health dispensaries	-0.017
Urban literacy 15 or older, 1998	-0.105
Constant	-14.504
Observations	728
R^2	0.0198
Adj. R^2	0.0144

*** Significant at the 1% level
** Significant at the 5% level
* Significant at the 10% level

Instrumented: gini coefficient 1998, per capita industrial production 1998.

Instruments: gini coefficient 1998, per capita industrial production 1998, regional poverty rate 1994, average per capita expenditure 1999, # of health dispensaries, urban literacy rate 15 or older 1998, rural literacy rate 15 or older 1998, total population 1998, urbanization rate 1998, # of permanent employees in industrial sector 1998, total sales of electricity 1998, index of average productivity per permanent employee in industrial sector 1998.

A cursory examination of table 10 shows that the model has a good fit especially since it is not a time series. The measures for poverty and inequality (the Gini coefficent) are significant and are positively linked. These results are similar to those in other empirical studies (such as Laabas and Limam, 2004). Contrary to theory, the coefficient for the per capita value of industrial production is positive. The variable, however, is not significant. Without giving any credence to the result, this recalls Hatzfield (1971) who said that a factory is an invention to create two articles: cotton and the poor. If true, this would raise economic and social questions on the impact of uncontrolled industrial development on measures of poverty.

The signs of the other parameters match those predicted by theory. Current levels of poverty appear to be linked lagged levels of poverty (poverty rate in 1994). Since the poverty rate is calculated in an absolute manner (and does not depend on the average) and is the same across regions, higher levels of per capita expenditure lower poverty rates. Even though they are not significant, higher numbers of dispensaries and lower rates of urban illiteracy are linked with lower levels of poverty. This suggests that public expenditure in health and expenditure may have a limited impact on poverty rates.

Table (11)
Two Stage Least Squares Estimate
of the Equation for the Gini Index at the Regional Level

Poverty rate, 1998	0.004***
Per capita industrial production, 1998	-1.904*
Total population, 19998	0.000
Urbanization rate, 1998	0.000
Average per capita expenditure, 1998	0.000**
Rural literacy 15 or older, 1998	-0.001
Urban literacy 15 or older, 1998	0.003
Constant	0.049
Observations	16
R^2	0.8912
Adj. R^2	0.796

*** Significant at the 1% level
** Significant at the 5% level
* Significant at the 10% level

Instrumented: gini coefficient 1998, per capita industrial production 1998.

Instruments: gini coefficient 1998, per capita industrial production 1998, regional poverty rate 1994, average per capita expenditure 1999, # of health dispensaries, urban literacy rate 15 or older 1998, rural literacy rate 15 or older 1998, total population 1998, urbanization rate 1998, # of permanent employees in industrial sector 1998, total sales of electricity 1998, index of average productivity per permanent employee in industrial sector 1998.

Inequality is positively linked with the regional levels of poverty. The value of per capita industrial production is significant and negatively correlated. This indicates that as industrial production increases, inequality decreases thus tempering the previous inference about industrial production and poverty.

As the population of regions increases, inequality does as well. This result is expected in light of the different development theories related to inequality (Kuznets) and migration (Harris and Todaro). While the coefficient for the rate of urbanization is, as expected, positive, it is not significant.

While per capita expenditure appears to reduce poverty, it is here linked with increased inequality. This seems to imply that increases in per capita expenditure are unevenly distributed; while rising levels reduce poverty, the unequal distribution, with the non-poor obtaining a disproportionate share, increases inequality.

The signs of the two different types of illiteracy (urban and rural) are opposite. This may be because higher rural literacy rates areas allow rural populations to improve their well-being and to reduce the inequality between urban and rural areas. On the other hand, rising urban literacy rates further widens the divide between rural and urban areas.

Table (12)
OLS Estimation of the Equation
for the Value of Per Capita Industrial Production in 1998 by Region

# of permanent employees in industrial sector, 1998	0.000***
Total sales of electricity, 1998	2.220
Average per capita expenditure, 1998	0.000
Index of average productivity per permanent employee in industrial sector, 1998	0.007***
Constant	-0.003*
Observations	16
R^2	0.9505
Adj. R^2	0.9325

*** Significant at the 1% level
** Significant at the 5% level
* Significant at the 10% level

Only two of the selected variables appear to explain the value of per capita industrial production by region. These are the number of permanent workers in the industrial section in 1998 by region and the index of industrial productivity. As expected, these variables are positively linked to the dependant variable. The other two variables, however, are insignificant.

Based upon these three equations, the impact of changes in certain exogenous variables on any or all of the endogenous variables (such the poverty rate or the Gini coefficient) can be calculated. In order to calibrate the optimization model in the second stage, the residuals are saved.

The Optimization Model

This model uses the same data as the first stage. In addition to the values of the estimated parameters, the model also integrates the residuals associated with each. The unit of analysis is the region.
The base equations, specified below, are evaluated for each of the 16 regions. These equations constitute the constraints for the optimization program. For the objective function, two specifications are used. The first

is a quadratic with the three endogenous variables of interest to the policy maker (the poverty rate, the Gini coefficient, and the value of per capita industrial production).

$$(4)_Q \quad \underset{X_{or}, X_{IGr}, X_{\Delta Yr}}{Min} \gamma_P[\sum_{r=1}^{R}(P_{0r} - P_{0r}^{*})^2] + \gamma_{IG}[\sum_{r=1}^{R}(IG_r - IG_r^{*})^2] + \gamma_{\Delta Y}[\sum_{r=1}^{R}(\Delta Y_r - \Delta Y_r^{*})^2] \ .$$

The second specification is an entropy function for the three same variables:

$$(4)_E \quad \underset{X_{or}, X_{IGr}, X_{\Delta Yr}}{Min} \gamma_P[\sum_{r=1}^{R} P_{0r} \ln(P_{0r} / P_{0r}^{*})] + \gamma_{IG}[\sum_{r=1}^{R} IG_r \ln(IG_r / IG_r^{*})] + \gamma_{\Delta Y}[\sum_{r=1}^{R} \Delta Y_r \ln(\Delta Y_r / \Delta Y_r^{*})] \ .$$

For the two specifications, the targeted exogenous values are picked for each of the variables and regions as well as for the weights γ_P, γ_{IG} and $\gamma_{\Delta Y}$. In addition to these three principal endogenous variables, several other variables are also endogenous to the model: average per capita expenditure, the number of dispensaries, the urban and rural illiteracy rates, the number of permanent employees in the industrial sector by region, total sales of electricity in Kwh and the productivity index for the industrial sector. The only explanatory variable from the 1st stage which remains exogenous is the regional poverty rate in 1994 which represents an initial data point.

Two other types of constraints are introduced to complete the numerical writing of the model (which is represented by (8) above). The physical constraints reflect the facts that these reallocations will occur through two variables: the population and the number of dispensaries. For any solution, the total population and the number of dispensaries remains constant at the national level but their distribution across regions may change. These two constraints have been introduced as specific constraints. The other types of constraints are upper or lower bounds for certain endogenous variables. The bounds chose are displayed in table 18 below.

Table (18)
Upper and Lower Bounds for the Variables of the Optimization Model

Variables	Lower bounds	Upper bounds
- Regional rate of poverty	0.5 * Observed value	2 * Observed value
- Gini coefficient	0.3	1.5 * Observed value
- per capita industrial production	0.75 * Observed value	2 * Observed value
- Average per capita expenditure	0.75 * Observed value	1.5 * Observed value
- Number of dispensaries	0.75 * Observed value	2 * Observed value
- Illiteracy rate (urban)	0.75 * Observed value	100
- Illiteracy rate (rural)	0.75 * Observed value	100
- Total population	0.75 * Observed value	2 * Observed value
- Urbanization rate	0.75 * Observed value	100
- # of permanent emp. industry	0.75 * Observed value	3 * Observed value
- Total sales of electricity	0.75 * Observed value	2 * Observed value
- Productivity index	0.75 * Observed value	2 * Observed value
- Poverty rate,1994	Observed value	Observed value

For the exogeneous target values (which reflect the preferences of the policy makers) and for the two selected criteria, the objective is to reduce poverty to ¾ (0.75 times) the rate of poverty observed in 1998-99 for each region. The same objective has been selected for the Gini coefficient. For the value of per capita industrial production, the objective is to increase it by 25% in each region.

For the weights γ_P, γ_{IG} and $\gamma_{\Delta Y}$, 4 scenarios are explored. The first uses the same value (0.33) for each of these while the other alternate placing a one (1) for one of the variables and a zero (0) for the other two. The resultant numerical model is solved, using GAMS, 8 times, four times for each of the two criteria.

Due to the data constraints, the results are only indicative and are only partially reproduced or discussed here. Despite this, the model and the results seem interesting from the points of view of methodology and economic policy. The results show that the model can have concrete application with precise economic implications.[16]

Using the quadratic criterion, under the two scenarios (uniform and poverty), the targets for the rates of poverty are reached (decrease in poverty rates by 25% for all regions-table A1 in the annex). For the two other scenarios (inequality and growth), the results vary across regions. As expected, a reduction of inequality requires a reduction, at times substantial, in the rates of poverty. When only an economic criterion is used (growth scenario), the poverty rates generally increase. This further raises the question as to the relationship between economic growth and the fight against poverty.

[16] Some of the associated results are reproduced in the appendix. The rest are available upon request.

If the same analysis for poverty is done using the entropy criteria (table A4 in the annex), the results for the two first scenarios (uniform and poverty) are broadly similar albeit with larger rates of variation (-50% which is the bound fixed in the program). Once again, the growth scenario has negative rates thereby illustrating the complex relationship between poverty rates and economic growth.

The targeted value (0.30) for inequality measure, the Gini coefficient, is not reached. (see tables A3 and A16 in the annex.) This is clearly missed under the inequality and uniform scenarios and, to a lesser extent, when both criteria are used. Consequently, it appears that the reduction of inequality at the regional level is a more difficult objective than the reduction of poverty. The growth scenario, using either the quadratic or entropy criteria, results in no change in the inequality levels. Therefore, if the policy maker only targets economic growth *($\gamma_P = 0$, $\gamma_{IG} = 0$ and $\gamma_{\Delta Y} = 1$)*, poverty and inequality remain relatively constant in all of the regions. However, if the target is closer to the uniform scenario *($\gamma_P = 0.33$, $\gamma_{IG} = 0.33$ and $\gamma_{\Delta Y} = 0.33$)*, then the three objectives are accomplished to varying degrees of success depending upon the region.

The costs, in terms of reallocations and resources, to reach these policy goals for poverty and inequality in the optimization model are given by the levels of the other endogenous variables considered. While there may be no costs for some variables in certain scenarios, they can be quite high for other variables (see for instance the number of dispensaries by region). In order to choose, the policy maker must compare the scenarios and weight these costs.

The two-stage modeling proposed here appears to be superior in terms of structure, coherence, logic and relevant information to the other possible methods of analysis particularly those which only perform the first stage. This method allows for a deeper analysis and therefore provides greater information for the debate on strategies to fight poverty and inequality while maintaining economic growth at a regional level.

This method, however, is more complex and demanding on several levels. Furthermore, it has several limitations. First, it is demanding in terms of data as it requires data at a regional level. These may not exist or may be unreliable. Additionally, it is often difficult to obtain data on the distribution by sector of the national public expenditure at the regional level. Further difficulties may exist in finding good measures for the most important variables.

This is further complicated since when the number of regions increases, the demand for data increases. Conversely, if the number of regions is too low, there may be problems in the precision of the estimators in the first stages (number of explanatory variables to use and the number of degrees of freedom).

For the second stage, the role of the policy maker is central and requires a detailed understanding. Also, while the concept of the objective function (or cost function) can be easily understood, the choice of the functional form complicates matters and can introduce skepticism as the results can vary greatly based upon this choice. Several of these limitations, however, are common to any quantified models or when the behavior of the policy maker is taken into consideration.

VIII. Conclusion

The Structural Adjustment Program and subsequent policies have noticeably improved the macro-economic situation. However, both poverty rates and the absolute number of poor have increased since the 1980s. Moreover, a review of the available surveys has shown that inequality, especially between rural and urban areas, has remained persistently high over the past 40 years. This trend appears in both monetary and non-monetary indicators such as education and health.

In large part, this is the result of the unequal sharing of the benefits of the weak growth and the differences in the access to physical and social infrastructure. Since the distribution of gains from growth are mainly determined by the initial distribution of capacity for human and physical production, the differences in infrastructure reinforces the unequal sharing of the gains from growth. Economic growth has also varied greatly partially due to its dependence on the agricultural sector and its output. Variation in rainfall has notable effects on aggregate growth.

Public expenditure, especially investment, can contribute to fighting poverty and inequality provided that it is correctly targeted. The review of public investment shows that, in real terms, it has declined in real terms since the advent of the SAP program. Moreover, due to structural rigidities in expenditure, public investment has been the remainder of the government expenditure. Its share in GDP has declined in periods of economic decline.

A growth incidence curve decomposition shows that the negative real economic growth was the driving force behind changes in national and urban/rural poverty during the 1990s,. In particular, the rural poor areas and the middle class in urban areas were the most affected. Furthermore, the unequal evolution of the distribution had a greater impact on rural areas.

A limited number of variables are found to be correlated with poverty. Having a male head of household, different levels of education, electricity, ownership of a telephone and access to water are found to be associated with higher well-being in urban households. The causality is likely reversed for the last three variables. In rural areas, the variables which increase the standard of living of the households are access to drinking water, owning a telephone, the area of owned land and the sum of wages received wages. The dependency ratio is negatively correlated in each case.

This paper also presents an original methodological approach to test the efficacy of public spending in terms of fighting against poverty and inequality at the regional level. It incorporates a spatial or regional optimization program for public expenditure. This model is then applied to Morocco using the available data. Due to difficulties related to the data, the results are only indicative. Despite this, several interesting findings emerge from the analysis. It appears that the reduction of inequality at the regional level is a more difficult objective than the reduction of poverty. Moreover, in certain scenarios, economic growth is associated with rising regional inequality.

References

Abdelkhalek, T., (2005),"*La pauvreté au Maroc",* chapter and contribution for theme 7 of the thematic group 7 "*Les Phénomènes d'Exclusion, de Pauvreté et d'Analphabétisme"* of the Rapport du Cinquantenaire sur *« 50 ans de Développement Humain au Maroc »* (RDH50).

Abdelkhalek, T., and Chaoubi A., (2004),"Distributions des Dépenses de Consommation des Ménages au Maroc: une analyse paramétrique", *Revue d'Économie du Développement,* 12(2) : 85-106.

Abdelkhalek, T., (2000),"*Féminisation de la Pauvreté au Maroc: Concept et Tests",* Communication for the Conference on *" Femme et pauvreté dans le monde arabe,"* organized by several organizations including the Arab Ligue, Casablanca, Morocco, March 20-23, 2001.

Abdelkhalek, T., and Chaoubi A., (1999),"Croissance Économique et Pauvreté au Maroc: le Contexte Théorique," *Cahier de recherche de l'équipe MIMAP-Maroc Étude C1,* INSEA, Rabat.

Abdelkhalek, T., (1999), "La Pauvreté au Maroc: une Approche Basée sur la Satisfaction des Besoins de Base," in *"Pauvreté, Satisfaction des Besoins Essentiels et Variables Démographiques au Maroc," Série Études* de l'INSEA, Rabat.

Assi, D., (2003),"La pauvreté et l'action de l'Etat au Maroc", Dissertation, Université Cadi Ayyad, Marrakech.

Datt, G., and Ravallion, M., (1992),"Growth and Redistribution Components of Changes in Poverty Measures: a Decomposition with Applications to Brazil and India in the 1980's", *Journal of Development Economics*, 38, 275-295.

Danziger, S., and Gottschalk, P., (1986),"Do Rising Tides Lift all Boats? The Impact of Secular and Cyclical Changes on poverty", *American Economic Review,* Papers and proceeding, 76(2): 405-410.

Deininger, K., et Squire, L., (1997),"Economic Growth and Income Inequality: Reexamining the Links", *Finance & Development*, March: 36-39.

Direction de la Statistique, "*Enquête Nationale sur les Niveaux de Vie des Ménages (1998-99)",* Rabat.

Direction de la Statistique, " *Enquête Nationale sur les Niveaux de Vie des Ménages (1990-91)",* Rabat.

Direction de la Statistique," *Enquête Nationale sur les Niveaux de Vie des Ménages (1984-85)",* Rabat.

Direction de la Politique Economique Générale, Ministère de l'Economie, des Finances, de la Privatisation et du Tourisme, (2002),"*Les Politiques Sociales au Maroc",* Document de travail n°80, septembre 2002.

Direction de la Politique Economique Générale, Ministère des Finances et de la Privatisation, (2003),"*Tableau de Bord des Finances Publiques",* avril 2003.

Fan, S., (1997),"Production and Productivity Growth in Chinese Agriculture: New Measurement and Evidence", *Food Policy* 22 (3): 213-228.

Fan, S., and Pardey, P. (1997),"Government Spending on Asian Agriculture: Trends and Production Consequence", *Resource paper* presented in the study meeting on Agricultural Public Finance Policy, organized by Asian Productivity Organization, Taipei, June 4-12.

Fan, S., (1990), *Regional Productivity Growth in China's Agriculture*, Boulder, Colo: Westview Press.

Fan, S., (1991), "Effects of Technological Change and Institutional Reform on Production Growth in Chinese Agriculture," *American Journal of Agricultural Economics* 73 (2): 266-275.

Fan, S., (2000),"Research Investment and the Economic Returns to Chinese Agricultural Research", *Journal of Productivity Analysis* 14 (92): 163-180.

Fan, S., (2004),"Public Spending, Growth, Poverty Reduction in Egypt: a Multi-level Analysis", Contribution in the *IFPRI/API Collaborative Research Project: Public Policy and Poverty Reduction in the Arab Region.*

Fan, S., Hazell, P., and Thorat, S. (1999), "Government Spending, Agricultural Growth and Poverty: An analysis of Interlinkages in Rural India," *Research Report 110*, Washington, D.C.: International Food Policy Research Institute.

Fan, S., and Pardey, P., G., (1992), "*Agricultural Research in China: Its Institutional Development and Impact"*, The Hague: International Service for National Agricultural Research.

Fan, S., and Pardey, P., G., (1997), "Research, Productivity, and Output Growth in Chinese Agriculture", *Journal of Development Economics* 53: 115-137.

Fan, S., and Zhang, X., (2002),"Production and Productivity Growth in Chinese Agriculture: New National and Regional Measures", *Economic Development and Cultural Change*, 50(4):819-838.

Fan, S., Fang, C., and Zhang, X., (2001),"How Agricultural Research Affects Urban Poverty in Developing Countries: The Case of China", *EPTD Discussion Paper 80*, Washington, D.C.: International Food Policy Research Institute.

Fan, S., Zhang, X., and Robinson, S., (2003), "Structural change and economic growth in China", *Review of Development Economics*,7: 360-377.

Fazouane, A., (1999), "Pauvreté, Satisfaction des Besoins Essentiels et Mortalité des Enfants," in *Pauvreté, Satisfaction des Besoins Essentiels et Variables Démographiques au Maroc"*, *Série Études* de l'INSEA, Rabat.

Gottschalk, P. and Danziger, S., (1985),"A Framework for Evaluating the Effects of Economic Growth and Transfers on Poverty", *American Economic Review*, Vol. 75(1): 153-161.

Hatzfeld, H., (1971), *Du paupérisme à la sécurité sociale, 1850-1949*, éditions Armand Colin.

Laabas, B., and Limam, I., (2004),"Impact of Public Policies on Poverty, Income Distribution and Growth", Contribution in the *IFPRI/API Collaborative Research Project: Public Policy and Poverty Reduction in the Arab Region.*

Morrisson, C., (1991),"Ajustement et Equité au Maroc", *Études du Centre de Développement de l'OCDE*, Paris.

Petit, M., L., (1990), *Control Theory and Dynamic Games in Economic Policy Analysis,* Cambridge University Press, Cambridge.

Ravallion, M. and Chen, S. (2003),"Measuring Pro-Poor Growth", *Economic Letters*, 78(1): 93-99.

Ravallion, M., (1996),"Comparaisons de la pauvreté, concepts et méthodes", *Document de travail* n°122 de la Banque Mondiale.

Sagou M. (2005), "*Les Politiques Macro-Economiques : les Politiques Budgétaires et Monétaires du Maroc depuis Cinquante Ans et Perspectives pour les Vingt Prochaines Années*," chapter and contribution to thematic group 2 "*Croissance Economique et Développement Humain* " of the Rapport du Cinquantenaire on the « 50 ans de développement humain au Maroc » (RDH50).

Secrétan, P., (1959),"Sens et Non Sens de la Pauvreté", reprinted in *Problèmes Economiques N° 2386*, August 1994.

Sen, A., (1976),"Poverty: An Ordinal Approach to Measurement", *Econometrica* 48: 437- 446.

United Nations Development Programme (2003), Rapport sur le Développement Humain du Maroc ; Gouvernance et Accélération du Développement Humain.

United Nations Development Programme, various years, Human Development Report, éditions Economica.

World Bank, (1993), "Pauvreté, Ajustement et Croissance", *Rapport numéro* 11918-MOR. Volumes 1 and 2.

World Bank, (1996), "Une Croissance plus Forte, des Opportunités d'Emploi: des Choix à faire pour le Maroc", *Études Économiques sur le Moyen-Orient et l'Afrique du Nord.*.

World Bank, (2000), "*Kingdom of Morocco Poverty Update*", Volume I: Main Report.

World Bank, (2004), "Rapport sur la Pauvreté : Comprendre les Dimensions Géographiques de la Pauvreté pour Améliorer l'Appréhension à Travers les Politiques Publiques, " Groupe du Développement Economique et Social, Région Moyen-Orient et Afrique du Nord (Rapport numéro 28223-MOR.

World Development Indicators (WDI), World Bank. 2006.

Annex (1)
Definitions of the variables used in the models on the determinants of poverty at the household level

Variable	Definition
poids_men	household weights
lnrev_pc	log of income of head of household
lndep_pc	log of total expenditure of head household
milieu	urban (1) or rural (0)
sexecm	gender of head of household
cmanalphabe	head of household with no level of schooling and illiterate
cmalphabe	head of household with no level of schooling but literate
cm_prim	head of household finished primary schooling
cm_coll	head of household finished middle school level
cm_secon	head of household finished secondary schooling
cm_univ	head of household finished university studies
dispelec	household connected to electricity network yes (1), no (0)
aplog	economic activity in housing, yes(1), no (0)
lntoterre_cap	log of total land per capita owned by household
ratio_dep	dependency ratio in household
lnsalaire_papca	log of total salary per active member of household
gecm	age of head of household
agecmcar	square of age of head of household
eaupble	connected to drinking water network, oui (1), no (0)
disphone	telephone in house, yes (1), no (0)
emcm	head of household married (1), not married (0)
distcons_moy	average distance to health center
lnnb_betail_pc	log of total number of heads of livestock per head in the household
occup_cm	occupation of head of household
taille	household size
pauvre	poor (1), not poor (0)

Definitions of variables used in the regional simultaneous equations model (regional level)

Variable	Definition
pauv98	poverty rate in 1998
gini98	Gini coefficient in 1998
prd_ind98_pc	per capita industrial production in million of DH in 1998
tx_pauv94	regional poverty rate in 1994 according to the chart
depmoy_cap98	average per capita expenditure in 1998
dispensaire	number of health dispensaries in region
tx_alphu98	urban literacy rate for people 15 or older in 1998
tx_alphr98	rural literacy rate for people 15 or older in 1998
poptot98	total population in region in 1998
tx_urb98	urbanization rate in region in 1998
efempr98	number of permanent employees in industrial sector in 1998
electr98	total sales of electricity in millions of Kwh in 1998
product	index of average productivity per permanent employee in industrial sector in 1998

Annex (2)
Results of GAMS program of the second stage of proposed method (optimization model)

Table A1: Results of the models by economic region and scenario using a quadratic criteria

Poverty Rates

Region	Initial Value	Uniform Scenario		Poverty Scenario		Inequality Scenario		Growth Scenario	
		Value	**Var. %**	**Valeu**	**Var. %**	**Valeur**	**Var. %**	**Valeur**	**Var. %**
1. Oued Ed-Dahab – Lagouira	8.71	6.53	-25	6.53	-25	4.35	-50	8.89	2.08
2. Laâyoune - Boujdour - Sakia El Hamra	4.42	3.31	-25.01	3.31	-25	2.21	-50	4.42	0.2
3. Guelmim - Es-Semara	14.61	10.96	-25	10.96	-25	7.3	-50	14.64	0.25
4. Souss - Massa – Daraâ	16.81	12.61	-25	12.61	-25	8.99	-46.52	16.88	0.42
5. Gharb - Chrarda - Bni Hssen	28.58	21.44	-25	21.44	-25	18.41	-35.6	28.67	0.31
6. Chaouia – Ouardigha	9.94	7.46	-25	7.46	-25	7.4	-25.6	10.04	1.01
7. Marrakech - Tensift - Al Haouz	27.04	20.28	-25	20.28	-25	16.72	-38.18	27.08	0.16
8. Oriental	17.25	12.94	-25	12.94	-25	13.56	-21.36	17.34	0.56
9. Grand Casablanca	5.4	4.05	-25	4.05	-25	2.7	-50	4.05	-25.08
10. Rabat – Sale - Zemmour – Zaer	11.73	8.8	-25	8.8	-25	5.86	-50	11.82	0.8
11. Doukala – Abda	18.26	13.69	-25	13.69	-25	15.08	-17.42	18.48	1.22
12. Tadla – Azilal	21.33	15.99	-25	15.99	-25	15	-29.68	21.35	0.11
13. Meknes – Tafilalet	29.02	21.76	-25	21.76	-25	19.6	-32.46	29.08	0.2
14. Fes – Boulemane	29.34	22.01	-25	22.01	-25	19.59	-33.24	29.44	0.34
15. Taza - Al Hoceïma – Taounate	26.65	19.99	-25	19.99	-25	17.16	-35.6	26.66	0.05
16. Tanger – Tetouan	18.77	14.08	-25	14.08	-25	14.27	-24.01	18.87	0.53

Table (A2) : Results of the models by economic region and scenario using a quadratic criteria

Average per capita expenditure

Region	Initial Value	Uniform Scenario		Poverty Scenario		Inequality Scenario		Growth Scenario	
		Value	**Var. %**	**Valeur**	**Var. %**	**Valeur**	**Var. %**	**Value**	**Var. %**
1. Oued Ed-Dahab – Lagouira	12721	9540.75	-25	12721	0	9540.75	-25	12721	0
2. Laâyoune - Boujdour - Sakia El Hamra	12721	9540.75	-25	12721	0	9540.75	-25	12721	0
3. Guelmim – Es-Semara	12721	9540.75	-25	12721	0	10980.84	-13.68	12721	0
4. Souss - Massa – Daraâ	7585	5953.89	-21.5	7585	0	7585	0	7585	0
5. Gharb - Chrarda - Bni Hssen	6506	4879.5	-25	6506	0	6506	0	6506	0
6. Chaouia – Ouardigha	7480	6749.93	-9.76	7480	0	7480	0	7480	0
7. Marrakech - Tensift – Al Haouz	6713	5034.75	-25	6713	0	6713	0	6713	0
8. Oriental	7226	7915.95	9.55	7099.74	-1.75	7226	0	7226	0
9. Grand Casablanca	11685	8763.75	-25	11685	0	8763.75	-25	12776.89	9.34
10. Rabat - Sale - Zemmour – Zaer	10045	7533.75	-25	10045	0	8357.5	-16.8	10045	0
11. Doukala – Abda	6488	7590.81	17	6834.75	5.34	6488	0	6488	0
12. Tadla – Azilal	6914	5185.5	-25	6914	0	6914	0	6914	0
13. Meknes – Tafilalet	6551	4945.48	-24.51	6551	0	6551	0	6551	0
14. Fes – Boulemane	6996	5269.27	-24.68	6996	0	6996	0	6996	0
15. Taza - Al Hoceïma – Taounate	6132	4747.59	-22.58	6132	0	6132	0	6132	0
16. Tanger – Tetouan	7068	7481.63	5.85	7068	0	7068	0	7068	0

Table (A3) : Results of the models by economic region and scenario using a quadratic criteria

Gini coefficient

Region	Initial Value	Uniform Scenario		Poverty Scenario		Inequality Scenario		Growth Scenario	
		Value	**Var. %**	**Valeur**	**Var. %**	**Valeur**	**Var. %**	**Value**	**Var. %**
1. Oued Ed-Dahab – Lagouira	0.41	0.31	-24.8	0.37	-9.25	0.3	-26.11	0.41	0
2. Laâyoune - Boujdour - Sakia El Hamra	0.41	0.32	-19.98	0.39	-4.67	0.32	-20	0.41	0
3. Guelmim – Es-Semara	0.41	0.3	-26.11	0.34	-15.47	0.3	-26.11	0.41	0
4. Souss - Massa – Daraâ	0.38	0.3	-21.26	0.31	-18.96	0.3	-21.26	0.38	0
5. Gharb - Chrarda - Bni Hssen	0.41	0.3	-26.11	0.3	-26.11	0.3	-26.11	0.41	0
6. Chaouia – Ouardigha	0.33	0.3	-8.26	0.3	-8.26	0.3	-8.26	0.33	0
7. Marrakech - Tensift - Al Haouz	0.41	0.3	-26.83	0.3	-26.83	0.3	-26.83	0.41	0
8. Oriental	0.34	0.3	-11.5	0.3	-11.5	0.3	-11.5	0.34	0
9. Grand Casablanca	0.38	0.3	-20.21	0.35	-6.18	0.3	-20.21	0.38	0
10. Rabat – Sale - Zemmour – Zaer	0.39	0.3	-22.88	0.34	-12.96	0.3	-22 .88	0.39	0
11. Doukala – Abda	0.33	0.3	-10.18	0.3	-10.18	0.3	-10.18	0.33	0
12. Tadla – Azilal	0.37	0.3	-18.48	0.3	-18.48	0.3	-18.48	0.37	0
13. Meknes – Tafilalet	0.4	0.3	-24.05	0.3	-24.05	0.3	-24.05	0.4	0
14. Fes – Boulemane	0.4	0.3	-24.24	0.3	-24.24	0.3	-24.24	0.4	0
15. Taza - Al Hoceïma – Taounate	0.4	0.3	-24.05	0.3	-24.05	0.3	-24.05	0.4	0
16. Tanger – Tetouan	0.35	0.3	-13.79	0.3	-13.79	0.3	-13.79	0.35	0

Table (A4): Results of the models by economic region and scenario using an entropy criteria

Poverty Rates

Region	Initial Value	Uniform Scenario		Poverty Scenario		Inequality Scenario		Growth Scenario	
		Value	**Var. %**	**Valeur**	**Var. %**	**Valeur**	**Var. %**	**Value**	**Var. %**
1. Oued Ed-Dahab – Lagouira	8.71	4.35	-50	4.35	-50	4.35	-50	10.39	19.28
2. Laâyoune - Boujdour - Sakia El Hamra	4.42	2.21	-50	2.21	-50	2.21	-50	4.41	-0.03
3. Guelmim - Es-Semara	14.61	7.3	-50	7.3	-50	7.3	-50	14.56	-0.31
4. Souss - Massa – Daraâ	16.81	8.4	-50	8.4	-50	8.99	-46.52	16.74	-0.4
5. Gharb - Chrarda - Bni Hssen	28.58	14.29	-50	14.29	-50	17.89	-37.43	28.5	-0.3
6. Chaouia – Ouardigha	9.94	4.97	-50	4.97	-50	7.4	-25.6	9.84	-1.04
7. Marrakech - Tensift - Al Haouz	27.04	13.52	-50	13.52	-50	15.84	-41.41	26.99	-0.18
8. Oriental	17.25	8.62	-50	8.62	-50	13.56	-21.36	17.16	-0.51
9. Grand Casablanca	5.4	2.7	-50	2.7	-50	2.7	-50	5.9	9.22
10. Rabat - Sale – Zemmour – Zaer	11.73	5.86	-50	5.86	-50	5.86	-50	11.64	-0.72
11. Doukala – Abda	18.26	9.13	-50	9.13	-50	15.08	-17.42	18.48	1.21
12. Tadla – Azilal	21.33	10.66	-50	10.66	-50	15	-29.68	21.3	-0.11
13. Meknes – Tafilalet	29.02	14.51	-50	14.51	-50	19.6	-32.46	28.95	-0.23
14. Fes – Boulemane	29.34	14.67	-50	14.67	-50	19.59	-33.24	29.24	-0.36
15. Taza - Al Hoceïma – Taounate	26.65	13.32	-50	13.32	-50	17.16	-35.6	26.64	-0.03
16. Tanger – Tetouan	18.77	9.39	-50	9.39	-50	14.27	-24.01	18.67	-0.53

Table (A5): Results of the models by economic region and scenario using an entropy criteria

Average per capita expenditure

Region	Initial Value	Uniform Scenario		Poverty Scenario		Inequality Scenario		Growth Scenario	
		Value	**Var. %**	**Valeur**	**Var. %**			**Value**	**Var. %**
1. Oued Ed-Dahab – Lagouira	12721	9540.75	-25	12721	0	9540.75	-25	11653.02	-8.4
2. Laâyoune - Boujdour - Sakia El Hamra	12721	9540.75	-25	12721	0	9540.75	-25	12721	0
3. Guelmim - Es-Semara	12721	10916.62	-14.18	12721	0	10681.17	-16.04	12721	0
4. Souss - Massa – Daraâ	7585	8341.01	9.97	7585	0	7585	0	7585	0
5. Gharb - Chrarda - Bni Hssen	6506	8626.02	32.59	7620.25	17.13	6506	0	6506	0
6. Chaouia – Ouardigha	7480	9502.85	27.04	8520.34	13.91	7480	0	7480	0
7. Marrakech - Tensift – Al Haouz	6713	8310.95	23.80	7121.56	6.09	6713	0	6713	0
8. Oriental	7226	10252.35	41.88	9553.07	32.2	7226	0	7226	0
9. Grand Casablanca	11685	8844.94	-24.31	11685	0	8763.75	-25	11083.39	-5.15
10. Rabat - Sale - Zemmour – Zaer	10045	8594.19	-14.44	10045	0	8357.5	-16.8	10045	0
11. Doukala – Abda	6488	7505.17	15.68	9431.35	45.37	6488	0	6237.74	-3.86
12. Tadla – Azilal	6914	9558.47	38.25	8479.92	22.65	6914	0	6914	0
13. Meknes – Tafilalet	6551	8419.39	28.52	8592.71	31.17	6551	0	6551	0
14. Fes – Boulemane	6996	9115.53	30.30	8984.93	28.43	6996	0	6996	0
15. Taza - Al Hoceïma – Taounate	6132	8526.27	39.05	7428.38	21.14	6132	0	6132	0
16. Tanger – Tetouan	7068	10193.89	44.23	9230.03	30.59	7068	0	7068	0

Table (A6): Results of the models by economic region and scenario using an entropy criteria

Gini coefficient

Region	Initial Value	Uniform Scenario		Poverty Scenario		Inequality Scenario		Growth Scenario	
		Value	Var. %	Valeur	Var. %	Valeur	Var. %	Value	Var. %
1. Oued Ed-Dahab – Lagouira	0.41	0.31	-24.8	0.37	-9.25	0.3	-26.11	0.41	0
2. Laâyoune - Boujdour - Sakia El Hamra	0.41	0.32	-19.98	0.39	-4.67	0.32	-20	0.41	0
3. Guelmim - Es-Semara	0.41	0.3	-26.11	0.34	-15.47	0.3	-26.11	0.41	0
4. Souss - Massa – Daraâ	0.38	0.3	-21.26	0.31	-18.96	0.3	-21.26	0.38	0
5. Gharb - Chrarda - Bni Hssen	0.41	0.3	-26.11	0.3	-26.11	0.3	-26.11	0.41	0
6. Chaouia – Ouardigha	0.33	0.3	-8.26	0.3	-8.26	0.3	-8.26	0.33	0
7. Marrakech - Tensift - Al Haouz	0.41	0.3	-26.83	0.3	-26.83	0.3	-26.83	0.41	0
8. Oriental	0.34	0.3	-11.5	0.3	-11.5	0.3	-11.5	0.34	0
9. Grand Casablanca	0.38	0.3	-20.21	0.35	-6.18	0.3	-20.21	0.38	0
10. Rabat - Sale - Zemmour – Zaer	0.39	0.3	-22.88	0.34	-12.96	0.3	-22 .88	0.39	0
11. Doukala – Abda	0.33	0.3	-10.18	0.3	-10.18	0.3	-10.18	0.33	0
12. Tadla – Azilal	0.37	0.3	-18.48	0.3	-18.48	0.3	-18.48	0.37	0
13. Meknes – Tafilalet	0.4	0.3	-24.05	0.3	-24.05	0.3	-24.05	0.4	0
14. Fes – Boulemane	0.4	0.3	-24.24	0.3	-24.24	0.3	-24.24	0.4	0
15. Taza - Al Hoceïma – Taounate	0.4	0.3	-24.05	0.3	-24.05	0.3	-24.05	0.4	0
16. Tanger – Tetouan	0.35	0.3	-13.79	0.3	-13.79	0.3	-13.79	0.35	0

Chapter Seven

Public Policy and Poverty Reduction in Sudan, 1971-2002

Hatim Ameer Mahran

1. Introduction:

With a total area of 1690 million hectares, the Sudan has a relatively huge economic potential measured in terms of its endowments of natural resources, including arable and grazing land, water, mineral resources, and a diversified and pervasive climatic zones. Despite this, over the mid 1970s and the 1980s Sudan has faced serious economic difficulties which culminated in economic decline resulting from the adoption of IMF sterio-type adjustment policies, where real GDP has registered a negative growth rate of nearly 2.0%. The significant macroeconomic imbalances, increasing unemployment, and mounting poverty led in early 1990s to the adoption of adjustment and liberalization policies that are believed to be more stringent than what the IMF would have dreamt of. While real GDP has registered an impressive growth rate of 10.22% during 1990-2002, and the economy has shown some signs of recovery, poverty indicators have continued their upward trend. Mounting political pressure on the government both from internal and external forces, together with the escalation of the civil war in the south have all led to a reduction in foreign aid and to a significant increase in the resources devoted for the war. These developments have frustrated the concerted efforts that were being made to move the economy into a sustained growth path. Nonetheless, the advent of oil in late 1990s have contributed to a large extent to the relative economic stability that the Sudan has witnessed since then.

The available poverty indices suggest that poverty remains one of the most serious problems in Sudan and has become the major concern of the general public, the government, as well as national, regional, and international organizations. More than 90% of the population in Sudan are classified as poor, both in rural and in urban areas. Furthermore, key human development indicators such as literacy rates, life expectancy, and child mortality, are still far below the levels in many middle-income countries. Under the present circumstances, the prospects for the Sudan to achieve the MDG of halving the number of the poor between 1990 and 2015 seem to be bleak. Imaginative approaches should therefore be sought to score some success in this regard.

Despite the attempts that have been made, notably by Ali (1992a, 1994) and Elmulathum (1999), to examine the impact of adjustment and liberalization policies on poverty in Sudan over time, none of the existing studies have looked at the role that public policy could play in promoting economic growth and reducing poverty. Such an exercise is particularly important as the Sudan is undergoing three important processes, namely the economic liberalization process, the oil exploration process, and the peace process. Valuable insights can thus be gained to improve the allocative efficiency of the public resources expected to be saved from the peace process and generated from the oil exploration process, with a view of checking the expected rise in poverty emanating from the economic liberalization process (Dagdeviron and Mahran, forthcoming).

However, while the links between public policy and poverty reduction are not well understood, the methods for rigorous analysis of the impact of policy interventions on growth and poverty reduction also remain underdeveloped. The primary objective of this paper is to generate a better understanding among policymakers and research community in the Sudan of how public policy, including government current and capital spending, can reduce poverty. The approach we propose here focuses on the public policy instruments that could have a significant impact on the most important determinants of poverty, namely mean income and the income distribution parameters. Due to constraints imposed by lack of appropriate data, our approach consists of two stages, where simple econometric methods are used. In the first stage province-level household data is used to estimate the relationship between poverty and its determinants, namely mean income and the inequality parameter. In the second stage, national-level annual time-series data is used to estimate the relationship between real per capita income and some public policy variables for the period 1971-2002 and the sub-period 1990-2002. These relationships are then used to identify the public policy variables with significant effects on income growth and income distribution, and therefore on poverty reduction. Descriptive analysis of some broader issues related to poverty are also presented.

The rest of the paper is organized as follows. Section (2) reviews growth and poverty in Sudan since the 1970s, while section (3) discusses the trends in public policy with emphasis on the growth of major macro aggregates. Section (4) outlines an analytical framework for examining the links between public policy and poverty reduction, while section (5) presents some empirical results on the relationship between public policy, growth, and poverty. Section (6) concludes the paper with some promising policies for poverty reduction, with emphasis on the scope for public policy to influence economic performance in general and poverty reduction in particular.

2. Growth and Poverty in Sudan: A Review:

This section briefly reviews the Sudan's economy, its structure, and its poverty profile and trends since the 1970s to 1990s. Changes in policies are also highlighted with a view of providing an analytical base for the evaluation of the impact of public policies, including investment, government current expenditure, and development expenditure, on growth and poverty reduction.

2.1 Economic Growth:

The Sudan's economy has witnessed major transformations during the last three decades. Full government control over economic activities characterized the period of the 1960s, while an inward-looking strategy dominated development policy during the early 1970s and mid 1980s. Economic difficulties assumed crisis proportions during the second half of the 1970s, following the ambitious development program launched at early 1970s. The failure of the investment boom to increase the economy's productive capacity has accelerated the crisis. By the late 1970s, the government was confronted by falling export earnings, increasing import bill, accelerating budget deficit, and mounting foreign debt (Ali, 1985). In the face of continuous economic deterioration, economic reforms became inevitable. The worsening balance of payments and deepening foreign debt problem made the foreign sector the central policy target over the period 1978-1985. Thus, the government launched three short-term development programs, starting June 1978, with financial assistance from the IMF. These programs aimed at improving the current account, attracting foreign capital and foreign investment, increasing capacity utilization, reducing the rate of inflation, and promoting economic growth. However, until 1985, the final outcome of these policy packages was stagnation in exports, increase in imports, deterioration in the trade balance and the balance of payments, accumulation of foreign debt, soaring inflation rates, loss of the national currency of its purchasing power, and increasing poverty. According to Ali and Elbadawi (2003), the period 1975-1979 registered an overall average growth rate of 4.1% per annum, compared to an overall negative average growth rate of 1.21% per annum over the period 1960-1974. Despite this improvement in development performance, growth remained volatile with a coefficient of variation of 2.7. Furthermore, the period 1980-1989 registered negative and highly volatile growth rates (Ali and Elbadawi, 2003).

It has been a monumental task to move the economy dramatically from a state of downward trend and somewhat central control that characterized the period of the 1970s and 1980s, to a free-market economy where market forces set the rules of the game in resource allocation and economic growth in the 1990s. The strict demand management policies adopted over the 1990s, coupled with some supply measures, were meant primarily to stabilize the economy by curbing inflation, the rate of which declined from three-digits to nearly 5.0% in 2001. On the other hand, the exchange rate depreciated rapidly as a result of liberalization of foreign exchange market, though eventually stabilized due primarily to the oil discovery. The 1990s registered positive growth rates, with an annual average rate of 0.33% per annum during the first half of the decade. In contrast, the second half of the 1990s registered sustained and stable positive growth at progressively higher rates. According to Ali and Elbadawi (2003), this is the only half decade since the 1960s during which the economy has achieved sustained positive growth.

A number of other factors have also contributed to the frustration of the efforts that were made during the last three decades to arrest the economic decline and to achieve economic stability and growth. These factors include political instability and the prolonged civil war in the south. Needless to mention, the civil war has drained huge human, environmental, and financial resources with a considerable social cost. In particular, the huge resources drained by the war, and its destruction of the national wealth have affected public expenditure on social services such as health and education, putting more pressure on the poor segments of the society. A number of external factors have also contributed to the dismal performance of the economy during the 1970s and 1980s, prominent among which are the continuous worsening of the international economic environment, particularly the deterioration in Sudan's terms of trade, huge external debt arrears, and falling inflows of foreign resources. The situation was further aggravated by unfavourable weather conditions during the first half of the 1980s as a result of the severe and pervasive drought and desertification that affected most of production areas in the agricultural sector. With agriculture playing the leading role in economic activity, the deterioration in export competitiveness and in the terms of trade have hit hard on the rural poor in terms of agricultural employment and income.

2.2 Economic Structure and Sectoral Growth:

Efforts that were made during the last three decades toward changing the structure of the Sudan's economy have at best been frustrated. From table (1), we observe that while agriculture continued to play the leading role in economic activity, contributing an annual average of nearly 34.0% of GDP during the last three decades, its share in GDP has been falling over the decades from 38.0% during the 1970s to nearly 34.0% during the 1980s, and further to over 31.0% during the 1990s. Similarly, despite the efforts made toward import substitution, the annual average contribution of the industrial sector (which includes manufacturing and mining) to GDP has fallen from nearly 9.0% during the 1970s to nearly 8.0% during the 1980s and further to 7.5% during the 1990s. More important, the contribution of electricity and water, by far one of the most important infrastructure services for agriculture and industry, has remained virtually stagnant at its annual average level of 1.7% during the three decades, constituting a tight structural constraint on development and growth. Finally, the services sector had the lion share in GDP, which has exhibited a rising trend during the last three decades at the expense of agriculture and industry. This share, estimated at an annual average of nearly 52.0%, typifies the economic structure of many LDCs. It is therefore evident that the structural changes that have taken place during the last three decades favoured tertiary activities at the expense of productive activities in agriculture and industry.

Table (1)
Annual Average Sectoral Contribution to GDP, 1971-2002

Sector	1971-1980	1981-1990	1991-2002	1971-2002
Agriculture	38.1	33.6	31.2	34.0
Industry	8.9	7.9	7.5	8.1
Electricity & Water	1.6	1.8	1.6	1.7
Construction	4.2	5.2	3.8	4.4
Services	47.2	51.5	55.9	51.8
Total GDP	100.0	100.0	100.0	100.0

Source: Own calculations based on data from Bank of Sudan Annual Reports (various issues).

Since early 1990s, the Sudan has undergone a dramatic shift in policy toward economic liberalization and resource mobilization. Despite the shift in policy and the efforts that were made during the 1990s, together with the advent of oil, agriculture remains the backbone of the Sudan's economy. Currently it contributes an average of 31.0% of GDP, accounts for a large share of export revenue, and constitutes the main source of livelihood for more than 80% of the population. Also, the sector supplies nearly all raw materials for Sudanese agro-industries such as sugar, textile, leather, and food-processing, and plays a vital role in national food security (Mahran, 2000).

Arable land, estimated at 245 million hectares, represents 14.5% of the total area of the Sudan. Despite the abundance of water resources, it is estimated that 16.6 million hectares, representing 6.7% of the country's area and 51.2% of the total arable land, is currently under cultivation (Bank of Sudan, 2003). Sudan's agriculture is pervasive, and is divided into three main subsectors, namely the traditional rainfed subsector (10 million hectares), mechanized rainfed subsector (5 million hectares), and the irrigated subsector (1.6 million hectares), in addition to the forest and livestock subsector with an area of 25 million hectares. Diverse climatic zones, the available water resources from the rain and the river Nile and its tributories, together with fertile soil allowed the cultivation of a variety of crops, including cotton, sorghum, groundnut, sesame, gum Arabic, wheat, and sunflower. Excluding gum Arabic, these crops occupy together 40% of the total arable land (Bank of Sudan, 2003). Despite its huge natural endowments, Sudan's agriculture is still lagging behind that of similar economies (Mahran, 2000). While it was once classified as the 'bread basket' of the Arab World, Sudan was highly dependent on imports of food, particulaly wheat and sugar, due to government control over economic activities and the ensuing disincentives to produce.

The 1960s through the 1980s witnessed greater role for public sector in the economy. The government was involved in a wide range of activities from policy-making and implementation to production, pricing, and marketing. During the 1960s up to 1980s, the government intervened over the agricultural sector, dictating even the patterns of production of various crops. It exercised almost full control over production, marketing, and pricing of all major crops, as well as the supply of inputs including seeds, fertilizers, pesticides, and rural credit facilities. Moreover, exports and imports of various commodities were banned or subject to quota or prior approval. The ultimate objectives of these inward-looking development strategies, which dominated development policy during the 1960s through the 1980s, were to achieve food self-sufficiency, to provide food at subsidized prices for the urban sector, and to generate enough government revenue to finance industrial growth and government expenditure obligations. These policies were pursued more or less until 1992, when the government initiated major economic reforms aimed at liberalizing economic activities with a view of spurring growth.

Table (2) shows Sudan's sectoral growth performance for the last three decades. Agricultural GDP grew at an average real rate of 0.9 % per annum during the 1970s, declined at a rate of 1.1% during the 1980s, and accelerated at a rate of 4.8% per annum during the 1990s. Despite the fall in its share in GDP, a combination of factors may be cited for the accelerated growth of agriculture during the 1990s, important among which are the policy and institutional reforms. Indeed, a number of policy changes took place in Sudan's agricultural sector over the years. Some of the important recent reforms in agriculture include the gradual removal of government control over crop prices, the elimination of food and input subsidies, the reduction of tariffs and other protection measures, and the liberalization of the foreign exchange market. Despite these measures, however, Sudan's agriculture still suffers from problems of low yield, low productivity, and institutional impediments. Thus, Mahran (2000) for example, argues that "… the agricultural sector in the Sudan is far from being an economically viable sector with its inherent low productivity. The evidence in this regard suggests that yield per hectare in Sudan's agriculture falls well below that of high-yield countries. While yield per hectare of wheat represents 30% of that in Egypt, that of sorghum represents only 16% of that in the USA". Furthermore, low public investment in agricultural infrastructure such as irrigation, drainage, and improvement of crop varieties through agricultural research are also to blame. Agricultural production and productivity could be increased through the allocation of more resources to agriculture and/or through the improvement in agricultural technology and more investment in education, health, roads, markets, and infrastructure.

Table (2)
Annual Average Sectoral Growth Rates, 1971-2002
(Constant 1990 prices)

Sector	1971-1980	1981-1990	1991-2002	1971-2002
Agriculture	0.9	-1.1	4.8	1.6
Industry	0.3	0.7	6.3	2.6
Electricity & Water	-4.8	5.9	-2.5	-0.2
Construction	7.6	2.0	-1.8	2.3
Services	5.0	-1.8	12.2	5.1
Total GDP	2.7	-1.7	8.4	3.2

Source: Own calculations based on data from Bank of Sudan Annual Reports (various issues).

A characteristic feature of Sudan's industrial sector is its high dependence on processing agricultural raw materials. The main industries include sugar, textile, leather, food-processing, and cement. The government intervention in the economy since the 1960s through the 1980s was even greater in the case of industry. During the 1970s the state expanded its investment mainly in food-processing. A number of newly established public corporations were given the monopoly of cotton and oil seeds marketing, resulting in a rise in public sector share in trade and marketing from an annual average of 24% of imports and a negligible position in exports during the 1960s to over 35% of both exports and imports in 1970. The early 1970s witnessed the nationalization of a number of corporations, including commercial banks. The nationalization process was reversed almost abruptly in a matter of two years, while public sector expansion continued through the 1970s, and to a lesser degree in the 1980s, via new public investment in textile, spinning, weaving and tanneries, in addition to a few other sugar and food-processing units (Dagdeviron and Mahran, forthcoming).

At the heart of import substitution strategy is the protection of 'infant' industries through a restrictive trade regime and supportive domestic policies. Like the case of many developing countries, import substitution in Sudan aimed at reducing the high dependency on imported consumer goods, reliance on primary commodity exports (for which the terms of trade deteriorated), and achieving industrial development and faster growth. However, industry remained reliant on protection measures for prolonged periods that went far beyond what is implied by the term 'infancy' (Dagdeviron and Mahran, forthcoming). Protectionist policies favoured some key import substituting sectors such as spinning and weaving, which enjoyed effective protection rates as high as 700% compared to 57% for sugar (World Bank, 1987). In contrast, most agricultural crops appeared to be adversely treated. The discrimination against cotton, by far the most important export crop, was indisputable. It is argued that while industry remained the 'dandy boy' of the economy, Sudan's agricultural crops have suffered a significant effective taxation, both explicit and implicit. This bias was particularly obvious in the case of cotton and groundnuts, whose exports were valued at the (lower) official exchange rate while producers imported inputs were evaluated at the (higher) parallel rate, creating disincentives for producers (The Consultative Panel, 1977). Despite these policies, the share of industry (including electricity, water, and construction) in GDP declined from 8.9% over the 1970s to 7.9% during the 1980s (table 1), while it has registered annual average real growth rates of only 0.3% and 0.7% during the two decades, respectively (table 2). In addition to 'wrong' policies, this poor industrial performance may be attributed primarily to the fundamental structural deficiences which confronted the sector during the 1960s through the 1980s. Poor infrastructure resulted in factories operating at low levels of capacity because of inadequate supply of raw materials due to transport problems, reduction in operating time as a result of power failure, as well as lack of spare parts caused by shortages in foreign exchange.

Migration of highly qualified cadre to oil-rich Arab countries have aggravated the problem.

Two major developments have taken place during the 1990s with regard to Sudan's industrial sector, namely the adoption of the economic liberalization policies in 1992, and the advent of oil in 1998. The latter resulted in the introduction of new industries, including petroleum industry, some heavy industries for transportation and agricultural machinery, together with some metal industries. Despite this, the share of industrial GDP declined to an annual average of 7.5% during the 1990s, lower than its share during the 1970s and 1980s. This may be attributed to the expansion in the services sector, the share of which increased to nearly 56% of GDP (table 1). However, as a result of the assiduous efforts related to institutional and policy reforms initiated as early as 1992, together with the advent of oil, the industrial sector grew at an annual average rate of 6.3% during the 1990s, far higher than the growth rates of 0.3% and 0.7% during the 1970s and 1980s, respectively (table 2). This impressive growth performance of industry during the 1990s may be indicative of the greater potential role that the sector could play in the process of growth and development, particularly with the stimulus provided by the emerging oil industry and the decline in the foreign exchange shortages. In particular, the growth of the oil sector can play an instrumental role through the provision of vital inputs such as petroleum derivatives and energy supply, the development of infrastructure, especially transport, telecommunications, water, and electricity, and the promotion of social services such as health and education.

2.3 Poverty in Sudan:

Measuring poverty and tracing its trends over time are crucial for formulating national strategies for poverty reduction. To examine poverty trends over time, we rely on poverty indices estimated by Ali (1992, 1994), together with those estimated from two official surveys conducted by the Ministry of Manpower (MOM) in 1990 and 1996. In all these studies, poverty is measured by the three most commonly used indices, namley the incidence of poverty index (P_0), the depth of poverty index (P_1), and the severity of poverty index (P_2). It is well known that all three measures can be obtained as special cases of the class of poverty measures suggested by Foster, Greer, and Thorbecke (1984). Furthermore, while Ali (1994) defined the poverty line as the level of expenditure needed to meet the minimum food and non-food requirement, the analysis of the Ministry of Manpower are confined to the income poverty line. Although the results on poverty measures reported by Ali (1994) have been calculated from different sources, yet they have a number of advantages over others that were estimated for the Sudan. First, they are based on an extensive treatment of the available information obtained from different sources with the objective of catering for consistency and coverage of rural and urban settings as well as the whole of Sudan (for more details on this, see Chs. 3 and 5 of Ali, 1994). Secondly, a uniform methodology has been adopted to treat and update the data for all periods under consideration. Finally, the poverty results cover a time horizon ranging between 1968 and 1993, which makes it peculiar to all studies conducted on poverty in Sudan. Although the results of the MOM (1997) are not directly comparable with those of Ali (1994), due to differences in sample size, methodology, and purposes, yet they provide the most recent estimates of poverty in Sudan. Table (3) reports the results obtained by Ali (1994).

Table (3)
Poverty Measures (%) for Sudan, 1968-1993

Poverty Measures	Mode of Living	Actual Values				Trend Values		Effect of Policies	
		1968	1978	1986	1993	1986	1993	1978-1986	1978-1993
P_0	Rural	62.68	64.17	83.12	93.16	65.36	64.17	17.74	28.99
	Urban	15.90	20.51	52.86	84.43	25.15	30.05	27.71	54.38
	Sudan	51.59	54.26	77.80	91.41	56.47	58.48	21.33	32.94
P_1	Rural	28.11	30.56	51.67	62.61	32.57	34.65	19.10	27.97
	Urban	04.56	08.58	24.38	47.78	14.23	22.16	10.15	25.62
	Sudan	24.66	23.12	45.43	59.35	21.96	21.00	23.47	38.35
G	Rural	38.00	48.00	66.21	--	--	--	--	--
	Urban	41.00	40.00	55.14	--	--	--	--	--
	Sudan	44.00	46.00	64.08	--	--	--	--	--

Source: Compiled from Ali (1994)

It is clear from these results that poverty as measured by the poverty incidence (P_0) and poverty depth (P_1) indices has exhibited a consistent upward trend over the 1968-1993 period, which is particularly noticeable during the 1978-1986 period. Thus, rural poverty increased from 64.2% in 1978 to 83.12% in 1986. For urban areas, the increase in poverty was even more drammatic, as the incidence of poverty increased from 20.51% in 1978 to 52.86% in 1986. For the whole of Sudan, the incidence of poverty increased from 54.26% in 1978 to 77.80% in 1986. Ali (1994) attributed this drammatic increase in poverty to the adjustment policies adopted during the period 1978-1986. Netting out the secular trends in poverty measures, it is observed that the impact of adjustment policies adopted over the 1978-1993 was an additional increase in the head-count index from its trend value in 1986 by 21.33 percentage points for the Sudan, and by 17.74 and 27.71 percentage points for rural and urban areas, respectively. Furthermore, adjustment policies were also held responsible for the increase in the poverty gap index from its trend value in 1986 by 23.5 percentage points for the Sudan, and by 19.1 and 10.2 percentage points for rural and urban areas, respectively. Needless to mention, the standard IMF adjustment policy package focuses on demand management policies, ignoring to a large extent supply measures. Central to this package is the devaluation of the national currency, together with supportive policy measures that include cuts in public spending. For an economy characterized by severe supply-side constraints, such a package could at best be judged as irrelevant. It has resulted in more scarcity, rocketing inflation rates, huge budget and balance-of-payments deficits, economic stagnation, and widespread poverty.

While adjustment policies continued more or less until the late 1980s, the early 1990s witnessed the adoption of adjustment policies that are believed to be more stringent than those the IMF and the World Bank would have dreamt of. Furthermore, the year 1992 witnessed the adoption of economic liberalization policies. Ali (1994) examined the compound impact of adjustment and liberalization policies on poverty over the period 1978-1993. Once more, netting out the secular trends in poverty measures, Ali (1994) observed that the compound impact of these policies was an additional increase in the head-count index from its trend value in 1993 by 33.0 percentage points for the Sudan, and by 29.0 and 54.4 percentage points for rural and urban areas, respectively. Furthermore, these policies were also held responsible for the increase in the poverty gap index from its trend value in 1993 by 38.4 percentage points for the Sudan, and by 28.0 and 25.6 percentage points in rural and urban areas, respectively. It may also be observed that while until 1978 poverty was a rural phenomenon since 64.17% of the observed poverty was found in rural areas, the phenomenon has spread all over the country since 91.41% of the population have become poor in 1993, with the corresponding figures for rural and urban areas estimated at 93.16% and 84.43%, respectively (table 3).

The policies adopted since 1978 have also created more inequality. Thus, the Gini coefficient (G) increased from 46.0% in 1978 to 64.1% in 1986 for the Sudan, from 48.0% to 66.2% for rural areas, and from 40.0% to 55.14% for urban areas (table 3). Athough estimates of the Gini coefficient for 1993 are not available, it is more likely that inequality has increased from its 1986 level emphasising the upward trend in poverty. The root cause of the increase in inequality is ultimately related to the adjustment and liberalization policies adopted since the late 1970s. Rocketing inflation rates, which was related to the persistent conditions of scarcity and production rigidities, characterized the 1970s and 1980s. These were further aggravated by policy factors, inevitably leading to the emergence and growth of a sizeable black market for goods, services, and foreign exchange. The absence of control over financial institutions induced speculative practices and led to increased borrowing from commercial banks to finance such illicit yet lucrative activities, thereby diverting resources away from productive activities. The excess demand thus created had fueled the inflationary process, which was further aggravated by the credit facilities from commercial banks. The inflationary spiral of the 1970s and 1980s resulted in the loss of confidence in the national currency, thereby inducing holders of wealth to shift their resources to more secure assets (such as real estate, foreign currencies, and durable goods) as a store of value. The excess demand thus created for such assets had fueled the inflationary process. The cummulative impact of these developments manifested itself in the huge windfall gains that accrued to holders of wealth and to foreign exchange dealers, thereby skewing income distribution against the poor.

During the 1990s, the story was quite different. While some supply measures were adopted, strict demand management policies characterized the period. These policies were meant primarily to curb inflation, the rate of which declined from three-digits to nearly 5.0% in 2001. On the other hand, the exchange rate depreciated rapidly as a result of liberalization of the foreign exchange market, though eventually stabilized due primarily to oil discovery. The considerable depreciation of the exchange rate coupled with the fall in the inflation rate have given rise to real windfall gains to exchange dealers and foreign exchange holders, leading to more poverty and to a change in the income distribution in favour of the wealthy.

Based on the 1990 and 1996 Migration and Labour Force Surveys (hereinafter, MLFS) , the MOM (1997) also examined the trend and profile of poverty in the Sudan over the two periods. It is observed that between 1990 and 1996 the income poverty lines have increased at unprecedented rates, from Ls. 9624.32 to Ls. 420715.79 (i.e. at over 610% per annum) for urban areas and from Ls. 4152.24 to Ls. 284756.94 (i.e. at 96% per annum) for rural areas. The results of the 1996 survey provide a further evidence that poverty in Sudan has become a widespread phenomenon, regardless of the characertistics of the poor and the mode of living. With the exception of Greater Khartoum which registered the least poverty measures, more than 90% of households in all other regions were below the poverty line in 1996. For Greater Khartoum, the incidence of poverty was estimated at an average of 80.2%. Indeed, poverty in Greater Khartoum was at odds with other regions. While it registered the least poverty measures, Greater Khartoum had the highest income inequality as measured by the Gini coefficient. The incidence of poverty in other regions was dramatic. Thus, for example, Kordofan and Darfur regions registered the highest incidence of poverty estimated at 94.5% and 96.0%, respectively (MOM, 1997).

What characterize the poor in Sudan? Table (A.1) of the appendices reports poverty indices for 1990 and 1996, according to the main characteristics of the heads of poor households, namely region of residence, gender (male and female), sector of employment (agriculture, industry, services), and mode of living (rural/urban). It is clear that between 1990-1996 poverty incidence, depth and severity have increased dramatically in the rural areas of all regions. These results support the contention that adjustment and liberalization policies have hit hard on the rural poor. The results also indicate that between 1990 and 1996 the incidence of poverty among male-headed and female-headed households in urban areas has not exhibited a significant change. For rural areas, however, the increase in poverty was dramatic. Thus, for male-headed households the incidence of poverty increased from 65.3% in 1990 to 94.3% in 1996, while it increased from 82.8% to 89.9% for female-headed households. This may be explained in terms of the self-employment opportunities that women have created for themselves in the tertiary sector in the face of economic hardship, as well as by the built-in social solidarity system which provides help for the needy, particularly women. Over time, as adjustment and liberalization policies started to hit hard on almost every family, a significant increase is observed in both the depth and severity of poverty for all poor households in rural areas. Again, this result confirms an earlier observation that the rural poor have borne the brunt of adjustment and liberalization measures.

The occupatioal distribution of the employed suggests that those who work in agriculture represent 55.5% of the total employed (1.4% in urban areas and 54.5% in rural areas). This is a characteristic feature of the Sudan economy where agriculture is the dominant economic activity providing employment opportunities for the majority of the labour force, particularly in rural areas. It is also observed that the ratio of males to females in agricultural employment is 8.5 for urban areas and 1.7 for rural areas, typifying the importance of females in agricultural activities in rural areas relative to their counterparts in urban areas (MOM, 1997). The results in table (A.1) suggest that, irrespective of the economic sector where the head of household is employed, the incidence of poverty among urban households remained almost the same between 1990 and 1996, while it has increased significantly among rural households. The hardest hit in this respect were households headed by employees in the agricultural sector in rural areas, among whom the incidence of poverty increased from 63.8% in 1990 to 94.5% in 1996. For the same group, the depth and severity of poverty have also increased dramatically between 1990 and 1996, from 33.11% to 74.13%, and from 22.60% to 62.35%, respectively.

With regard to education, it is also observed that 35.2% of the population are illiterate (12.5% males and 22.7% females), while those with university education and above constitute 4.2% of the population (2.5% males and 1.7% females). Of the total illiterate, 15% were in urban areas (4.3% males and 10.7% females) and 85% in rural areas (31.2% males and 53.8% females). Of those with university education and above, 89.2% were in urban areas (50.4% males and 38.8% females) while 10.8% were in rural areas (8.9% males and 1.9% females). Although these results suggest a very high illiteracy rate at the national level, yet this rate is far higher in rural areas, particularly among females. Furthermore, at all levels of education, the results indicate the prevalence of high disparities not only between urban and rural areas, but also between males and females (MOM, 1996). From table (A.1) we observe that in both rural and urban areas, the incidence of poverty declines with educational level, reaching 74.2% and 72.2% in 1996 for those with university education in urban and rural areas, respectively. Of the total number of households whose heads attained an educational level below primary school, 78.6% were poor in 1990, increasing to 93.2% in 1996. On the other hand, for households whose heads attained a university education or above, 65.0% were poor in 1990, increasing to 67.1% in 1996.

According to the MOM (1997), the incidence of poverty in urban areas decreases monotonically with the incidence of migration among household working members, reaching its lowest level of 62.5% for households with migration incidence of 50% or more. However, for rural households with migration incidence exceeding 50% among working members, the incidence of poverty starts to rise. This may be attributed to the decline in production following the migration of a larger proportion of working household members (recall Sen's celebrated thesis that zero marginal productivity is neither necessary nor sufficient for the existence of surplus labour). On the other hand, returning migrants in urban areas contribute in alleviating poverty of their households only temporarily since some of them remain unemployed or underemployed, and their savings fall gradually and poverty incidence starts to rise. In rural areas, poverty incidence increases with the number of returning migrants (MOM, 1997).

The MOM (1997) also reported data on the type of assets (or durable goods) that the sample of households possesses, including houses, private cars, bicycles, refrigerators, washing machines, air conditioners, sewing machines, television sets, video machines, and radios. It is observed that 88.9% of households (66.1% in urban areas and 22.8% in rural areas) possess some sort of accommodation, be it a house/villa, an apartment, a shared house, a cottage, or a tent (Table A.2) Those who possess a house/villa, by far the most expensive type of accommodation, represent ony 31.4% of households, 16.2% in urban areas and 15.2% in rural areas. The cottage is the most commonly used type of accommodation where 48.6% of households live, with the majority (45.0%) in rural areas. Furthermore, households who own cottages represent 46.5% of total households, with 43.8% in rural areas. As for durable goods, although radio is probably the least expensive, it is owned by only 32.6% of households, 19.4% in urban areas and 13.2% in rural areas (Table A.3). Ownership of other assets is concentrated in urban areas. Thus, for example, almost all households who own video machines are found in urban areas, whereas those who own private cars represent only 7.4% of all households, with 6.0% in urban areas and 1.4% in rural areas.

The data of the 1996 MLFS also included information on some basic human needs, such as the sources of water and lighting. Sources of water for households include inside taps, outside taps, mobile water tanks, deep and surface wells, pits, river/canal, and others. We observe that inside water taps constitute the source of water for 30.1% of households, 24.3% in urban areas and 5.8% in rural areas. When outside taps are included, this percentage increase to 40.5 (28.5% in urban areas and 12.0% in rural areas). The majority of households, representing 42.2% of the total, obtain water from deep and surface wells (1.8% in urban areas and 40.4% in rural areas). Households which obtain water from other sources represent 17.3% of the sample, most of them are in rural areas (table A.4). Electricity constitutes the source of lighting for 29.5% of households, 23.9% in urban areas and 5.6% in rural areas, while kerosin is the source of lighting for 49.5% of households, 6.9% in urban areas and 42.6% in rural areas (table A.5).

3. Trends of Public Policy in Sudan, 1971-2002:

Although some controversey has surrounded its level, what is indisputable about poverty in Sudan is that it has been rising over the last three decades, with adjustment and liberalization policies contributing significantly to this upward trend. Poverty is multi-dimensional in nature and is influenced by a wide range of variables. With poverty incidence estimated at more than 90% of the population, the whole set of macroeconomic policy instruments becomes relevant in any meaningful strategy for poverty reduction. To gain more insights on the causes of the upward trend in poverty, this section examines the trends in some macro aggregates as well as in public policy variables over the last three decades. Such an examination is useful in highliting the general performance of the economy and in identifying some important public policy variables that may induce poverty reduction. In this respect, we may note that the 1990s is the decade that has witnessed a dramatic shift in policy toward liberalization, and that these policies are still being adopted. Furthermore, while high levels of poverty evolved since early 1970s, these levels have increased at accelerating rates during the 1990s. For these reasons, more attention in the analysis will be given to the sub-period 1990-2002.

In addition to investment, the variables of interest include GDP by economic sector, government current expenditure, and development expenditure. Annual time-series data for the period 1971-2002 obtained from various issues of the Bank of Sudan Annual Reports were used to estimate the time trends of the real values (at January 1990 prices) of these variables. Trend estimates are based on the standard inverse semilogarithmic (log-lin) trend equation in the natural logarithm. The regression results are reported in tables (4)-(6) below for the 1990s onwards (for the 1971-2002 results see tables A.6-A.8 of the appendices). The figures inside the parantheses are the absolute t-ratios of the estimated parameters, those inside the square brackets are the significance levels, and the last column reports the estimated real growth rate of the variables that exhibited a statistically significant trend. All the equations for which the results indicated the presence of autocorrelated disturbances have been corrected in the usual manner.

The results related to the trends and growth rates of overall GDP, sectoral GDP, and per capita income (y) for the period 1971-2002 suggest that, with the exception of the trend coefficients for GDP, industry, and services, all other trend coefficients are negative (Table A.6). Furthermore, the estimated trend coefficients for all variables turned out to be statistically insignificant. These results indicate that in their totality, the last three decades were at best characterized by economic stagnation, if not by economic decline. Such a dismal economic performance is a natural outcome of the diversity and complexity of the problems that the economy has encountered over the three decades, including mis-conceived economic policy, political instability, economic sanctions, internal and external pressures, social strife, and the inflationary spiral. In particular, the prolonged civil war has not only drained enormous resources, but has also inflicted a massive destruction on national wealth, thereby grossly undermining the growth and development efforts. The general economic stagnation that characterized the last three decades may provide an evidence for the upward trend in poverty.

Desite the dismal economic performance during the last three decades, the period 1990-2002 witnessed an impressive growth performance for GDP, industry, services, and per capita income (table 4). We observe that the impressive growth performance of the services sector is wiped out by the dismal performance of construction and ‘other’ sectors. For the productive sectors, the trend of agricultural GDP is insignificant, though positive, while industry has been the star performer, growing at nearly 6.0% over the period in line with per capita income. Electricity, by far an important infrastructure, has exhibited a negative, though insignificant, downward trend, which might have constrained further growth, particularly in industry.

Table (4)
Trends and Growth of GDP by Economic Sector (1990-2002)

Variable	Constant	Trend Coefficient	R^2	Adjusted R^2	F	DW	Growth Rate (%)
ln Agriculture	5.0923 (6.143) [0.000]	0.0177 (0.592) [0.569]	0.037	-0.176	0.350	1.811	--
ln Industry	2.6073 (2.981) [0.015]	0.0573 (1.823) [0.102]	0.270	0.108	3.325	1.441	5.90
ln Electricity	3.6087 (4.719) [0.001]	-0.0417 (1.507) [0.166]	0.201	0.024	2.270	1.561	--
ln Construction	4.4030 (14.156) [0.000]	-0.0237 (2.181) [0.052]	0.302	0.238	4.755	1.656	-4.08
ln Services	1.0671 (1.236) [0.248]	0.1853 (6.118) [0.000]	0.806	0.763	37.435	0.902	20.36
ln Other	6.1640 (3.905) [0.002]	-0.1950 (3.241) [0.008]	0.488	0.442	10.503	1.526	-17.72
ln GDP	4.1707 (12.221) [0.000]	0.0973 (7.794) [0.000]	0.871	0.842	60.743	1.173	10.22
ln y	1.9490 (5.388) [0.000]	0.0573 (4.161) [0.002]	0.611	0.576	17.314	1.243	5.90

Source: Own calculations based on data compiled from Bank of Sudan , Annual Reports, various issues.
The category "Services" includes transportation, commerce , government and other services.

The results on the trends and real growth rates of some important public policy variables for the 1971-2002 period suggest that while investment and current expenditure have exhibited no signifcant trends, development expenditure and expenditure on social services have declined at annual average rates of 4.8% and 4.9%, respectively, over the last three decades (Table A.7). In contrast, the results for the 1990-2002 as reported in table (5) suggest that while investment and current expenditure have exhibited signifcant upward trends, with growth rates of 15.8% and 8.6% respectively, the trends of development expenditure and expenditure on social services turned out to be insignificant. These results provide a clear evidence for the dramatic shift in policy, particularly for the assiduous efforts that have been made since early 1990s to create a more conducive environment for the attraction of more investment.

Table (5)
Trends and Growth of Public Policy Variables (1990-2002)

Variable	Constant	Trend Coefficient	R^2	Adjusted R^2	F	DW	Growth Rate (%)
ln Investment	0.716 (1.160) [0.270]	0.147 (6.273) [0.000]	0.782	0.762	39.352	1.484	15.84
ln Current Expend	2.085 (2.298) [0.047]	0.082 (2.479) [0.035]	0.406	0.274	6.144	1.475	8.55
ln Development Expend	2.885 (2.662) [0.022]	-0.012 (0.285) [0.781]	0.007	-0.083	0.081	1.225	--
ln Social Services	0.856 (0.425) [0.679]	0.023 (0.298) [0.771]	0.008	-0.082	0.089	1.772	--

Source: Own calculations bassed on data compiled from various issues of Bank of Sudan annual reports and from the Cenral Bureau of Statistics, Khartoum.

Government current expenditure is decomposed into five categories, namely economic services, social services, loans repayment and debt-servicing obligations, defence and security, and others. An examination of these components suggests that they have exhibited an upward trend over the 1990s. The highest real growth rate was registered for the expenditure on defence and security, followed by expenditure on loans repayment. These observations may all be explained in the context of an already poor economy that is devastated by civil wars and social conflicts, and further burdened with heavy debt and debt-servicing obligations. With meager financial resources, expenditure on items such as defence and security and repayment of foreign-debt obligations would undoutedly take place at the expense of expenditure on economic and social services, particularly education and health.

Development expenditure is yet another important public policy variable through which the government could influence sectoral development and growth, as well as poverty alleviation. It comprises development outlays to different sectors, including agriculture, industry, transport and communication, and services. Despite the concerted efforts that have been made in the development front during the 1990s, these efforts failed to show up in sectoral growth performance for the 1971-2002 period (Table A.8). Real development outlays for agriculture, transportation, and services have exhibited significant downward trends over the last three decades, declining at annual average rates of 5.23%, 8.84%, and 6.03%, respectively. For industry, while the downward trend in development outlays was statistically insignificant during 1971-2002, they have increased at a phenomenal rate of over 33.0% during the 1990s (table 6). Once more, this may be attributed to the efforts that are being made since the early 1990s toward industrial development and the increasing attention accorded to industry in an attempt to arrest the decline of the sector. These efforts are in line with the declared objectives of utilizing the resource endowments, realizing full utilization of existing capacities in the manufacturing sector, and diversifying the economy by developing new industries and consolidating import substitution. The significant rate of decline in real development outlays for transportation over 1971-2002, though arrested during the 1990s, provides yet another evidence for the bottlenecks in infrastructure that have constrained development and growth.

Table (6)
Trends and Growth of Development Expenditure by Economic Sector (1990-2002)

Variable	Constant	Trend Coefficient	R^2	Adjusted R^2	F	DW	Growth Rate (%)
ln Agriculture	-0.145 (0.167) [0.871]	0.048 (1.444) [0.177]	0.159	0.083	2.084	1.844	--
ln Industry	-7.094 (3.462) [0.005]	0.286 (3.670) [0.004]	0.550	0.510	13.466	2.523	33.11
ln Transport	-0.502 (0.166) [0.872]	0.022 (0.203) [0.844]	0.005	-0.217	0.041	1.464	--
ln Services	1.331 (1.295) [0.222]	-0.034 (0.854) [0.411]	0.062	-0.023	0.730	2.739	--

Source: Own calculations based on data compiled from Bank of Sudan Annual Reports, various issues. Since 1999, new items have been introduced such as social development, peace and settlement program, development reserve, and industrial development. The first three items are added to 'Others', while the fourth is added to 'Industry and Mining'. Also during the period 1993-1999, the category 'Other' includes capital transfers

4. Public Policy and Poverty: An Analytical Framework:

While the links between public policy and poverty reduction are not well understood, the methods for rigorous analysis of the impact of policy on growth and poverty reduction remain underdeveloped. With the advent of structural adjustment programs, two approaches were proposed at the theoretical level to examine the policy impact on poverty, namely the qualititative (indirect) approach and the quantitative (direct) approach. The first approach is based on the Stolper-Samuelson theorem of the relationship between the factor-price ratio and commodity-price ratio in a two-good model economy, and focuses on the effects of changes in the latter (triggered, for exampe, by devaluation as related to expenditure-switching policies or by fiscal measures such as taxes and subsidies) on the former. The quantitative approach is based on an explicit geneal equilibrium model where the impact of policy is traced through the interaction of a large number of equations. However, Kanbur (1987) argues that these models have been subject to a number of criticisms, most important of which are the data requirement and the classification of the institutions on which they are built. Needless to mention, the general equilibrium framework also requires the endogenization of the particular poverty measure.

Poverty is multi-dimensional in nature, and is affected by a large set of complex and interrelated endogenous and exogenous factors. As such, the interaction between policy variables with the poverty index could alternatively be captured by a simultaneous equations model. Once more, such a framework faces some problems and constraints. The size of such a system will increase as more poverty-related variables are incorporated, which will more likely give rise to specification problems and measurement errors, particularly with sample data. Most important, the adoption of a simultaneous equations framework requires either time-series data at the national level or cross-section data at the regional level. For the case of Sudan, while data on poverty indices and its related determinants are available at the province level, only complete national-level data are avaiable on some of the policy variables. Based on these difficulties, this section outlines a rather simple two-stage approach for analysing the links between public policy and poverty reduction in Sudan. In the first stage we specify the relationship between the poverty index and its determinants. The second stage involves an examination of the public policy variables that may have favourable impact on poverty determinants. Both relationships could then be used at the empirical level to identify the most important public policy tools that could lead to poverty reduction. This is in line with the direct quantitative approach proposed by Kanbur (1987) and Kakwani (1990), which involves tracing the mechanism of the impact of policy on a convenient poverty index

Although poverty is influenced by a wide range of factors, its determinants have rightly been summarized into the three variables that enter directly in the calculation of the most frequently used poverty measures, namely average income of society (y), the poverty line (Z), and the Gini coefficient (G). As such, the use of *ad hoc* specifications (such as those which add more variables to the poverty equation) might not give valuable insight into the poverty mechanism and the areas for policy intervention. Thus, with (P) denoting the poverty index, we have:

$$P = P(y,Z,G) \qquad (1)$$

These poverty determinants, in turn, are influenced by a large set of policy variables, which constitute the core variables for any meaningful analysis of the causes of poverty and its alleviation. Our next task, therefore, is to outline the contentions related to public policy, growth, and poverty. In this respect, we first note that within the context of a strategy for dealing with poverty, the World Bank (1990) proposed a number of policy interventions that are believed to be most important in poverty alleviation. Such policies should be geared toward empowering the poor by providing them with the opportunities that enable them to participate in the growth process. More specifically, the policies should aim at the realization of four important objectives. First, and foremost, is the realization of overall development; secondly, increasing the participation of the poor in the growth process by increasing their access to land, credit, and public infrastructure services; thirdly, facilitating outmigration in resource-poor regions where population is increasing, poverty and environmental degredation are interrelated, and the potential for growth is limited; fourthly, meeting basic needs, maintaining or increasing yield, and preserving natural resources by undertaking additional investment with government subsidies in resource-poor regions (World Bank, 1990).

After ten years of the publication of the 1990 World Development Report, and in the absence of serious actions to deal with the poverty phenomenon since then, the international community, represented by leaders from 189 countries, has adopted the broader recommendation of the United Nations Millennium Summit held in New York in September 2000, namely the creation of a fairer and more stable world. This broader objective is spelt out in terms of what has come to be known as the eight millennium development goals (MDGs), namely eradicating extreme poverty and hunger; achieving universal primary education; empowering women and promoting gender equality; reducing child mortality; improving maternal health; combating HIV/AIDS, malaria, and other diseases; ensuring environmental sustainability; and enhancing global partnership for development. The core objective of the eight MDGs is to reduce by 50% between 1990 and 2015 the number of people who live on less than $1.0 a day. In a nutshell, the achievement of this goal and the realization of the good intentions of the international community rest on building economic growth that spurs sustained growth in average per capita income. However, achieving sustained economic growth depends crucially on a number of various and complex internal and external factors. These include the skills and abilities acquired by the population through education, training and good health, the soundness of government economic and social policies, the strength of institutional and legal framework, good governance, and the willingness of the industrial countries to open their markets to exports of less developed countries.

In addition to good governance and sound macroeconomic policies, sustained economic growth also depends crucially on the provision of better and reliable infrastructure. Indeed, there is increasing recognition of the vital role that infrastructure could play not only in inducing faster economic growth but also in reducing poverty. Infrastructure may induce faster economic growth by increasing capacity utilization, speeding service delivery, and improving human development. On the one hand, investment decisions depend to a large extent on the provision of adequate and reliable infrastructure services such as telecommunication, information technology, roads, electricity, water, sanitation, education, and health services. Thus, for example, adequate and reliable electricity services have proven to be highly important in increasing capacity utilization, inducing growth, and reducing poverty. On the other hand, contaminated water increases poverty through the increase in disease incidence and reduction in labour productivity and growth. This is particularly the case in poor families characterized by low level of education and health knowledge, especially among women. Since these are all dimensions of poverty, the combination of investment in infrastructure with investment in human capital constitutes important and complimentary ingredients of poverty-reduction strategies.

Effective fiscal policy can also be used to spur growth and revive a stagnant economy. What needs to be explored in this respect for a developing economy is the causal relationship between growth (say, of real per capita GDP) on the one hand, and quantitative fiscal adjustment (improvement in the fiscal balance), expenditure composition (wages and salaries, development expenditure, and social services such as education and health), and sources (domestic and foreign) of financing budget deficits on the other hand.

In theory, trade could play an important role in enhancing growth in most developing countries. In reality, however, this thesis has been violated for long periods of time through trade barriers imposed by the developed world on exports from the developing world. It has long been argued that reduction or elimination of the high tariffs on exports of agricultural products, processed foods, and textiles from developing countries could play a vital role in generating substantial income gains for developing countries, and should be given priority in any poverty-reduction strategy sponsored by the international community. Given this, the ability of developing countries to exploit improved market access depends to a large extent on the efforts they make toward improving productivity and competitiveness, increasing investment in trade-related infrastructure, and adopting sound trade reforms, which are crucial measures for improving price and non-price competitiveness and for penetrating international matrkets.

Additional foreign aid to developing countries could be complementary to trade in a number of respects. It could benefit these countries in developing adequate infrastructure and in taking advantage of the resulting opportunities to expand exports. In pursuit of such policies, however, account should be taken of the lessons learnt from past experiences when the financing provided to these countries did not generate the expected growth and has trapped these economies in debt crisis. In this respect, both aid recipients and donnors were to blame. Policy deficiencies, poor governance, weak institutions, corruption, poor debt management, vulnerability to exogenous shocks, and civil wars and social strife are among the most important factors that explain the dissonance between debt and growth in developing countries. From the donors side, such factors include nonconcessional lending and financing policies, unfavourable lending terms, and political considerations. To avoid falling in another debt trap, developing countries need to design a sound borrowing strategy that strikes a careful balance between the amount of borrowing they require to finance development and their ability to servicing and repaying the debt.

Developing countries are also more vulnerable to internal and external shocks as well as to natural disasters. Desertification, drought, floods, and civil wars are all examples of negative internal shocks, while deterioration in the terms of trade, and conflicts in neighbouring countries are examples of negative external shocks that are beyond the control of these countries. Because of such shocks and their high incidence, any economic progress that these countries may achieve is deemed fragile. In addition to physical damage and income losses, shocks will more likely hamper production and investment, reduce growth and employment, and upset macroeconomic balances, thereby leading to slower growth and high incidence of poverty.

From the above contentions, we observe that growth and equity constitute the central objectives of all policy interventions proposed by the World Bank for poverty reduction. Thus, an examination of the effects of policy variables on growth and equity becomes important. In line with the determinants of poverty, the two variables which represent the growth and distribution objectives of public policy are real per capita income of society (y) and the Gini coefficient (G). Once the effects of public policy on these two determinants of poverty is known, inferences could easily be made on the effects of policies on poverty. This is the approach that will be adopted here. In the next section we report the empirical results.

5. The Impact of Public Policy on Poverty in Sudan: The Empirical Results:

We mentioned earlier that because of data limitations, our approach involes two stages. In the first stage, province-level data compiled from the 1996 MLFS are used to estimate a log-linear relationship between the particular poverty index and its determinants, namely the real average income (y) and the Gini coefficient (G). In the second stage, national-level data compiled from the Bank of Sudan Annual Reports is used to estimate the relationship between real per capita income and a set of public policy variables. Ordinary least squares method is used to estimate both relationships. In passing we may note that, with widespread poverty where more than 90% of the population are below the poverty line, all macroeconomic policy instruments become relevant for a comprehensive poverty reduction strategy. Despite this, we focus here on investment and some public policy variables, including government current expenditure, development expenditure, and expenditure on social services. While education and health are two important correlates of poverty, a complete and reliable set of data on these two variables either at the household or national levels, are not available for the period under study. With such high poverty levels, it seems reasonable to generalize results from province level analysis of the first stage to national level analysis of the second stage. Despite data limitations, it is hoped that our approach will provide some valuable insights into areas where government interventions for poverty reduction are most important.

Based on the above, we have applied OLS method on data for the thirty six provinces covered by the 1996 MLFS to estimate a log-linear relationship between each of the three poverty indices and their determinants. In this respect, given the zero homogeneity of the poverty measures in income (y) and the poverty line (z), one may be tempted to estimate these relationships with (y/z) and the Gini coefficient (G) as explanatory variables. However, because data on the poverty lines by province are not available, the relatioships have been estimated with real per capita income (y), defined as nominal income at the province level deflated by the 1996 consumer price index, and the Gini coefficient (G). Table (7) reports the results, with the absolute t-ratios of the estimated parameters given in parentheses, and the significance levels for the estimated parameters given inside the square brackets.

Table (7)
Province-Level Regressions on the Determinants of Poverty

Dependent Variable	Coefficients		R^2	Adjusted R^2	F Ratio
	ln y	ln G			
ln P_0	-0.102 (2.415) [0.021]	1.253 (19.396) [0.000]	0.998	0.998	7673.008
ln P_1	-0.200 (4.334) [0.000]	1.341 (19.085) [0.000]	0.997	0.997	5814.218
ln P_2	-0.262 (5.357) [0.000]	1.387 (18.591) [0.000]	0.996	0.996	4696.401

Source: Own estimation.

It is clear from these results that the estimated relationships are highly statistically significant, as indicated by the exeptionally high values (for a cross-section data) of R^2 and hence the F-ratios. Furthermore, all elasticities for all poverty indices related to income and the distribution parameter are highly statistically significant and have the expected signs. We also observe that the absolute values of the elasticities of the incidence of poverty index (P_0) with respect to both income and the distribution parameter are the lowest, while they are the highest for the severity of poverty index (P_2). Finally, it is also clear from the results that the elasticites of all poverty indices with respect to the distribution parameter are higher than the income elasticities. These results provide a strong evidence that the increase in income inequality has played a more significant role in the increase in poverty.

The implications of these results are obvious. First, although both income growth and an improvement in income distribution are important ingredients for poverty reduction, the role that more equity in the distribution of income could play in this respect is more important. With an economy that has been stagnant, if it has not declined, for three decades, the rise in poverty must be ultimately related to a deterioration in income distribution. Secondly, while these ingredients are important for reducing all poverty indices, the role that each of them could play in this respect becomes more pronounced as we move from the incidence, to the depth, and to the severity of poverty indices.

Having established the significance of income growth and an improvement in income distribution as two important ingredients for poverty reduction, the question that arises relates to the policies that spur economic growth and improve equity. In particular, what are the public policies that could be adopted which give rise to an increase in real per capita income and hence to a reduction in poverty? Along the same lines, what are the policy measures that enhance a more equitable distribution of income and poverty reduction? We turn our attention to these and other related questions.

First, we examine the impact of public policy on real per capita GDP. To this end, we have used annual time-series data for the period 1971-2002 to estimate a simple inverse semilogarithmic (log-lin) relationship between real per capita GDP (expressed in natural logarithm) and a set of public policy variables. In addition to investment (INVS), the public policy varaibles considered in the analysis include government current expenditure (CE), development expenditure (DE), and expenditure on social services (SS), all of which are expressed as percentages of GDP. As such, when multiplied by 100, all estimated coefficients of these variables are interpreted as the percentage change in real per capita GDP resulting from a change in the policy variable (as percentage of GDP) by one percentage point. The results reported in table (8) below represent the best regressions for a good numer of model specifications that have been attempted (including those with development expenditure by economic sector), where the figures in parantheses are the t-ratios of the estimated parameters, and those inside the square brackets are the significance levels of the parameters.

Table (8)
Regressions of Poverty-Related Policy Variables on Real Per Capita GDP (1971-2002)

Eq. No.	Constant	Coefficients				R^2	Adj. R^2	F	DW
		CE	DE	SS	INVS				
1	2.922 (17.768) [0.000]	0.0139 (1.283) [0.210]	0.0040 (0.118) [0.907]	0.0183 (0.364) [0.719]	0.0357 (3.212) [0.003]	0.447	0.365	5.450	1.211
2	2.915 (19.369) [0.000]	0.0149 (2.453) 0.021]		0.0162 (0.351) [0.728]	0.0362 (3.576) [0.001]	0.446	0.387	7.528	1.210
3	2.920 (18.047) [0.000]	0.0160 (1.791) [0.084]	- 0.0005 (0.014) [0.989]		0.0360 (3.303) [0.003]	0.444	0.384	7.454	1.182
4	2.921 (19.853) [0.000]	0.0159 (2.999) [0.006]			0.0360 (3.616) [0.001]	0.444	0.406	11.58 0	1.181

Source: Own cestimation.

The regression results in table (8) suggest that, while investment (INVS) is consistently statistically significant in explaining real per capita income in all equations, equation (4) of the table turned out to be the best fitted equation, with coefficients for investment (INVS) and current expenditure (CE) estimated at 0.036 and 0.016, respectively. These estimated coefficients suggest that an increase in the share of investment and current expenditure in GDP by one percentage point increases real per capita income by 3.6% and 1.6%, respectively.

With the dramatic shift in policy during the 1990s, it might be instructive to examine the impact on growth and on poverty reduction of public policy adopted during that decade under the umbrella of economic liberalization policies. This is particularly important in view of the impressive growth performance that the economy has achieved over the 1990s, which was undermined by the dismal economic performance during the 1970s and 1980s (table 2). Before doing so, however, we hasten to note that, because the annual time-series data available for the period 1990-2002 may not permit enough degrees of freedom in the analysis, the regression results from such an exercise should be taken with some caution. Furthermore, an examination of the trends of these policy variables over the 1990s indicates that with the exception of investment, the shares of all other variables in GDP have exhibited downward trends over the decade (Table A.9). Moreover, despite the significant downward trend in the share of development expenditure in GDP, that of industry has exhibited a significant upward trend at the expense of other sectors (Table A.10). These observations provide yet another evidence for the attention accorded to industry during the 1990s.

The regression results related to policy variables on real per capita GDP are reported in table (9), where DIND denotes development expenditure in industry. We observe that investment is the only statistically significant variable in explaining real per capita GDP over the 1990s. Furthermore, while the coefficient of development in industry has the expected sign, it turned out to be statistically insignificant. In view of the efforts that have been made and the impressive growth performance of industry during the 1990s, this result may suggest that the industrial sector has not yet recovered from the effects of the past policies which crippled its growth, and has not yet gained new and enogh momentum to contribute significantly to income growth. Equation (7) of table (9) is the best fitted equation, with a coefficient for investment as a ratio of GDP estimated at 0.0505, meaning that an increase in the share of investment in GDP by one percentage point increases real per capita income by 5.1%.

Table (9)
Regressions of Poverty-Related Policy Variables on Real Per Capita GDP (1990-2002)

Eq. No.	Constant	Coefficients				R^2	Adj. R^2	F	DW
		CE	DIND	SS	INVS				
1	3.230 (13.813) [0.000]	-0.0220 (1.496) [0.173]	0.3150 (1.232) [0.253]	-0.0888 (1.692) [0.129]	0.0347 (2.396) [0.043]	0.771	0.657	6.744	1.415
2	3.178 (13.435) [0.000]	-0.0206 (1.365) [0.205]		-0.0939 (1.746) [0.115]	0.0456 (3.859) [0.004]	0.728	0.637	8.024	1.374
3	2.899 (18.400) [0.000]		0.320 (1.112) [0.292]		0.0390 (2.489) [0.032]	0.633	0.560	8.640	1.447
4	3.091 (12.178) [0.000]	-0.0189 (1.143) [0.280]			0.0452 (3.483) [0.006]	0.636	0.563	8.725	1.149
5	2.954 (19.330) [0.000]		0.286 (1.049) [0.321]	-0.0842 (1.507) [0.166]	0.0409 (2.761) [0.022]	0.707	0.610	7.250	1.307
6	2.946 (16.041) [0.000]				0.0439 (2.852) [0.016]	0.425	0.373	8.134	1.554
7	2.922 (19.400) [0.000]			-0.0891 (1.593) [0.142]	0.0505 (4.295) [0.002]	0.672	0.606	10.221	1.274

Source: Own estimation.

So far we have been setting the stage. In view of the results of tables (7), (8) and (9), it is a straighforward exercise to calculate the impact of policy on poverty. In particular, we calculate the percentage change in the poverty index resulting from an absolute change in the policy variable by one percentage point. The focus here will be on the impact of policy-induced growth in real per capita income on poverty. Given the definitions of the variables in the regressions, the percentage change in the poverty index (P), denoted ΔP, resulting from policy-induced change in real per capita income (y), is given by :

$$\Delta P = \frac{\partial \ln P}{\partial V} x100 = \frac{\partial \ln P}{\partial \ln y}\frac{\partial \ln y}{\partial V} x100 \qquad (2)$$

where (V) denotes the policy variable (as percentage of GDP). Applying the formula in (2) to the results of table (7), together with equation (4) of table (8) and equation (7) of table (9), we obtain the results reported in table (10). It is clear from these results that, as growth-inducing policy variables, investment (INVS) and government current expenditure (CE) turned out to be the only two policy variables that could have some role to play in poverty reduction. Mild as it is, this role becomes more important as we move from poverty incidence to the depth and severity of poverty. For example, the evidence for the period 1971-2002 suggests that an increase in investment as a ratio of GDP by one percent leads to a reduction in the incidence, depth, and severity of poverty indices by 0.37%, 0.72%, and 0.94%, respectively. We also observe that during the 1990s, a decade characterized by economic liberalization policies, the role of investment in poverty reduction is more pronouced compared to its role during the 1971-2002 period. Indeed, the measured impact effect of investment on poverty reduction during the 1990s is slightly lower than the combined effect of investment and current expenditure during the 1971-2002 period.

One of the important lessons learnt from the above analysis is that growth-inducing policies for poverty alleviation purposes should focus more on opening the economy for more investment. In view of the impressive growth performance that industry has achieved during the 1990s and the huge potential that the sector possesses for further expansion and growth, growth-inducing policies should focus more on attracting new investment for industry. Indeed, with the existence of backward and forward linkages between industry and other sectors of the economy, particularly agriculture, more investment in industry will spur income growth in all sectors and enhance poverty reduction in both urban and rural areas. In turn, such growth will enhance balanced development and reduce regional disparities. In this sense, industrial development may be seen as the real engine of national growth and the appropriate channel for poverty reduction. The growth of the emerging oil sector is expected to play an instrumental role in industrial growth. Indeed, the expansion in agro-based industry, coupled with growth in the oil sector, can provide the stimulus for growth in all other sectors. It is important that this opportunity is captured and utilized by further investment and expansion in the industrial sector. Needless to mention, in addition to a more conducive macroeconomic environment, the attraction of more investment requires the development of adequate infrastructure, particularly in transport, communication, electricity, and water, the absence of which will render supply measures meaningless.

Table (10)
Effect of Policy-Induced Growth on Poverty (1971-2002)

Poverty Index	Policy-Induced Change in Poverty Index (%)		
	1971-2002		1990-2002
	CE	INVS	INVS
P_0	-0.1622	-0.3672	-0.5151
P_1	-0.3180	-0.7200	-1.0100
P_2	-0.4166	-0.9432	-1.3231

Source: Own calculations.

With regard to income distribution, the results of table (7) suggest that all poverty indices are more responsive to inequality than to income growth. As such, public policies geared toward poverty reduction should focus more on improving income distribution. In this respect, the lessons learnt from the experiences of the last three decades indicate that controlling inflation, by far one of the serious problems the economy has encountered, constitute an important objective of a policy package for reducing inequality and poverty. Such a package should focus not only on controlling financial institutions and money supply, but also on creating a more conducive macroeconomic environment for investment and for the reallocation of resources away from tertiary activities toward industrial and agricultural production. Furthermore, with a degree of progression of income tax estimated at 1.052 for the period 1970-2000 (Zaroog, 2003), which is not significantly different from one, it may be argued that a more progressive income tax structure could also play an important role in reducing income inequality and poverty.

A number of institutions that help in poverty alleviation could also be consolidated. These include the Zakat Chamber, the Social Support Fund, and the Saving and Social Developmet Bank. While some of these institutions provide direct support to poor families, others provide reasonable credit facilities to small businesses and poor productive families. In addition, the allocation of more funds to the States' governments and localities could serve the purposes of accelerating balanced regional development and enabling the rural poor, through health and education services, to participate in economic activities.

At the society's level, the consolidation of the historically built-in social solidarity system could continue to play a more important role in poverty alleviation. According to Nur (1992), a characteristic feature of the Sudanese society is the existence of a deeply rooted and elaborate system of social solidarity as manifested in the provision of help (financial or otherwise) to different people, particularly the needy. Nur (1992) argued that this solidarity system operates as a mechanism for poverty alleviation since it increases the average income of the poor and has a distributional effect since it alters the income distribution in favour of the poor and among them.

6. Conclusion:

In this paper an attempt has been made to identify the most promising public policy and related policy tools for accelerated poverty reduction in Sudan. The analysis focus on public policies that will more likely spur economic growth, improve income distribution, and reduce poverty. In addition to investment, the public policy variables considered in the analysis include government current expenditure, development expenditure, and expenditure on social services, while development expenditure is also disaggregated according to economic sector. In view of data limitations, simple regression methods are adopted at two levels. In the first stage province-level data is used to examine the determinants of poverty, while in the second stage national-level data is used to examine the impact of public policy on poverty determinants. Based on these analysis, inferences were made about the most effective policies for poverty reduction.

The results for the period 1971-2002 suggest that with the exception of investment and government current expenditure, all other public policy variables considered in the analysis have had no significant effect on growth and hence on poverty reduction. These results are attributed to a host of problems that the economy has encountered during the last three decades, which culminated in its dismal performance. Based on these results, it is argued that more attention should be given to investment with emphasis on industry, a potentially more promising sector for growth. With carefully articulated forward and backward linkages between different sectors, industrial development could play a pivotal role in overall growth and in poverty reduction. Given widespread poverty, this role could be even more important for balanced regional development, which is vital in any meaningful strategy that aims at reducing widespread poverty. The emerging oil sector, together with adequate and reliable infrastructure, could play an instrumental role in this process.

It is also observed that all poverty indices are more responsive to inequality than to income growth. As such, public policies geared toward poverty reduction should focus more on improving income distribution. The lessons learnt from the past suggest that the root cause of the increase in inequality over the 1970s and 1980s is ultimately related to rocketing inflation rates which, in turn, was related to the persistent conditions of scarcity and production rigidities. Control over financial institutions and the adoption of policies that encourage the reallocation of resources toward productive activities seem to be important not only for combating inflation and reducing inequality, but also for attracting more investment and inducing growth. In addition, a number of institutions that help in poverty alleviation, either by empowering the poor or redistributiong income, could also be consolidated. Finally, the maintenance and consolidation of the historically built-in social solidarity system could continue to play a more important role in income redistribution and poverty alleviation.

References

Abd Alla, M.K. (2004): "The Effect of Exchange Rate Regimes on Competitiveness of Agricultural Crops in Sudan: The Case of Sorghum in Gezira Scheme, 1981-2001", unpublished M.A. Dissertation, Department of Economics, University of Gezira, Sudan.

Ali, A.A.G. (1998): "Dealing with Poverty and Income Distribution Issues in Developing Countries: Cross-Regional Experiences", Journal of African Economies, Vol.7.

Ali, A.A.G. (1994): Structural Adjustment Programs and Poverty in the Sudan, Arab Research Centre, Cairo, Egypt (in Arabic).

Ali, A.A.G. (1992a): "Structural Adjustment Programs and Poverty Creation: Evidence from Sudan", Eastern Africa Social Science Research Review, Vol. 8, No.1.

Ali, A.A. (1992b): "Economic Restructuring and Poverty Alleviation: Some Theoretical and Empirical Results", Research Report, IDRC Regional Office, Cairo.

Ali, A.A. (ed.)(1985): The Sudan Economy in Disarray: Essays on the IMF Model, (Ali Abdel Gadir Ali, Khartoum, Sudan).

Ali, A.A.G. and I.A. Elbadawi (2003): "Explaining Sudans\'s Economic Growth Performance", Cambridge General Economic Surveys of Africa: Eastern and Southern Africa (Draft).

Ananad, V.K. and E.M. Nur (1988): "The Absolute Poverty Line in the Sudan: Estimates and Analysis', The Asian Economic Review.

Bank of Sudan: Annual Reports (various issues).

Bank of Sudan: Elmasrafi (various issues, in Arabic).

Dagdeviren, H. and H.A. Mahran: "Trade and Industry in Sudan: What Role for Poverty Alleviation", Final Draft, UNDP Project on Macroeconomic Policy and Poverty Alleviation in the Arab Region, Khartoum, Sudan.

Economic Commission for Africa (2003): "Economic Report on Africa: Accelerating the Pace of Development", Addis Ababa, Ethiopia.

Elhaj, A.E.F. (2004): "Poverty and Inequality in Sudan: An Analysis of Household Data, 2000", unpublished Ph.D. thesis, Department of Economics, University of Gezira, Sudan.

Elmulathum, N.A.M. (1999): "Poverty and Food Security in the Sudan", Unpublished Ph.D. Thesis, Department of Agricultural Economics, University of Gezira.

Firgani, N. (1997): “A Map of Relative Poverty in Northern Sudan Based on 1993 Population Census”, paper presented to a workshop on “Poverty in the Sudan: Causes, Consequences, and Future Policies for Eradication”, Khartoum, 14-15 June, 1997.

Foster, J., Greer, J., and E. Thorbecke (1984): “A Class of Decomposable Poverty Measures”, Econometrica, 52.

Gama, I.A. (2004): “The Effect of Exchange Rate Regimes on Competitiveness of Agricultural Crops in Sudan: The Case of Wheat in Gezira Scheme, 1980-2001”, unpublished M.A. Dissertation, Department of Economics, University of Gezira, Sudan.

Gbreil, A.M.N. (2004): “The Effect of Exchange Rate Regimes on Competitiveness of Agricultural Crops in Sudan: The Case of Long-Staple Cotton in Gezira Scheme, 1981-2000”, unpublished M.A. Dissertation, Department of Economics, University of Gezira, Sudan.

Hamed, F.A.M. (2004): “The Effect of Exchange Rate Regimes on Competitiveness of Agricultural Crops in Sudan: The Case of Groundnuts in Gezira Scheme, 1979-2002”, unpublished M.A. Dissertation, Department of Economics, University of Gezira, Sudan.

Kakwani, N. (1993): “Poverty and Economic Growth with Application to Cote d’Ivoire”, Review of Income and Wealth, 39(2).

Kakwani, N. (1990): “Poverty and Economic Growth with Application to Cote d’Ivoire”, Living Standards Measurement Study (LSMS), Working Paper No. 63, World Bank.

Kanbur, R. (1987): “Structural Adjustment, Macroeconomic Adjustment and Poverty: A Methodology for Analysis”, World Development.

Mahran, H.A. (2003): “The Potency of Horizontal and Vertical Expansion on Food Output Growth in Sudan: A Causality Analysis, 1962-2000”, Gezira Journal of Agricultural Science, Vol. 1(2).

Mahran, H.A. (2000): “Food Security and Food Productivity in Sudan: 1970-1995”, African Development Review, vol. 12, no. 2.

Mahran, H.A. (1999): “Causality between the Inflation Rate and the Exchange Rate in Sudan, 1971-1991”, The OSSREA Newsletter, Vol. XVII, No. 2, PP. 14-20.

Mahran, H.A. and Y.A. Gangi (1996): "Causes of Inflation in the Sudan: 1970-1991", Eastern Africa Social Science Research Review, PP. 13-23.

Ministry of Manpower (1997): “Migration and Labour Force Survey, 1996”, Khartoum, Sudan.

Ministry of Manpower (1997): "Trends and Profiles of Poverty in Sudan, 1990-1996", (in collaboration with the ILO), Final Teport, Khartoum, Sudan.

Mohammed, A.B. (2004): "The Effect of the Floated Exchange Rate Regime on Competitiveness of Agricultural Crops in Sudan: The Case of Medium-Staple Cotton in Gezira Scheme, 1989-2000", unpublished M.A. Dissertation, Department of Economics, University of Gezira, Sudan.

Nur, E.M. (1995): "Poverty in Sudan in 1992: With and Without Coping Practices", Research Report, The Social Solidarity Fund, Khartoum, Sudan.

Nur, E.M. (1992): "On the Political Economy of Poverty: A Theoretical Trail", Seminar on 'Combating Poverty: Sudan as a Case Study', organized by the Social Solidarity Fund, in collaboration with F.E. Foundation, Sudan.

Sayed, O.A. (1996): "Devaluation and the Balance of Payments: The Experience of Sudan, 1972-1993", unpublished M.A. Dissertation, Department of Economics, University of Gezira, Sudan.

The Consultative Panel (1977): "An Evaluation of the Desirability of an Adjustment in the Exchange Rate of the Sudanese Pound", Ministry of Finance, National Economy and Planning, Khartoum, Sudan.

World Bank (2003): Sudan: Stabilization and Reconstruction: Country Economic Memorandum, Vol. 1: Main Text, Report No. 24620-SU, www.worldbank.org.

World Bank (1990): World Development Report: Poverty.
World Bank (1987): Sudan–The Manufacturing Sector: Setting the Stage for Restructuring, Volumes 1 & II, Report No. 6475-SU.

Zaroog, A.M.N. (2003): "Progression of Personal Income Taxation in Sudan: An Empirical Analysis, 1970-2000", Unpublished M.Sc. Dissertation, Department of Economics, University of Gezira, Sudan.

APPENDICES

Table (A.1)
Poverty Indices according to Region of Residence, Gender, Sector of Employment, Education Level, and Mode of Living of Head of Household (1990, 1996)

Character	1990						1996					
	P_0		P_1		P_2		P_0		P_1		P_2	
	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
Region												
Northern	88.6	56.1	62.42	32.23	49.02	18.02	90.0	92.7	60.72	67.48	45.52	53.65
Eastern	89.0	60.4	59.58	34.45	44.68	20.87	88.4	94.3	60.07	71.50	46.26	58.05
Khartoum	83.7	56.1	55.56	29.27	41.61	19.47	76.9	80.0	50.72	50.43	37.08	37.40
Central	87.7	66.5	61.07	38.62	47.07	26.81	93.1	91.2	61.39	66.36	46.28	52.32
Kordofan	91.1	76.5	67.76	45.59	54.59	32.10	86.5	96.0	62.03	76.81	48.09	65.13
Darfur	87.0	55.0	61.30	25.94	47.80	18.28	89.1	97.0	67.78	72.81	56.73	69.49
Gender												
Male	88.4	65.3	61.32	34.67	47.78	23.80	84.5	94.3	58.00	72.79	44.39	60.29
Female	83.7	82.8	51.81	27.52	38.51	18.39	85.2	89.9	57.11	68.50	43.16	57.29
Sector												
Agric.	86.4	63.8	66.60	33.11	43.10	22.60	88.9	94.9	60.36	74.13	45.34	62.35
Mining	--	--	59.30	29.99	45.84	17.99	--	--	--	--	--	--
Industry	89.6	69.0	63.07	37.85	49.02	25.86	86.0	91.8	60.68	67.34	47.75	53.63
Construct.	--	--	66.38	38.66	54.11	28.37	--	--	78.55	40.80	63.53	23.18
Electricity	--	--	58.23	34.26	43.11	23.93	--	--	63.60	61.10	49.53	47.37
Commerce	--	--	61.44	37.69	47.43	25.68	--	--	55.34	66.58	42.49	53.55
Transport	--	--	63.15	33.84	49.49	23.71	--	--	61.75	68.64	49.10	54.87
Services	87.9	66.2	53.24	52.28	40.08	36.80	84.2	92.0	56.10	76.28	42.15	60.86
Education												
Illiterate	88.1	67.4	61.22	35.67	47.31	24.46	89.9	94.9	64.13	76.00	49.77	64.56
Read Writ	88.8	64.7	63.90	35.85	50.26	24.92	84.3	94.1	60.46	71.59	47.70	58.79
Primary	89.4	65.6	63.52	34.06	49.69	22.85	88.1	92.9	62.14	65.53	47.91	50.59
Intermed.	86.7	56.6	59.89	29.91	46.40	20.73	84.6	91.0	56.19	62.28	42.34	47.39
Secondary	87.2	50.9	59.93	84.83	45.63	15.14	80.1	87.0	52.42	56.43	39.20	41.42
University	79.2	58.8	49.62	24.83	35.99	22.33	74.7	72.2	40.86	41.91	27.30	28.34

Source: Compiled from the 1996 MLFS.

Table (A.2)
Percentage Distribution of Households according to Type of Accomodation, Type of Holding, and Mode of Living

Type of Holding	House/Villa		Apartment		Shared House		Cottage		Tent		Other		Total	
	Urb.	Rur	Urb.	Rur	Urb.	Rur	Urb	Rur	Urb	Rur	Urb	Rur	Urb	Rur
Owned	16.2	15.2	0.2	0.5	3.2	4.5	2.7	43.8	0.0	0.3	0.5	1.8	22.8	66.1
Rented	4.0	0.4	0.1	0.0	1.3	0.0	0.5	0.4	0.0	0.0	0.5	0.0	6.5	0.9
Other	1.3	0.4	0.0	0.0	0.4	0.3	0.4	0.8	0.0	0.0	0.0	0.0	2.2	1.5
Total	21.5	16.0	0.3	0.5	4.9	4.8	3.6	45.0	0.0	0.3	1.0	1.8	31.5	68.5

Source: Own calculations based on data compiled from the 1996 MLFS.

Table (A.3)
Percentage Distribution of Households according to Ownership of Durable Goods and Mode of Living

Durable Goods	Ownership			No Ownership		
	Urban	Rural	Total	Urban	Rural	Total
Private Car	6.0	1.4	7.4	25.6	67.0	92.6
Bicycle	6.4	2.2	8.6	25.2	66.2	93.4
Refrigerator	16.2	1.8	18.0	15.4	66.6	82.0
Washing Machine	4.9	0.4	5.3	26.6	68.1	94.7
Air Conditioner	4.5	0.0	4.5	27.2	68.3	95.5
Sewing Machine	5.9	1.8	7.7	25.6	66.7	92.3
Black & White TV.	7.8	1.5	9.3	23.7	67.0	90.7
Video Machine	3.7	0.2	3.9	27.8	68.3	96.1
Radio	19.4	13.2	32.6	12.2	55.2	67.4

Source: Own calculations based on data compiled from the 1996 MLFS.

Table (A.4)
Percentage Distribution of Households according to Source of Water and Mode of Living

Source of Water	Urban	Rural	Total
Inside Tap	24.3	5.8	30.1
Outside Tap	4.2	6.2	10.4
Deep Well	0.9	25.5	26.4
Surface Well	0.9	14.9	15.8
Mobile Tank	0.7	0.6	1.3
Pit	0.0	4.2	4.2
River/Canal	0.0	8.1	8.1
Other	0.6	3.1	3.7
Total	**31.6**	**68.4**	**100.0**

Source: Own calculations based on data compiled from the 1996 MLFS.

Table (A.5)
Percentage Distribution of Households according to Source of Lighting and Mode of Living

Source o Lighting	Urban	Rural	Total
Electricity	23.9	5.6	29.5
Kerosin	6.9	42.6	49.5
None	0.7	5.0	5.7
Other	0.1	15.2	15.3
Total	**31.6**	**68.4**	**100.0**

Source: Own calculations based on data compiled from the MLFS.

Table (A.6)
Trends and Growth of GDP by Economic Sector (1971-2002)

Variable	Const.	Trend Coefficient	R^2	Adjusted R^2	F	DW	Growth Rate (%)
ln Agriculture	5.6940 (55.724) [0.000]	-0.0043 (0.836) [0.411]	0.024	-0.045	0.698	1.949	--
ln Industry	4.1406 (28.025) [0.000]	0.0031 (0.426) [0.673]	0.007	-0.065	0.182	1.535	--
ln Electricity	2.6163 (17.255) [0.000]	-0.0040 (0.535) [0.597]	0.010	-0.061	0.286	1.578	--
ln Construction	3.8250 (20.728) [0.000]	-0.0145 (1.619) [0.117]	0.086	0.020	2.622	1.808	--
ln Servvices	4.359 (2.849) [0.008]	0.0716 (1.580) [0.125]	0.082	0.016	2.495	0.827	--
ln Other	1.651 (4.982) [0.000]	-0.0200 (1.129) [0.268]	0.041	0.009	1.274	1.149	--
ln GDP	6.3381 (15.505) [0.000]	0.0230 (1.378) [0.179]	0.064	-0.003	1.900	1.653	--
ln y	3.6895 (11.617) [0.000]	-0.005 (0.330) [0.744]	0.004	-0.067	0.109	1.996	--

Source: Own calculations based on data compiled from Bank of Sudan Annual Reports (various issues).

Table (A.7)
Trends and Growth of Public Policy Varaiables (1971-2002)

Variable	Const.	Trend Coeff.	R^2	Adjusted R^2	F	DW	Growth Rate (%)
ln Investment	4.0352 (6.950) [0.000]	0.0291 (1.103) [0.279]	0.042	-0.027	1.216	1.555	--
ln Current Expend.	5.3047 (15.4481) [0.000]	-0.0269 (1.6776) [0.105]	0.091	0.026	2.814	1.741	--
ln Develop.Expend.	4.0009 (11.4640) [0.000]	-0.0492 (2.8277) [0.086]	0.222	0.167	7.997	1.816	-4.80
ln Social Services	2.8340 (10.705) [0.000]	-0.0500 (3.562) [0.001]	0.297	0.274	12.690	1.513	-4.88

Source: Own calculations based on data compiled from Bank of Sudan Annual Reports (various issues).

Table (A.8)
Trends and Growth of Development Expenditure by Economic Sector (1971-2002)

Variable	Const.	Trend Coefficient	R^2	Adjusted R^2	F	DW	Growth Rate (%)
ln Agriculture	2.6925 (7.435) [0.000]	-0.0537 (2.9824) [0.006]	0.241	0.187	8.896	1.680	-5.23
ln Industry	2.2046 (2.257) [0.032]	-0.0466 (0.965) [0.343]	0.032	-0.037	0.931	1.940	--
ln Transport	2.7505 (4.914) [0.000]	-0.0925 (3.355) [0.002]	0.287	0.236	11.257	1.416	-8.84
ln Services	2.110 (13.337) [0.000]	-0.0622 (7.431) [0.000]	0.648	0.636	55.225	2.417	-6.03

Source: Own calculations based on data compiled from Bank of Sudan Annual Reports (various issues).

Table (A.9)
Trends of Percentage Shares of Public Policy Varaiables in GDP
(1990-2002)

Variable	Constant	Trend Coefficient	R^2	Adjusted R^2	F	DW
ln INVS	0.486 (0.898) [0.388]	0.073 (3.551) [0.005]	0.534	0.492	12.609	1.865
ln CE	3.560 (6.365) [0.000]	-0.053 (2.467) [0.031]	0.356	0.298	6.085	1.245
ln DE	2.655 (2.687) [0.021]	-0.086 (2.286) [0.043]	0.322	0.260	5.225	1.309
ln SS	0.626 (0.301) [0.769]	-0.051 (0.647) [0.531]	0.037	-0.051	0.418	1.714

Source: Own calculations based on data compiled from Bank of Sudan Annual Reports (various issues).

Table (A.10)
Trends of Percentage Shares of Development Expenditure by Economic Sector in GDP
(1990-2002)

Variable	**Constant**	**Trend Coefficient**	**R^2**	**Adjusted R^2**	**F**	**DW**
ln Share Agriculture	-0.375 (0.463) [0.653]	-0.026 (0.851) [0.413]	0.062	-0.024	0.724	1.840
ln Share Industry	-7.323 (3.790) [0.003]	0.212 (2.882) [0.015]	0.430	0.378	8.307	2.792
ln Share Transport	-0.026 (0.008) [0.994]	-0.076 (0.641) [0.537]	0.044	-0.169	0.411	1.391
ln Share Services	1.101 (0.999) [0.339]	-0.108 (2.566) [0.026]	0.374	0.318	6.586	2.455

Source: Own calculations based on data compiled from Bank of Sudan Annual Reports (various issues).

Variables' Definitions

GDP	: Gross domestic product
CE	: Percentage share of government current expenditure in GDP.
DE	: Percentage share of development expenditure in GDP.
SS	: Percentage share of expenditure on social services in GDP.
INVS	: Percentage share of investment in GDP.
DIND	: Percentage share of development expenditure in industry in GDP.
y	: Real per capita income.
P_0	: Head-count (incidence of poverty) index (%)
P_1	: Poverty-gap (depth of poverty) index (%)
P_0	: Squared poverty-gap (severity of poverty) index (%)
G	: Gini coefficient (%)

Chapter Eight

Public Spending, Pro-poor Growth and Poverty Reduction in Tunisia: A Multi-level Analysis

Sami Bibi and Rim Chatti

1. Introduction

The year 2005 marks five years since the Millennium Summit in which fighting extreme poverty was declared as the major challenge of the international community. In monitoring progress in poverty reduction, the importance of income (or consumption) deprivation is conventional, although the need to go beyond the income dimension is appealing.[1]

It is well known fact that public expenditures are an effective tool for promoting economic growth, improving income distribution and fighting poverty in all its aspects. Although the literature on pro-poor public expenditures is extensive, few studies have attempted to look at the role of various categories of public investment in enhancing pro-poor growth in the Arab countries. In this context, the Arab Planning Institute (API) and the International Food Policy Research Institute (IFPRI) conducted a collaborative research project on public policies and poverty reduction in Egypt, Jordan, Morocco, Sudan, Tunisia, and Yemen.

This paper is a contribution featuring the Tunisian case. It aims to document and explain the main factors that have affected the dynamics of poverty during the last four decades dating from 1965 to 2002. It also simulates some alternative policy reforms to go a step further in improving the distributional characteristic of public spending.

Tunisia is situated in the north of Africa with a total land area of 165 000 sq km. With a population of almost 9.79 million in 2002, this means an average density of 63 inhabitants per square kilometer. The country is bordered in the north and northeast by the Mediterranean Sea, in the southeast by Libya and in the south and west by Algeria. It has three major geo-climatic zones: the north with an average rainfall ranging between 450 and 600 mm, the center where the average ranges between 300 and 200 mm, and the rainless south with less than 150 mm, on the average per year.

Since its independence from French rule in 1956, Tunisia has consciously designed development strategies anchored on human development. Although different development strategies have been

[1] On this, see for instance UNDP (1997).

followed, using economic growth to widen people's choices has always been a constant objective. This is done through a large enrolment in basic school, the provision of basic health services, the establishment of an important social security system, and the active participation of women in the development process through the promulgation of the personal status code in 1956 and the institution of a family planning program in 1968.[2]

The development strategy followed to achieve this goal has been the object of much speculation, but the results speak for themselves. From 1961 to 2002, *per capita* GDP jumped from US$760 to US$2580 measured in constant 1995 US$;[3] with a rapid decrease in extreme poverty from perhaps 33% of the population in 1967 to about 4.7% in 2000. Furthermore, illiteracy is close to becoming eradicated among the youth. Health levels have improved, as indicated by increasing life expectancy and falling infant, child and maternal mortality rates. The strong progress on human capital should be an important factor behind the reduction of poverty during the last four decades.

Today, extreme poverty is no longer a very serious problem in Tunisia. There are indications that it could be eliminated by the year 2015, if the annual mean growth experienced during the last decades is maintained for the period 2000–2015. However, as economic vulnerability remains to be an important concern in Tunisia, this paper is also focused on this issue. The vulnerable segment of the population corresponds to the proportion of people with an income level at the very most, 25% higher than the lower (absolute) poverty line. Indeed, about 6% of the population remains clustered above, but close to, the lower poverty lines. In addition, if poverty thresholds were set at twice the level for the lower poverty line (roughly equal to 50% of the mean consumption), 40% of the rural population and 15% of people in urban areas would fall in poverty.[4] With increasingly tighter budgets required following the Free Trade Agreement signed with the EU in 1995, a more in-depth review of the public expenditures contribution in enhancing the capability of the less well-off to escape extreme poverty and vulnerability is then in order.[5]

For this purpose, a multi-level analysis approach is used to capture the likely effects of some public spending on pro-poor growth. The paper involves analysis and simulations at different levels: household, regional, and macro levels, using an appropriate analytical tool for each one.

---

[2] In addition to prohibiting polygamy and repudiation, the personnel status code sets the rules for divorce as well as relations between ascendants, descendants and relatives to promote gender equality.

[3] In purchasing power parity, the per capita GDP was about US$6580 in 2002. (Source: Global Development Network, www.gdn.org).

[4] Bibi (2004) and The World Bank (2004a).

[5] Hereinafter, the less well-off segment of the population includes at least the extremely poor and the vulnerable.

2. *Different Development Strategies*

Poverty

Monitoring poverty and tracking its dynamics over time are essential for designing national strategies to fight deprivation and vulnerability. To study the dynamics of poverty over time, the authors relied on the official publications of the *Institut National de la Statistique* (henceforth INS) and the study of Bibi (2004) who uses official and World Bank (1995) estimates of poverty lines to characterize the poverty trend from 1970 to 2000.

For the INS and World Bank (1995) approach, poverty lines are based on the food share method. The food component of the poverty threshold is anchored to the consumption behavior of a **reference group**. The average food expenditure per calorie is estimated for this group and multiplied by the recommended caloric intake to calculate the food component of the poverty line. The overall poverty line is then obtained by dividing this component by an estimated of the budget share devoted to food of the reference group.

The official approach sets the poorest 20th percentile of the population as the reference group in urban areas and in rural areas, separately. As the poorest quintile in urban areas is better off than that in rural areas, food poverty line will be then higher in urban zones; reflecting that the better off spend more per calorie basis rather than reflecting price differences between urban and rural areas. To avoid this drawback, The World Bank (1995) method fixes the reference group in each area with reference to the same expenditure range.

Food Poverty Lines. Instead of dividing the food poverty line by the food budget share of the reference group to obtain the overall poverty line, The World Bank (1995) follows Ravallion's (1998) approach to deduce a lower and an upper poverty line. The lower poverty line (referred to as lower WB in Table 1) corresponds to the minimal allowance for nonfood goods by estimating the nonfood component based on the typical value of nonfood spending by households whose total expenditure is just equal to the food poverty line. For the upper poverty line (referred to as upper WB in Table 1), it corresponds to the minimum income that is required for a household to devote for food an amount exactly equal to the food poverty line. Households with an expenditure level *per capita* less than the lower poverty line are deemed to be in extreme poverty. But households ranging between the lower and the upper poverty line are in moderate poverty and referred to as economically vulnerable. Therefore, when poverty indices are captured using a lower poverty line, the term poverty will be used to designate only extreme poverty. However, when poverty is measured using an upper poverty line, the term poor will also include those who fall in vulnerability. Estimates of the different poverty lines during the last two decades are reported in Table 1.

Table (1)
Official and World Bank Poverty Lines
(in current Tunisian Dinar - TND)

	1980		1985		1990		1995		2000	
Method	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
INS	120	60	190	95	278	139	362	181	428	221
Lower WB	*100*	*85*	158	134	218	185	290	242	343	294
Upper WB	*140*	*110*	221	174	305	240	405	315	480	380
Adjustment 1995 US$	2.96		1.83		1.37		1.06		0.88	
Adjustment PPP US$	7.04		4.35		3.26		2.52		2.09	

INS: Institut .National de la .Statistique
Lower WB: Lower World Bank poverty line
Upper WB: Upper World Bank poverty line

Sources : Banque Mondiale (1999), Institut National de la .Statistique publications, World Bank (1995, 2003), Global Development Network (www.gdn.org) and authors' calculations. Values in italics correspond to the authors' calculations using the consumer price index of Institut National de la .Statistique (1985).

The extent of poverty is summarized by the commonly used FGT (Foster, Greer and Thorbecke, 1984) class of poverty measures, which is defined as:

$$\mathrm{P}_{\alpha}(z,Y)=\frac{1}{N}\sum_{h=1}^{H}n_c^h\left(\frac{z_c-Y_c^h}{z_c}\right)_+^{\alpha}=\frac{1}{N}\sum_{h=1}^{H}n_c^h(1-y_c^h)_+^{\alpha}$$

(Equation 1)

where Y_c^h is the standard of living (income *per capita*, for short) for a household h living in the locality c; y_c^h is income *per capita* for household h living in locality c as a ratio of z_c; z_c is the poverty line within c; n_c^h is the size of the pertinent household; H is the number of households; N is the population size; and α may be considered as a measure of aversion to inequality among the poor. $P_0(z, Y)$ is the incidence of poverty or the head count ratio (the proportion of the population living with less than the poverty line). When $\alpha = 1$, the resulting index, that is $P_1(z, Y)$, yields the average poverty gap (or the deficit of poverty); and when $\alpha = 2$, $P_2(z, Y)$ summarizes the severity of poverty. In reality, for $\alpha \geq 2$, the FGT poverty measures take account of distribution among the poor.

Table 2 sets out the poverty and inequality trend in Tunisia since the late 1960s.[6] Prior to 1980, only INS poverty estimates were displayed due to the unavailability of unit record data of the 1966 and 1975 household surveys.[7]

---

[6] For expositional simplicity, only the trend of the incidence of poverty is considered here. More details are available in Bibi (2004).

[7] The unit record data of 1980, 1985, and 1990 household surveys were available for the needs of the present study. However, the unit record data of the 2000 household survey was not accessible and only a sample of the 1995 household survey was available. These household surveys are multipurpose and provide reliable information on consumption expenditures on many commodities and extensive socio-demographic information (like household's head level of education and occupation). However, they do not include information on incomes leading to the use of total household expenditure *per capita* for characterizing the dynamics of poverty.

From 1985, World Bank (1995, 2003) poverty estimates using lower and upper poverty lines are also displayed.

Table (2)
The Official and The World Bank Incidence of Poverty (%)

Method / Period		1966-67	1975	1980	1985	1990	1995	2000
INS	National Urban Rural	33	22 26.5 18	12.9 11.8 14.1	7.7 8.4 7.0	6.7 7.3 5.7	6.2 7.1 4.9	4.2 4.9 2.9
Lower WB	National Urban Rural			*17.8* *7.3* *27.5*	11.2 4.6 19.1	7.4 3.5 13.1	7.6 3.6 13.9	4.7 2.3 8.7
Upper WB	National Urban Rural			*30.6* *18.5* *41.7*	21.9 12.9 32.4	15.6 9.9 24.1	16.6 10.3 26.5	10.6 7.4 15.9
Gini (Index of Inequality)	National Urban Rural		44 42.9 39.7	43 39.6 37.5	43.4 41.1 36.4	40.1 37.4 35.4	41.7 38.9 35.3	40.9 39.1 35.8
Growth in		-	1967-75	1975-80	1980-85	1985-90	1990-95	1995-00
Lower WB poverty		-			-37	-34	2.7	-38
Non- agricultural GDP *per capita*			5.24	4.71	1.35 (-27)	0.64 (-53)	2.78 (1)	3.93 (-9.6)
Agricultural GDP per worker			9.92	-0.59	5.51 (-6.7)	3.75 (-9)	-3.52 (-0.77)	6.67 (-5.7)
Consumption *per capita*			8.08	4.75	1.69 (-21)	0.034 (-1000)	1.57 (1.7)	3.72 (-10.2)

N.B. WB (1): Incidence of poverty using the lower World Bank poverty line
WB (2): Incidence of poverty using the upper World Bank poverty line
Gini: Index of inequality

Sources: *Banque Mondiale* (1999), World Bank (1995, 2003), *Institut .National de la .Statistique* (1980, 1985, 1990, 1995, 2000), UNDP (1999), PNUD (2004), and Bibi (2004). Values in *italics* correspond to the authors' estimation. Values between parentheses correspond to the ratio of the growth rate of the lower World Bank incidence of poverty to the pertinent variable.

The first observation that may be drawn from the official monitoring of poverty is surprising. Table 2 shows that since 1985, the urban incidence of poverty is higher than rural incidence. This is due to the inappropriate approach followed by the INS to set the poverty lines which consequently led The World Bank (1995. N.B. Hereinafter, unless otherwise specified, source of information is The World Bank 1995 study) to suggest an alternative approach for poverty lines setting. Designing anti-poverty programs on the basis of such findings could have confounded policy choices relating to the priority given to urban *vs* rural development.

Based on the alternative route suggested by The World Bank, the incidence of poverty appears to be, by far, larger in rural areas than in urban areas, as Table 2 illustrates. In the 1980s, extreme poverty was more than four times higher in the rural than in the urban areas and that rural areas accounted for more than three quarters of the aggregate poverty. In the 1990s however, extreme poverty in rural areas experienced a stronger downward trend, with some reversals in 1995, despite the likely misleading findings of the INS comparisons of spatial poverty.

Although the official approach to poverty measurement led to inconsistency in poverty comparisons between areas, it could be more consistent in tracing out poverty trends within each area. As regards the dynamics of poverty, Table 2 reveals that Tunisia has experienced a continuous decline of the head count ratio over the last three decades; both in urban and rural areas. Table 2 also shows a marginal decrease in poverty reduction. For instance, the national, urban, and rural reduction of the head count ratio between 1990 and 1995 were really thin. Since the expenditure distributions used to compute them were likely to be log-normally distributed, and since the INS poverty lines were close to the bottom of distributions, it is not excluded that these results are very sensitive to the poverty lines setting. This is confirmed when using The World Bank approach to trace out the dynamics of poverty in the first half of the 1990s.

Indeed, while the INS approach shows a decrease in poverty from 6.7% in 1990 to 6.2% in 1995, The World Bank approach shows an increase in poverty from 7.4 to 7.6% during the same period. This gives evidence that the choice of poverty lines, and also poverty measures, is usually arbitrary. Thus, this calls for the use of more than one poverty line for each area.[8] Once again, using the upper poverty lines estimated by The World Bank, moderate poverty increased slightly in the first half of 1990s, but declined considerably from 9% in 1995 to about 6% in 2000.

The strong decline of poverty during the last four decades is certainly the result of many factors, but the contribution of economic growth should be important.

Economic Growth and Its Impact on Poverty

Tunisia has a solid track record of stable growth. As reported in Table 3, its average growth rate in the last four decades is 5.13% in real terms; and the volatility of the growth, gauged by the standard deviation that is equal to 3.6, is to some extent, moderate. Agricultural production fluctuations, due to variability in rainfall, account for a major share of GDP growth volatility. But with the increased diversification of the economy, the effect of agricultural output fluctuations has been declining.

[8] The choice of more than one poverty measure is appealing. In reality, the head count index does not yield a broader and fuller picture of poverty. For instance, it does not illustrate how far below the poverty line the income levels of the poor are, or to what extent incomes are unequally distributed among the poor segment. Some alternative measures, like the intensity and severity of poverty, enable a better characterization of the dynamics of poverty. Bibi (2004) shows that, with the exception of the first half of 1990s, even these measures have declined during the last three decades. Further, robustness analysis gives evidence that, always with the exception of the first half of 1990s, poverty has unambiguously declined over the last two decades, irrespective of the choice of poverty line or poverty measure.

Table (3)
Economic and Consumption Growth in Tunisia

	GDP	Consumption	GDP per capita	Consumption per capita
	Million of 1995 constant US$		US$ *per capita*, 1995 prices	
1961	3.246	2.059	759	482
1970	5.145	2.861	1003	558
1975	7706	4.788	1373	853
1980	10.475	6.871	1641	1076
1985	12.863	8.493	1771	1169
1990	14.867	9.560	1823	1172
1995	17.987	11.348	2008	1267
2000	23.623	14.544	2470	1521
2002	25.253	15.994	2580	1634
Annual Growth Rate (%)				
1961 – 1969	5.32	2.37	3.21	0.26
1970 – 1974	8.73	9.63	6.87	7.77
1975 – 1979	6.06	6.20	3.38	3.52
1980 – 1984	3.83	4.89	1.31	2.37
1985 – 1989	1.72	0.81	-0.59	-1.49
1990 – 1994	4.28	3.62	2.26	1.60
1995 – 1999	5.83	5.06	4.40	3.63
2000 – 2002	3.39	4.87	2.20	3.68
1961 – 2002	5.13	5.13	3.03	3.03

Sources: GDP and household consumption expenditure are from the Global Development Network (www.gdn.org).

The relatively stable economic growth has been achieved through different development strategies. After reaching political independence, Tunisia opted for a strategy of collectivization in the 1960s. This strategy involved pervasive government control of the production factors through the institution of sizable public firms even within the competitive sectors, and through heavily public investments.[9] In the late 1960s, Tunisia removed the collectivization of the production means and embarked on an import-substitution strategy.[10] Within this strategy, the country promoted a private sector by protecting it against foreign competition, while continuing to exert extensive controls. Also, as it was a net exporter, Tunisia benefited from the escalation of oil and phosphate prices during this period to sustain high level of public investments in infrastructure and human capital, rapid increase in public sector wages, and generous subsidies on many foodstuffs. This period was so favorable that the country experienced a high economic growth up to the beginning of the 1980s. From 1970 to 1980, the real GDP grew, at the average, at an annual rate of 7.4%, so that the real GDP *per capita* jumped from US$ 1003 in 1970 to about US$ 1640 in 1980, measured in constant 1995 US$.

As reported in Table 3, the rapid increase in public sector wages and the generous food subsidies led to a faster growth of household consumption expenditure in real terms, with an annual rate of 7.8% in average during the first half of that period and 3.5 during the

[9] More information about this development strategy is in Morrisson and Talbi (1996).

[10] On this, see for instance Morrisson and Talbi (1996).

second half. Furthermore, Table 2 reveals that expenditure distribution improved to some extent, with the Gini index falling from 0.44 in 1975 to 0.43 in 1980. This gives evidence that expenditure growth had sufficiently spread over the population, consequently leading to a strong decline of poverty. According to official estimates, poverty affected 22% of the population in 1975. By 1980, total poverty had declined to 12.9% or by 41% in relative terms. Assuming unchanged expenditure distribution, the elasticity of the head count ratio to consumption growth was really high (about 11.7).

Despite the social gains achieved during this period, several policies of the 1970s and early 1980s were costly for the country but their drawbacks were to a large extent, covered by oil earnings. They included:

- The expansion of the public enterprise sector, which came to dominate various sectors of the economy, lagging behind the development of the private sector;
- An expansionary monetary policy to finance the government budget and the deficit of public firms and which relied heavily on government support;
- A rapid increase in public sector wages which set the pace for private sector wages and limits its scope to create jobs;
- A negative interest rate in real terms that distorted both credit allocation and investment choice;
- A pervasive system of price controls designed to protect consumers considering the limited competition in the domestic market;
- The maintenance of an overrated exchange rate regime that penalized exports;
- Quantitative import restrictions and high import tariffs to offset the maintenance of an overrated exchange rate regime; and
- The introduction of generous and not targeted subsidies on many food staples to support the purchasing power of the poor.

These policies were continued after 1980, even with the decline of oil and phosphate export earnings; resulting both from the depletion and the price decline of these resources. Although it appears pro-poor, as the extreme poverty had declined from 12.9% in 1980 to 7.7% in 1985, this is only true in the short run. In the long run however, this inward-oriented economic strategy could not be maintained, since the heavy distortions it creates, would impair economic growth as well as the downward trend of poverty. Indeed, these policies led to a large budgetary deficit, which averaged 5.2% of GDP during the period 1981–1986, a consumption growth that is higher than the income growth, a widening of the external current account deficit, which reached the pick of 11% in 1984 and averaged 8% of GDP in 1985–1986, and a rise in the level of foreign debt from 38% of GDP in 1981 to 63% in 1986. As a result, the economy stagnated throughout the

1980s. Unemployment had also risen to an estimated 15% and Tunisia's foreign currency had fallen dramatically by mid-1986.

With the decline of oil earnings, the heavy distortions and the large absorption of resources by the public sector could no longer be supported. The government of Tunisia made in the mid-1980s the strategic choice to move the economy toward market orientation while enhancing sustainable growth through an outward-oriented strategy in mid-1986 to compensate for the small domestic market. To achieve these goals, the government initiated a stabilization program together with structural adjustment reforms.[11] As the stabilization program required the reduction of macroeconomic disequilibria, the government reduced public expenditures and investment, privatized some public firms, froze wages, began cutting consumer subsidies, and devaluated exchange rate. Structural reforms have been applied throughout the period, but gained increasing importance after 1990. They were focused on four areas, namely:

- Foreign trade liberalization by removing quantitative restrictions, lowering import tariffs, and introducing convertibility on current account transaction;
- Price liberalization by dismantling the pervasive controls to curb relative price distortions, promote domestic competition, and improve the allocation of scarce resources;[12]
- Promoting the financial sector through a partial liberalization of interest rate, the introduction of new instruments, removing credit authorizations from the Central Bank, and the enhancement of the role of market forces; and
- Reforming taxation structure by introducing the value added tax and broadening the income tax base to reduce the reliance on foreign-trade taxes and increase total tax revenue.

Many macroeconomic indices showed that these reforms were, to a large extent, successful. Despite lower investment as a share of GDP, growth performance improved in the period 1987-1994 as compared to 1984-1986. Real GDP grew at an average rate of 4.5% in the latter period, compared to 2.6% corresponding to the former one. This improvement was stronger in terms of *per capita* GDP growth; as a result of the slowdown in population growth from 2.6% in 1984-1986 to 2.1% in 1987-1994. Economic growth was supported by production and export performance in labor-intensive sectors; like textile and tourism. These sectors became more competitive due to labor productivity improvement by 2.1% a year between 1987 and

[11] A full description of these programs and their impact on economic growth and reallocation of resources could be found, for instance, in Nsouli *et al.* (1993) and The World Bank (1996).

[12] Cereal prices are not included in the price liberalization reform but are set by the government. The prices of many services continue to be regulated. On this, see The World Bank (1996).

1994, real wages stagnation, and the devaluation of the exchange rate.

The net budget deficit was reduced from 5.3% of GDP in 1986 to 2.6% in 1993 by cutting budgetary investment and food subsidies and freezing public wages. Estimates of the public sector's share, which include government and public firms, in total output and in total investment, have slowly come down between the early 1980s and 1990s from 48% to 42% for output and from 57% to 54% for investment. Nevertheless, these shares remain quite high even compared with other developing countries. Privatization of public firms has played only a modest role in the government's restructuring and competitiveness upgrading efforts. Total cumulative sales since 1987 represented approximately 1% of GDP in 1994, with almost half of the privatization in the tourism sector.

Nonetheless, the economy is becoming more diversified and more open. While export (import) volume growth averaged 3% (0.8) between 1981 and 1986, it grew up to 13.2% (9.1) during 1987–1989 and averaged 5% (3.8) during 1990–1997. In addition, Tunisia's exports structure underwent a dramatic shift. It changed from being dominated by natural resource-based products with large export revenues in 1970s and large agricultural export share with 38.5% and 22.7% of total exports in 1972, respectively, to being more diversified in manufacturing and services. The share of the manufacturing products grew up from 8.4% in 1972 to 40.6% in 1997 whereas that of the services is less important; from 30.4% 37.3%. The agricultural share in total export represented only 7.1% in 1997 and the country became a net importer of energy products in 1990s.[13]

While undertaking adjustment reforms, the government cut social expenditures less than other expenditure categories. From 1985 to 1990, social spending roughly grew at the same rate of GDP and cut in food subsidies, as Table 6 reports, was still weak. In addition, the climatic conditions were so favorable that the agricultural output grew at 3.75% per worker during that period.[14] These conditions were decisive in reducing extreme poverty from 11.2% in 1985 to 7.4% in 1990.[15] As Table 2 clearly shows, while both *per capita* consumption and non agricultural GDP stagnated during the second half of 1980s, growth rate in agricultural income per worker was appreciable. This growth rate in agricultural income per worker

---

[13] The change in the composition of output was accompanied by an increase in the overall productivity of the economy. Total factor productivity's annual contribution to growth during the last four decades was 1.1%. On the other hand, capital and labor annual average contributions to growth were 2.7% and 1.1%, respectively, for an average growth rate of 5.1% during 1960-1998. On this, see *Banque Mondiale* (1999).

[14] According to The World Bank (1995), poverty reduction during that period is only the result of government choice to cut less in social spending than in the other public expenditures.

[15] These results are computed using The World Bank (1995) lower poverty lines.

should be a main factor behind the distribution improvement and the extreme and moderate poverty drop mainly in rural areas.

Surprisingly enough, Tunisian economy was found in a symmetric situation in the first half of the 1990s. The *per capita* consumption and non agricultural GDP increased while agricultural GDP growth was negative, following a high incidence of droughts. It follows a weak increase in extreme poverty, vulnerability and inequality as reported in Table 2. The incidence of extreme poverty rose from 7.4% in 1990 to 7.6% in 1995, the vulnerability from 8.2% to 9%, and the Gini index from 40.1 to 41.7.

The economy experienced an acceleration in economic growth during the second half of the1990s, supported by export performance and a higher growth in private consumption on the demand side, and an expansion in all GDP components (including agricultural output) on the supply side. Extreme poverty declined thus rapidly between 1995 and 2000. Using The World Bank estimates of lower and upper poverty lines, 7.6% of the population was in extreme poverty in 1995 and another 9% in moderate poverty. Extreme poverty was higher in the rural areas (13.9%) than in urban areas (3.6). By 2000, extreme poverty had declined to 4.7% or by 2.9 percentage points, with the absolute decline being higher in rural areas than in urban areas (5.2 *vs* 1.3 percentage points).

Table 2 clearly shows that, holding the assumption of distributional neutral growth, only the elasticity of poverty to agricultural GDP always has a negative sign.[16] Agricultural output conducts a counter-cyclical action on poverty with an elasticity that is by far lower during recession period (about -0.77) than during the expansion period (about -6 in average). Using an appropriate share of public expenditure to reduce the reliance of the agricultural output on the climatic conditions could be one of the key tools to promote pro-poor growth. Furthermore, the structural reforms of the 1990s may have increased the country's growth potential. Yet to heighten this potential, public spending should be devoted more to improve infrastructure and to invest more in education and health.

3. Public Spending: Trend and Composition

A pro-poor public action entails the removal of institutional and policy-induced biases against the poor, as well as the adoption of direct pro-poor policy. Macroeconomic policies that tend to constraint the combat against poverty include public infrastructure spending biased toward urban areas and against rural areas. Direct pro-poor policies are then required to promote both total factor productivity and equity goals. These include adequate targeted

[16] In reality, one cannot simply divide poverty changes by changes in some types of income to compute the quoted elasticities. One must also isolate the impact of such income changes on poverty. Unfortunately, this is not done in Table 2 since the required micro-data to compute accurately such elasticities are not available.

public expenditures for basic education, health and family planning services, improved access to public services, spending on labor intensive sector (like agricultural), and social safety nets.

Education, Health and Family Planning

The one-dimensional setting is not an effective way to yield a broader and fuller characterization of the dynamics of poverty. As argued above, the human development approach perceives development as an improvement in an array of human needs and not just as growth in income or consumption. Interestingly enough, Tunisia is not doing less efficiently in terms of human development indicators. As may be seen in Table 4, health levels improved, as the increase in life expectancy and falling in child mortality rates improved. Primary education became nearly universal and illiteracy is close to becoming eradicated among younger generations. Population growth also has been put under control following a family planning program undertaken in the early 1960s. The strong progress on social indicators and the regress in population growth are an important factor behind the reduction in the poverty head count over the last four decades.

Table(4)
Human Progress

	1966	1975	1984	1994	1999
Population					
Fertility Rate (per woman in age to procreate)	7.2	5.8	4.7	2.9	2.09
Population Growth Rate (%)	2.1	2.3	3	1.6	1.13
Health					
Life Expectancy at Birth for Male (years)	50.6	57.8	64	69	70
Life Expectancy at Birth for Female (years)	51.6	59.3	66	73	74
Mortality Rate under 5 (%)	22.7	15	7.6	3.7	2.9
Crude Death Rate (%)	0.15	0.1	0.065		0.054
Vaccination Rate (%)			66	93	96
Number of Individuals per Physician	6806	5900	2400	1762	1259
Education (%)					
School Enrollment Rate, Primary Male		90.4	97.8	99	99.1
School Enrollment Rate, Primary Female		62	83.4	95.4	97
School Enrollment Rate, Secondary Male		20.3	36.1	54.2	65.8
School Enrollment Rate, Secondary Female		12.2	*25*	*53.9*	69.9
School Enrollment Rate, Tertiary		3.9	5.4	12	19.3
Illiteracy Rate, Adult Male (15 and Above)	67	50.5	35.4	25	20
Illiteracy Rate, Adult Female (15 and Above)	91	77	62.5	48	41
Illiteracy Rate, Youth Male (15-24)	39	20	11.4	5	3
Illiteracy Rate, Youth Female (15-24)	76	53	35	18	7.4
Infrastructure (%)	1980	1985	1990	1995	1999
Access to Improved Sanitation Facilities	67.5	71	76	88.7	94.2
Rural			43	71.2	86.9
Urban			98	98.3	98.6
Access to Improved Water Source			75	86.7	91.6
Rural			54	65.7	77.5
Urban			91	98	99

Sources: UNDP (1999), World Bank (2003), Global Development Network, Societé Tunisienne d'Electricité et du Gaz (STEG – 2000), and authors' estimation for the values in *italics*.

Education. Education is a key asset to fight poverty in its multidimensional aspects, largely because it widens opportunities to find a good job and receive a higher earning in the labor market. Table 5 shows that a particularly large contribution to the overall poverty and vulnerability is made by the households headed by an illiterate. With an incidence of poverty of 15.6% in 1990, these households represent 68.1% of the poor in the country as a whole.

Table (5)
Poverty Indices and Contribution to Global Poverty by Socioeconomic Group

Poverty Measure (multiplied by 100)		P_0	P_1	P_2
National		15.6 (100)	4 (100)	1.6 (100)
Zone	Urban	9.8 (37.5)	2.3 (33.5)	0.8 (30.8)
	Rural	24.1 (62.5)	6.7 (66.5)	2.7 (69.2)
Region	Great Tunis	6.6 (8.8)	1.4 (7.4)	0.4 (6.6)
	Northeast	13.2 (11.6)	3.2 (10.8)	1.2 (10.1)
	Northwest	27 (26.0)	7.9 (29.2)	3.4 (31.5)
	Middle West	22.8 (21,4)	7 (25.1)	3 (27.6)
	Middle East	11.3 (15.2)	2.6 (13.3)	0.9 (11.9
	Southwest	24.3 (9.0)	6.3 (8.9)	2.4 (8.7)
	Southeast	13.7 (8.0)	2.3 (5.2)	0.7 (3.8)
Profession	Unemployed	15.0 (15.7)	4.2 (17.0)	1.7 (17.7)
	Agricultural laborer	34.3 (21.2)	9.8 (23.3)	4.1 (24.7)
	Agricultural farm	15.8 (15.8)	3.5 (13.4)	1.2 (11.6)
	Non agricultural laborer	16.0 (36.9)	4.2 (37.0)	1.7 (37.2)
	Non-farm self employed	12.9 (10.0)	3.1 (9.2)	1.2 (8.8)
	Skilled or manager	0.4 (0.3)	0.0 (0.06)	0.0 (0.0)
Education	Illiterate	21.8 (68.1)	6.0 (71.1)	2.4 (73.0)
	Primary schooling level	13.3 (27.3)	3.2 (24.9)	1.1 (23.4)
	Secondary schooling level	4.3 (4.3)	1.0 (3.8)	0.4 (3.4)
	Higher education level	1.3 (0.3)	0.2 (0.2)	0.06 (0.1)
Water	Access to pipe water	9.3 (35.5)	2.0 (30.7)	0.7 (27.5)
	Otherwise	25.1 (64.5)	7.0 (69.3)	2.9 (72.5)

Sources: Authors' calculation using the 1990 Household Survey and the upper poverty lines estimated by The World Bank (1995). The numbers between parentheses are the contribution of the pertinent group to the global poverty measure. For instance, rural poverty represents 69.2% of the national severity of poverty (P_2). Urban poverty represents only 30.8%.

Since its independence, Tunisia has given high priority to education. Education is accessible and free of charge to all individuals at all learning levels. Public spending on education has historically been high. It ranged between 5 and 6.5% of GDP over the last decades, with roughly 90% for recurrent expenditures and 10% for investment; as shown in Table 6.[17] Education spending has always been in an upward trend, even over the adjustment program. Although recurrent expenditures stagnate during that period in real terms as a result of the public employment freeze, investment in infrastructure was doubled.

Table (6)
Public Expenditure and Transfers in Tunisia
(Constant 1995 US$, million)

	1965	**1970**	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**
GDP constant 1995 US$	4102	5145	7706	10475	12863	14867	17987	23623
Total Revenue					4041	4153	6352	8800
Total Expenditure					4668	4981	6562	9400
Total Public Investment	844	615	1031	1574	1118	980	1259	1825
Agriculture	192	109	123	296	309	243	368	382
Industry	371	198	438	519	358	204	215.9	428.2
Electrification	45	42.9	54.9	90.5	215.5	97.2	136.6	335.4
Potable Water	0	21.1	30.1	122	93.4	62.3	52.5	70.8
Others	326	134	353	306.5	49.1	44.5	26.8	22
Services	114	152	297	508	227	199	242.2	410
Transport and Communication	56	136	275	439	159	176	232.6	395
Tourism	25	6.1	8.9	4.44	1.8	6.5	2.11	0.44
Housing	25	2.7	1.8	58.3	56	11.7	2.54	7.2
Other services	6.3	6.8	11.1	6.21	10.4	4.8	5	7
Public facilities	167	159	166	251	224	335	434	605
Education Recurrent Expenditures Investment	68.6	66.7	55.3	75.2	917 838 79	1029 886 143	1181 1028 153	1503 1307 196
Health Recurrent Expenditures Investment	19.7	21.1	30.5	51.2	291 245 46	330 294 36	404.5 355.5 49	488.4 444 44.4
Others (Cultural, Urbanism)	79	71.4	80.6	125	98.2	156	231.8	345.5
Transfers					1518	1725		
Food Subsidy	0	8.85	260	411	480	436	363	354
Cash Transfers to the Needy						23	32.4	44

Sources: Institut National de la Statistique, Ministère de l'Economie Nationale (1991), The World Bank (1995) and authors' calculation.

Using the 1990 household survey, The World Bank (1995) traces out two distinct features that characterize education subsidies in 1990. At the primary level, public spending benefited more the poorest than the richest deciles in relative terms, i.e., subsidies of primary schooling are pro-poor. Yet, recurrent expenditures on secondary

[17] According to The World Bank (1995), primary education accounts for 41% of recurrent expenditures, secondary education for 33%, training for 5%, and tertiary education for 18%.

schooling and higher education benefited the better-off both in absolute and in relative terms, letting this public spending share the pro-rich. The key factors driving this pro-rich bias should be a weak mean duration of school enrolment of the poor children and the indirect schooling costs, related to school stationery, that are incurred by the families.

Notwithstanding the distribution patterns, the outcomes of education policy are to a large extent, outstanding. While it was only at about 60% for female and 90% for male in 1975, net primary enrollment is virtually universal regardless of gender today; as Table 4 reports.

The effectiveness of primary education could be appreciated by looking at the dynamics of the illiteracy rate. For both male and female, this rate is nine-tenths finished in 1999.

Some aspects of gender equality are however, still not at par with Tunisia's ambitions. For instance, illiteracy rate among young females remains substantially higher than for their male counterparts. Poor children were less likely to be enrolled in primary and in secondary schools than non-poor children.[18] Indeed, while the net primary enrollment rate approximates 99% in 2000, it concerns only 67% of the poor children.[19] With less access to schooling, children of the poor may not improve their skill level, and could inherit the poverty status of their parents.

The future challenge for Tunisia is to ensure that all children successfully complete the primary and the first cycle of secondary school, or equivalently, basic school. Despite high public spending, the Tunisian education system shows signs of inefficiency. The repetition and dropout rates in upper basic school remain high (9.7% dropouts and 19.5% repetitions).[20] This inefficiency is mainly due to the allocation of resources: more than 90% of recurrent expenditures are on salaries and therefore spending on other pedagogical inputs is inadequate.

Another challenge that the country faces, is related to diversifying teaching programs and adapting them to the needs of the economy. Considering that the unemployment rate becomes more important among the educated people (one out four young among the educated whereas the national average is one out six in 2001), the education system should be adapted so as to remove as much as possible the mismatch between the demand side and the supply side of skilled workers.

[18] While this fact is not surprising, due to the opportunity cost of schooling time that is higher for the poor, this is a serious issue, given the strong correlation between poverty status and education level.

[19] See The World Bank (2003).

[20] See The World Bank (2004a).

Health. Over its development process, Tunisia has channeled large resources to develop a health care system that covers the population needs. Public health expenditures correspond in average to 2.2% of the GDP, with approximately 90% for recurrent expenditures and 10% for investment; as shown in Table 6. Although some inefficiency characterizes the system, it provides various preventive and curative health services that are rather impressive; as the improvement in the health status of the population proves. Table 4 reveals that life expectancy at birth has reached 70 years for men and 74 years for women in 1999. Vaccination of children is almost universal. Infant mortality has been significantly reduced, and the crude death rate has fallen.

Public health facilities are classified according to the level of care provided. At the primary level, the basic health centers, district hospitals, and maternities yield preventive services, basic outpatient care and primary care hospital services. At the secondary level, regional hospitals located principally in urban areas provide some specialized care and hospital services. The tertiary level includes university hospitals and specialized care institutes. They offer high-level services and are located in the largest urban centers.

The public sector is the main provider of health care facilities. The private sector facilities are concentrated in the largest urban centers. They account for less than 10% of the beds and play a growing role in yielding outpatient care.

Today, the Tunisian health care financing system is a combination of social insurance, general revenue, and out-of-pocket payment. To ensure the access of the poor to medical services irrespective of their ability to pay, the state provides free or subsidized health care to the lowest income groups: (a) 8% of the population which are classified as needy *familles nécessiteuses* receive free care in Ministry of Health facilities; and (b) an additional 25% of the population, who have low income, receive care in public facilities at reduced prices (co-payments). In addition, 66% of the population is covered by the social insurance funds.

Improving both the accessibility and the quality of the health sector continues to be an important challenge in Tunisia. Indeed, urban–rural disparities are evident in the geographic distribution of health facilities. While public expenditures represent 2.2% of GDP, private expenditures corresponded to 3% of GDP in 1992 and reached 3.2% in 2002. Although detailed national health surveys do not exist, 1990 household expenditure survey indicates that the share of the household budget devoted to health care is positive at very low consumption levels and greater in rural areas at all income levels.[21] Both the extremely poor and the vulnerable are then likely to spend a significant proportion of their income on private health care even though public services are available free of charge.

[21] On this, see The World Bank (1995).

According to The World Bank (2004a), this suggests that patients are not really satisfied with public care services. Despite recent considerable efforts of the Ministry of Health to address issues of care quality, going a step further in this direction remains a significant challenge. Challenges in future health sector developments also include increasing demand for high-technology health care, and an increasingly elderly population with chronic diseases that are expensive to treat. This is a natural consequence of the family planning effort undertaken in the early 1960s.

Family Planning Program. Tunisia embarked on a program aimed at lowering its fertility rate through the family planning program. Through this program, social workers make home visits to women to disseminate information on contraceptive methods. The Ministry of Education picked up this program in 1979 by integrating population education into the primary, secondary and higher education curricula as well as in training programs for teachers. Concurrently, an effective network of maternal and family planning centers was established in 1964 to yield primary health care and preventive services, particularly in rural areas.

The family planning program has been largely successful. The population currently grows at a rate of 1.1% a year. The total fertility rate has fallen from 7.2% in 1966 to 2.09% in 1999. These improvements are due to more mature marriage age, increased educational level of women and planning efforts. The country has therefore benefited from this decline at different levels. For instance, the work force growth rate has been declining from 4.5% during 1966–1975 to 2.5% during 1994–1999; despite the fact that an increasingly share of the female population is coming to the labor market.

Social Security

Legal social security is mandatory, covers urban wage-earners (including civil servants), agriculture workers and the self-employed, and provides cash benefits against insurable social risks, such as retirement, disability and survivors pensions, health insurance care, and protection against non-insurable risks such as family benefits. The system is managed by two distinct social security funds: (a) one for private sector workers, and (b) the other for public sector workers.

The system covers 60% of the labor force or about 86% of the eligible population, and this rate is progressing. About 33% of population over 60 years old receives pension benefits, compared to 15% in 1984. The amount of payments grew from 3.56% of GDP in 1987 to about 6% of GDP in 2002 (of which 4.5% of GDP is spent on pension benefits). However, the pension system is fragmented even if benefits are generous. Its financial balance is therefore under pressure due to the demographic transition.[22]

[22] The demographic transition leads to a declining of the demographic ratio, i.e, the number of active contributors per pensioner.

Agriculture

The cultivable area is estimated at 8.7 million hectares (ha), which is about half of the total area of the country. In 1993, the cultivated area was estimated at 4.25 million ha, of which 2.18 million ha consisted of annual crops and 2.07 million of permanent crops. Agriculture generates about 13.2% of GDP and 7.1% of merchandise exports in 1997. It employs about 22% of the labor force. Table 5 shows that 34.3% of households headed by an agricultural worker were at least in moderate poverty in 1990. Moreover, *per capita* expenditure of this population segment is just 49% higher than upper poverty line.[23] Although this picture should be improved by 2000, it demonstrates the extent to which the development of agricultural sector is of fundamental importance to fight extreme poverty and vulnerability.

Public investments in agriculture increased from US$109 million (at 1995 prices) in 1970 to US$382 in 2000, or an average growth rate of 4.26 per annum in real terms (see Table 6). Most of this increase occurred however, from 1970 to 1985 and, to less extent, during 1990s. Prior to 1985, public investment grew at an annual rate of 7.2%; it declined during the most severe period of adjustment by 4.7% per annum, but recovered in 1990s at 4.63% a year. As a proportion of GDP, public investments averaged more than 2.2% in 1970s and ranged between 1.6 and 2% in 1990s.

Because water resources are relatively scarce in Tunisia, public investments are oriented towards irrigation, drainage, and reuse of treated wastewater. Policy makers consider irrigation as a major tool to reduce rural poverty, income fluctuations, and increase food self-sufficiency. In 1980, only 3.8% of cultivated area was (intensively) irrigated and this rate increased to 8% in 2000. The communal irrigation water distribution systems are, in general, modern. There are prefabricated canals or low pressure pipes for surface irrigation and high pressure pipes for sprinkler irrigation. However, surface irrigation remains to be the most important irrigation technique.

Despite the expansion of irrigation, more investments are still needed to treat waste water, conserve and increase supply, protect the environment and increase water use efficiency. The high costs of investments in irrigation, drainage, operation and maintenance expenditures represent a drain to the national budget and have a clear impact on the rest of the economy. With poor efficiency in water use, these costs may remain a burden on the national economy while doing little to enhance and stabilize rural incomes. According to The World Bank (2004a), Tunisia recovers only about 90% of the operation and maintenance costs of irrigation water,[24] creating disincentives for more efficient use of what is the country's scarcest natural resource. Improvement in the recovery rate is then needed to

---

[23] Authors' calculation using the INS 1990 household survey.

[24] Depending on the region, recovery rates vary from 50 to 125%.

enhance irrigation efficiency rate, which in some small perimeters, is only 40%.

The objectives of the country are to encourage the adoption and practice of water- saving techniques, to expand irrigated areas, to favor the reuse of treated wastewater for irrigation, to introduce a better water tariff structure, and to set up related activities necessary for agricultural development and better use of irrigation schemes.

Infrastructure

Public expenditures on infrastructure include transport and communication, electrification, potable water, and housing. Public expenditures to improve infrastructure averaged about 3.55% of GDP during the period 1965–2000.[25] About 54% of capital spending under these programs went to transport and communication, 28% to electrification, 13% to water and 5% to housing.

Electricity. The 1989 national survey on population and employment reveals that almost 100% of the urban population has direct access to electricity. In rural areas however, more than 60% rely on oil lamp and other traditional means. The situation has improved in 1999 with approximately 87% of rural population having access to this facility. The lower rate was in the center west region with only 76.3% connected. But it is likely that this rate has reached the 88.4% in 2004.

Electricity prices are set to discriminate among consumption ranges and type of users (domestic, public and agricultural) with the goal to subsidize agricultural users. Thus, electricity tariffs are set at highly progressive rates across consumption ranges. The analysis of the Engel curves estimated by The World Bank (1995) shows that the budget share declines with income in urban areas but shows a flat profile in rural areas. This means that whereas this price policy is likely to exert redistributive effects in urban areas, it leaves rural distribution unchanged.

Water. Access to drinking water is one of the key factors of development in general, and of human development, in particular. Connection rate to the water power and potable water grids has been growing in both rural and urban areas, including for the poor. According to the UNDP (1999), almost 100% of the urban population and about 77.5% of the rural one have direct access to piped water, compared with 91% and 54% in 1985, respectively. The World Bank (1995) reveals that in 1989, about 70–80% of the urban poor have direct access to piped water but this rate falls to only 25% in rural areas. The dispersion and the isolation of the rural poor raise the cost of connecting them and slow down then the progress in the direction of the rural poor. Table 5 shows that 25.1% of the population with no access to piped water was at least in moderate poverty in 1990.

---

[25] Author's calculation using information reported in Table 6.

Like electricity tariffs, pricing structure of piped water discriminates between consumption levels and type of users (domestic, industrial, tourism, and collective). Tariffs by consumption range are highly progressive, leading to substantial cross-subsidization. According to The World Bank (1995), the effect of this price structure is that productive activities end up heavily subsidizing low-, middle-, and possibly high-income consumers.

Housing. According to the *Institut National de la Statistique* (2000), 87.4% of household own their dwellings. To improve access of the poor to decent house property, a notable effort has been made through different programs. The slum rehabilitation program, which absorbs about 25% of the public housing budget, is targeted to the poor. This program grants loan facilities and donations, which could cover up to 80% of the housing cost. This program enabled to reduce the proportion of rudimentary houses from 44% in 1956 to 1.2% in 1999. The rest of the housing funds are allocated to the construction of public housing units (houses and flats). Households with modest salaries could purchase these dwelling through subsidized loans.

Social Safety Nets

Tunisia has used two types of social safety nets to alleviate poverty: (a) direct transfers to the needy (the elderly, the handicapped, schoolchildren, and needy families); and (b) consumer food subsidy. The main difference in approach needs to be noted: the first regime is a targeted program while the second is to some extent, universal. Expenditures on these programs, about 1.5% of GDP in 2000, have decreased considerably in recent years reflecting the fall of consumer subsidy (from about 3. 9% of GDP in early in early 1980 to 3% in early 1990s and about 1% in 2002). Four-fifths of these public expenditures are devoted to food subsidy, and about a tenth goes to direct transfers to needy families. The rest covers administrative costs, like the remuneration of relevant government personnel.

Direct transfers. The National Program for Assistance to Needy Families (NPANF) was established in 1986 with the key role of granting allowances to the households living in extreme poverty. Concurrently, this program provides food aid for school children and preschoolers, cash transfers to the handicapped and the elderly poor. The NPANF budget has expanded nearly two-folds in real terms from US$23 million in 1990 to US$44 million in 2000. Thus, the number of targeted households rose from 65 000 in 1986, about 81% of the extremely poor, to 113 500 in 2000, that is about 189% of the extremely poor; or about 137% of the extremely and moderately poor.[26]

[26] Authors' calculation from *Institut National de la Statistique* (2000), World Bank (2003), PNUD (2004) and Bibi (2004). Note that according to the *Institut National de la Statistique* (2000), the household size for the whole population averages 4.85 persons and 6.65 for the poor population.

The NPANF suffers from the difficulties that typically arise in targeting direct assistance to the poor using means tests and socio-demographic criteria. Administration is complex; eligibility lists are rarely updated; and coverage is not always extended to those newly identified as eligible. Even when the lists are updated, the absence of serious analysis about the determinants of poverty leaves the eligibility criteria very general. The lack of such information could lead to leakage of large funds to the non-poor as well as under-coverage of the extremely poor. For instance, using Bibi (2004) estimates, the average gap between the lower poverty line and the mean expenditure per capita of the poor was US$60 in 2000 while the *per capita* transfers awarded under the NPANF reached about US$58. Thus, this program could either be very effective in reducing extreme poverty, if the pre-NPANF deficit of poverty was US$118 — or totally ineffective, if the US$60 deficit of poverty was unaffected by the NPANF. The reality ranges certainly between these two extreme assumptions. The limited access to unit record data on needy families thus prevents serious investigations concerning the effectiveness of NPANF in fighting poverty.

Food Subsidy. Since its inception in 1970, the principal goals of the food subsidy program have involved redistributing income toward the poor and protecting the purchasing power and nutritional status of low-income segments. Thus, basic staples were available in unlimited quantities at below-market prices to anyone who chose to buy them, and the government paid the difference between the producer prices and the subsidized consumer prices. Government expenditures on this program have been substantial throughout the1980s, amounting to 3.9% of GDP in 1980, 3.7% in 1985 and 2.9% in 1990.

To some extent, the universal subsidy program was successful in meeting these objectives. It was progressive in relative terms, contributing over four times more to the purchasing power of the poorest quintile of the population than to that of the richest (as a share of total expenditures).[27] This is not surprising since most subsidies were targeted on foodstuffs which, by Engel's Law, generally constitute a larger share of total spending by lower-income consumers than by the better-off. The presence of this program made the incidence of poverty less serious than it should appear in official statistics. Using the 1990 household survey, it was found that, according to the poverty line and the poverty measure chosen, poverty would be anywhere 12% to 23% higher in the absence of this program and that the elasticity of poverty measures to subsidy funds ranged between 0.12 and 0.23.

Performances of targeting by commodities in reducing poverty do not indicate, however, that it is an optimal transfer design. The program in hand benefited over two times more the richest quintile group than the poorest one in absolute terms. This erroneous awarding of benefits to the non-poor reduces the vertical efficiency of this scheme

---

[27] The poorest quintile of the population covers then the extremely poor and the vulnerable. For more details on this, see Bibi (2003).

and leads to an important leakage of the program benefits. The leakage ratio reached in 1990 about 75% of the public spending on this program, even if 40% of the population is deemed to be in (extreme or moderate) poverty.

In 1991, the government launched a reform on its consumer food subsidy program, designed to improve the targeting of subsidies and reduce expenditures with the least possible impact on lower-income groups. The program relied on a self-targeting mechanism based on quality differentiation of "inferior" and "superior" goods. The reforms aimed to transform the program from one that transferred more absolute benefits to the rich to one that disproportionately benefited the poor. Using 1995 household survey, it is observed that this goal is not achieved since the richest quintile of the population continued to reap over two times than the poorest quintile of theses funds. Indeed, about 29% of food subsidy benefited the richest quantile while only 12.8% assisted the less well-off quintile of the population.

Although it is inexpensive to administer, the absence of some commodities that are predominantly consumed by the less well-off, leaves food subsidy always poorly targeted and therefore, excessively costly. One of the aims of this study is to test whether transferring these funds to target direct transfers to the less well-off and/or increasing public expenditures on human capital is appealing.

4. Household Level Analysis of Poverty

Poverty is fundamentally a phenomenon arising at the level of households and their members. Thus, its measurement and characterization ideally requires the use of a representative data set at the household level. Unit-record data set of 1990 household survey are then used to analyze the factors that influence the households standard of living; and so their poverty status. Capturing the predominant factors that impact on the living standards of the less well-off could also be used to reduce leakages to non-poor and improve coverage of the targeted population of some social funds devoted to fight both extreme poverty and vulnerability.

Modeling the Determinants of Poverty

In any study of poverty, the first choice one faces is whether poverty should be measured in terms of income or expenditures. Total household expenditure *per capita* has been usually preferred, primarily on the ground that it appears to be much more linked to the households' standard of living.[28] This indicator includes market purchases (of food and non-food items), an imputation for the

---

[28] On this, see for instance Slesnick (1998). Deaton (1997) considers that this argument is much weaker than arguments based on practicality and available data. It is also for this last reason that in the present paper, poverty is measured in terms of consumption expenditures.

domestic consumption, and an imputed consumption of the dwelling services for the owner. To neutralize the differences between urban and rural cost of living, household expenditure *per capita* is then adjusted by the upper World Bank (1995) poverty lines. The choice of the upper poverty line is motivated by the focus on both the extreme poverty and the vulnerability issues.

The one-dimensional profile of poverty displayed in Table 5 highlights some important correlates of poverty. It can not however, establish the relative importance of each correlate (or determinant, if causality can be assumed). A multivariate analysis of poverty is then required. A basic model uses the standard of living measure (defined above) as dependent variable in a regression with exogenous household characteristics as explanatory variables. Such welfare model is a reduced-form equation of the various structural equations which express the income-earning and consumption behavior of the household.[29] This model should explicitly capture the marginal contribution of each characteristic on the household consumption level:

$$y_c^h = X_c^{h\,\prime}\beta + W_c^{\prime}\gamma + \mu_c + \varepsilon_c^h,\ h = 1,\ldots H \text{ and } c = 1,\ldots,C,$$
(Equation 2)

where y_c^h is the income *per capita* for household *h* living in locality *c* as a ratio of the local poverty line (z_c). X_c^h is a vector of characteristics of the pertinent household. W_c is a set of characteristics shared by all households living in *c*; μ_c is a term error specific to the locality *c*; and ε_c^h is a standard residual term.

Whenever no simultaneous effect of household's welfare on household's characteristics is assumed to be an acceptable assumption, so that all variables in X_c^h are exogenous, Equation 2 enables to capture the net effect of each characteristic. Holding this assumption, a simple ordinary least square (henceforth OLS) estimation of Equation 2 is fitting. Yet, for the purpose of poverty analysis, Equation 2, and then OLS estimation, is not the optimal choice. Indeed, it is assumed within this framework, that the marginal effect of a given household's characteristic, like education, is the same across the whole population, irrespective of the poverty status of each household. Moreover, OLS procedure stresses minimizing the errors between "true" and predicted welfare at the top of the welfare distribution, which is not of interest for poverty analysis. Equation 2 is, therefore, not strictly appropriate to the problem posed in this section.

To address this issue, the easiest approach is to follow either of these two routes. The first route is to estimate Equation 2 for the poor and the non-poor separately. The second one is to introduce a set of interaction variables (between a binary variable, which indicates the poverty status of each household, and the other right-hand side

[29] See Glewwe (1991).

variables). Whereas the two methods are equivalent econometrically, their estimation is yet problematic. In the first way, each group (the poor and the non-poor) forms a truncated segment of the overall welfare spectrum, so that a selectivity bias would arise from OLS estimation. The second route leads to the same result, because the binary interaction variable is clearly endogenous; as it is merely a binary representation of the dependent variable.

Given this fact, an appropriate econometric approach to modeling the living standards of households is the Heckman-type selection model.[30] Applied to the present context, such an approach models the standard of living based on two equations, the first capturing the poverty status and, then, using the derived inverse Mills-ratio to correct the welfare equations of the poor group:

$$y_{1c}^{h} = X_{1c}^{h}{}'\beta_1 + W_{1c}^{'}\gamma_1 + \mu_{1c} + \varepsilon_{1c}^{h},\ h = 1,...H \text{ and } c = 1,...,C,$$
$$y_{2c}^{h} = X_{2c}^{h}{}'\beta_2 + W_{2c}^{'}\gamma_2 + \mu_{2c} + \varepsilon_{2c}^{h},$$

(Equation 3)

where $\varepsilon_{1c}{}^{h}$ and $\varepsilon_{2c}{}^{h}$ are typically allowed to be correlated; $y_{1c}{}^{h}$ is a binary variable indicating whether or not household h is poor:

$$y_{1c}^{h} = \begin{cases} 1 & \text{if} \quad y_c^h < 1 \\ 0 & \text{if} \quad y_c^h \geq 1 \end{cases}$$

and $y_{2c}{}^{h}$ is observed as $y_c{}^{h}$ when $y_{1c}{}^{h}$ is equal to 1. The first equation of Equation 3 is estimated across all observations and captures the probability to be poor, conditional on the household characteristics:

$$P(y_{1c}^{h} = 1) = P(y_{1c}^{h} > 0) = F(X_{1c}^{h}{}'\beta_1 + W_{1c}^{'}\gamma_1 + \mu_{1c})$$

where $F(.)$ is the cumulative function specified for the error terms $\varepsilon_{1c}{}^{h}$. In reality, $y_{1c}{}^{h}$ is not observable. What is observed is the latent variable $l_{1c}{}^{h}$ where $l_{1c}{}^{h}$ = 1 if the household h living in c is poor. This is modeled as a function of household–specific explanatory variables, estimated as a Probit, and considering the same variables across all households.

The second equation of Equation 3 then applies only to those households selected as being poor.[31] This second equation gives the household's welfare level as a function of relevant explanatory variables. In this case, the dependent variable is both observable and continuous. Because of the selectivity problem previously referred to,

---

[30] See Heckman (1976).

[31] Thus, estimation results of the Heckman selection model could not be used for targeting purpose whenever the living standard of the households is assumed to be an unobservable variable.

however, the two equations should be considered jointly using the inverse Mills-ratio derived from the Probit model to correct the welfare equations. Having included this term in the second equation of Equation 3, it may be then estimated by OLS to yield consistent coefficient estimates.

The explanatory variables included in X_{1c} and X_{2c} are household-specific variables influencing, respectively, the poverty status and the standard of living within the poor segment. These sets may contain some of the same variables; the only restriction is that, for identification purposes, the matrix X_{1c} should involve some variables that are not in X_{2c}. However, in practice, it is not always easy to determine which variables should be included in the former matrix but not in the latter.

The interpretation of the coefficients in the second equation of Equation 3 is straightforward, being the same, like in any OLS regression. Nevertheless, the coefficients of the Probit model do not give the marginal effects of the variable in question on the probability to be poor. However, these are readily computed by a standard transformation. It is the marginal effects of both equations that are going to be interpreted in turn.

Table 7 defines the correlates of living standards used in the prediction regressions. The correlates are grouped to facilitate the discussion of their characteristics as:

- Household composition and characteristics of the head of household;
- Household assets: education, and dwelling quality;
- Labor market connections: employment rate; and
- Economic environment: mainly the region in which household lives.

Table (7)
Nomenclature of Explanatory Variables
Using Household Level Data

Area	
Great Tunis	1 if household lives in Great Tunis; 0 otherwise.
Northeast	1 if household lives in Bizerte, Nabeul or Zaghouen; 0 otherwise.
Northwest	1 if household lives in Beja, Jendouba, Kef, or Siliana; 0 otherwise.
Middle East	1 if household lives in Sousse, Monastir, Mahdia, or Sfax; 0 otherwise.
Middle West	1 if household lives in Kairouen, Sidi Bouzid, or Kasserine; 0 otherwise.
Southeast	1 if household lives in Gabes, Medenine, or Tataouine; 0 otherwise.
Southwest	1 if household lives in Tozeur, Kebillie, or Gafsa; 0 otherwise.
Demographic	Number of children in household old less than 2 years old
Information	Number of children aged between 3 and 6 years
Nc2	Number of children aged between 7 and 11 years
Nc3-6	Number of adults aged between 12 and 18 years
Nc7-11	Number of adults old more than 19 years
Na12-18	Household size
Na19p	(Nc2 + Nc3-6 +Nc7-11)/size
Size	Age of the household head (HH)
Demographic_Ratio	Squared age of the HH
Age	
Age2	
Occupation of HH	Household Head
Unemployed	Dummy variable for unemployed HH
Agrilab	Dummy variable for agricultural laborer HH.
Notagrilab	Dummy variable for non agricultural laborer HH
Agrifar	Dummy variable for agricultural farmer HH
Informal	Dummy variable for informal HH
Skilled	Dummy variable for skilled HH
Another	Dummy variable for HH having another type of job
Working	Number of working men and women living in the household
Employment_Rate	Working/Na19p
Schooling Level of HH	Dummy variable for HH is illiterate
Illiterate	Dummy variable for HH has a primary schooling level
Primary	Dummy variable for HH has a secondary or a higher educational level
Higher	Dummy variable for HH has a higher educational level
Type of House	1 if household lives in a detached house; 0 otherwise
Detached House	1 if household lives in a flat; 0 otherwise
Flat	1 if household lives in an Arab house; 0 otherwise
Arab_House	1 if household lives in a hovel; 0 otherwise
Hovel	Number of rooms *per capita*
Room_*per capita*	Room_*per capita* multiplied by hovel
Room_Hovel	Room_*per capita* multiplied by Arab_house
Room_A	

Whereas it is easy to include other explanatory variables, eg., the occupation nature of the households' head and the dwelling characteristics, this route is not followed to avoid simultaneity problem that leads to biased estimators. Column 2 of Table 8 displays the estimation results of Equation 2 by the OLS method. The general pattern of findings is that the selected variables have large effects on welfare outcomes. These results serve as a benchmark in analyzing the marginal effect of each of the selected variable on the welfare of the poor.

Table (8)
Estimation Results of Equations 2, 3 and 4
Using Household Level Data

Variables	OLS (Equation 2)	Heckman (Equation 3)		Tobit (Equation 4)	
		Probit *100	OLS	Version 1	Version 2
Northwest	-49.9	7.8	-7.2	-15.1	-13.9
	(-5.6)	(4)	(-3.6)	(-7)	(-7.5)
Middle West	-42.1	4.3	-7.1	-10.1	-10.3
	(-4.8)	(2.7)	(-3)	(-4.8)	(-5.8)
Southwest	-60.4	6.5	-3.3	-4.5	-4.8
	(-4.8)	(2.2)	(-1.3)	(-1.6)	(-1.8)
Nc2	-	-	-1.97	-	-2.5
			(-1.9)		(-2.3)
Nc3-6	-	-	-1.7	-	-5.3
			(-2.3)		(-6.9)
Nc7-11	-	-	-	-	-6.7
					(-9.5)
Na12-18	-	-	-1.6	-	-
			(-2.9)		
Na19p	-	-	0.74	-	-
			(1.65)		
Demographic	-293.1	28.1	-	-67.2	-
Ratio	(-21)	(14.8)		(-16.6)	
	0.39	0.104	0.47	-0.21	-
Age	(0.3)	(0.6)	(1.65)	(-0.6)	
	0.004	-0.001	-0.004	0.002	-
Age2	(0.4)	(-0.6)	(-1.6)	(0.7)	
	73.1	-5.8	-	12.4	-
Employment_	(7.6)	(-4.4)		(4.6)	
Rate	-	11.1	-2.9	-	-
		(10.8)	(-1.4)		
Illiterate	64.6	-	-	16.4	-
	(8.8)			(8.3)	
Primary	235.1	-	-	44.5	-
	(27.6)			(13.2)	
Higher	-	-	-	-	50.3
					(13)
Detached house	-	-	-	-	24.2
					(13)
Arab house	-	-	-	-	-
Hovel	-	-	-	-	66.2
					(16)
Room_pc	-	-	-	-	-
Room_hovel	-	-	-	-	-
Room_a	32.2	-6.4	-	13.0	-
	(4.8)	(-5.9)		(7.6)	
Pipe_water	25.6	-1.7	-	0.6	4.8
	(3.9)	(-1.5)		(0.3)	(3.1)
Tourism					

Values between parentheses indicate the t – ratio.

Column 3 of Table 8 reports the marginal effects of the explanatory variables on the probability that a particular household belongs to the poor segment of the population. The signs of most coefficient estimates correspond to what is expected for such equations and are statistically significant at the 5%. *Ceteris paribus*, households whose head is illiterate are poorer than the households whose head has at least primary level of education. Unsurprisingly, to be located in the Northwest, Middle West and Southwest of Tunisia appear to be a predominant factor influencing poverty status. On one hand, this may reflect the weak access to public services, as the negative sign of the pipe water variable suggests.[32] On the other hand, this may also reflect the lack of waged jobs in the poorest western regions of the country. In part, this latter argument is confirmed in two ways. The first one is the negative relationship between the employment rate (the proportion of the employed in the household) and the likelihood to be poor. Although to a less extent, the second one is the negative contribution of the tourism industry in the city in which households live on the probability to be poor. Concerning demographic characteristics, households with high proportion of children (under 12 years old) run a higher risk to be poor.

Turning to column 4 of Table 8, the determinant of the standard of living of the poor population segment is considered. Some of the added variables, e.g., the number of children, are not statistically significant. On the other hand, education of the households' head, which is a predominant factor influencing the poverty status, does not appear to be an important determinant of the households' living standards. This probably reflects the fact that most of the poor are illiterate and unemployed or may have a wage employment which is likely to comprise mostly activities for which education is not very important, such as working as in agricultural or informal sectors.

Notwithstanding, and as mentioned above, the OLS estimation method is anchored on the mean of the distribution of the dependent variable and provides accurate predictions around this mean only, which is often higher than the poverty line. Furthermore, as it is merely a binary representation of the dependent variable, the use of an interaction variable (which indicates the poverty status of each household) should lead to biased estimates. This endogeneity problem rules out certainly the use of OLS regression, but also casts doubt on the Heckman selection model. Indeed, since the poverty criterion is the same as the dependent variable in the welfare equations, it would be very difficult to place an identifying restriction on the welfare equation. For the purpose of using poverty correlates to improve targeting of social funds, like those devoted to food subsidy, the Heckman selection model is not pertinent whenever the living standard of the poor is not a directly observable variable.

A suitable technique is available, however, if the situation could be deemed as a censored model, in which case Tobit regression becomes a relevant tool to tackle both the problem of poverty correlates and targeting issues. This requires the assumption that Equation 2 is the correct welfare model for the poor and that the same set of explanatory variables determine whether a given household is poor or

[32] It may be noted here that if the tourism variable is removed from the regression, the coefficient of the pipe water variable becomes statistically significant at the 5% conventional level.

not. No assumptions are made about the welfare determinants of the non-poor; the process and the parameters could or could not be the same. The model sets any expenditure level higher than the relevant poverty line equal to 1, i.e., the data are censored at the poverty line:

$$y_{3c}^{h} = \begin{cases} y_c^h & \text{if} \quad y_c^h < 1 \\ 1 & \text{if} \quad y_c^h \geq 1 \end{cases}$$

(Equation 4)

This model allows for the possibility of different parameters for the poor and non-poor. Furthermore, a comparison of the estimated parameters of Equation 4 with those of Equation 2 enables the checking of whether the mechanisms explaining the living standards of the non-poor are very different from those explaining the living standards of the poor. This is especially relevant for the parameters of human capital, which measure the returns to these assets. One can then check whether, for example, the returns to education differ between the poor and the non-poor. Another appealing feature of Equation 4 is that it focuses on the well-being of those who are either in extreme poverty or in vulnerability, since it is a simple transformation of the households' poverty gap:[33]

$$g_c^h = \begin{cases} 1 - y_c^h & \text{if} \quad y_c^h < 1 \\ 0 & \text{if} \quad y_c^h \geq 1 \end{cases}$$

(Equation 4a)

Column 5 of Table 8 reveals that Tobit estimation performs, to some extent, better in capturing the marginal effect of a number of key variables on the living standard of the poor. For instance, Tobit estimation clearly indicates the key role played by education in enhancing the well being of the poor. Households where the chief has primary education, have a welfare level by 16.4% (of the pertinent poverty line) above that of the reference households headed by an illiterate. Furthermore, these results confirm once again the strong link between poverty and location, labor market connection, and demographic characteristics. These results could be a useful tool to simulate poverty levels resulting from the implementation of an alternative targeting scheme to food subsidy.

Poverty Correlates and Targeting

Attempts to target public transfers efficiently are typically constrained by the lack of information government agencies have on the welfare of households. This is particularly true in less developed countries. Policy makers are thus forced to select among imperfect targeting schemes to select recipients of public support. As reviewed in the previous section, subsidy program is one of the main tools used to enhance the purchasing power of the poor. Although this program

[33] Recall that this poverty gap is captured using the upper poverty line.

lessens the severity of poverty, the leakages to the non-poor are very large (about 75%). Because governments have limited resources, and therefore vitally important to use them efficiently, it would thus seem instructive to compare the outcome of this program with that of an alternative one, based on household proxy-means tests; subject to the same aggregate budget as that devoted for food subsidy.

There is plenty of theoretical modeling and empirical estimation concerned with the question of how to yield assistance to the poor when it is possible to observe some individuals' characteristics, but not their income.[34] Fortunately, the analysis of poverty correlates using Equation 4 shows a strong association between poverty and many socio-demographic characteristics that are easily observable. These variables are linked to the location and demographic characteristics; and could then be used for targeting purpose. In addition, for this purpose, new variables linked to dwelling characteristics may be included.

While these variables could be deemed as endogenous, there is no cause for concern since the underlying determinants of income is not being estimated. Indeed, the concern is whether some right-hand side variables can be hidden or manipulated by households who realize that the information is being collected for targeting purpose. Thus, whereas it is technically possible to consider other correlates, like the occupation nature of the households' head and their education level, this is not done since any household attempting to become eligible or to get more benefits, may effortlessly conceal these characteristics.

Hence, to predict the households' standard of living, the aforementioned variables are used to estimate a second version of the Tobit model. The regression results are displayed in the sixth column of Table 8. The program channels redistributive direct transfers to the predicted poorest household first, the least poor, last. More precisely, the program assigns firstly to household with the highest predicted poverty gap a *per capita* transfer that lowers its poverty deficit to the next highest one. This is followed by a transfer to these first two households that lowers their predicted poverty gap to that of the next poorest household. This pattern is repeated until expending all food subsidy funds. This procedure yields a detailed schedule of transfers that depends on observable socio-demographic characteristics.

Comparing the outcomes of food subsidy and socio-demographic targeting requires an estimator of individual well-being that is sensitive to price variations. Following King's (1983) methodology, a vector of reference prices is used to compute a distribution of real (or ''equivalent'') incomes under the current program (food subsidy) as well as under the counterfactual one (socio-demographic targeting). The reference prices are given by those prices presumed to prevail in the absence of any of these anti-poverty programs. To compute

[34] On this, see for instance Ravallion and Chao (1989), Glewwe (1992), Grosh and Baker (1995), and Bibi (2003).

equivalent incomes (and, if need be, the size of the deadweight losses), the results of Bibi's (2001) estimation of a Tunisian commodity demand system are used.[35]

Quantitative estimates of the overall comparative policy effectiveness of the two targeting schemes are summarized in Table 9. Using the upper poverty line, the initial head count ratio would be 20.8%. It is reduced to 15.6% under the food subsidy program and to 11.4% under the counterfactual one. Yet the head count ratio only records people that have been lifted out of poverty. Thus, the effectiveness of this counterfactual policy cannot be accurately evaluated using only the incidence of poverty; since this policy is not only a poverty-eliminating program but also a poverty-alleviating scheme. Looking at the poverty gap, this policy would enable to halve the deficit of poverty from its original level, i.e., from 4.1% of The World Bank (1995) upper poverty line under the food subsidy program to 2.1% using the proxy-means test. For a distribution-sensitive poverty measure, the effects are outstanding, since the severity of poverty would be more than halved.

Table (9)
Impact on Poverty of Alternative Schemes Using Poverty Correlates from Equation 4a

Situation	P_0	P_1	P_2	Leakages (%)
Benchmark lower	10.6	2.65	1.01	0
upper	20.8	5.84	2.39	0
Food subsidy lower	7.43	1.72	0.63	94.7
upper	15.6	4.08	1.59	87.8
Dir. transfers lower	3.05	0.49	0.13	86.6
upper	11.4	2.13	0.64	69.8
Marginal Benefice (%)	(47)	(68)	(73)	

Source: Authors' estimation using the 1990 Household Survey.

Furthermore, one way to look at the gains from proxy-means tests is to assess how much money may be saved while attaining the same poverty alleviation achieved by food subsidy. This evaluation is particularly interesting since in the wake of structural adjustments, the reduction of public deficit without impairing the welfare of a targeted group is one of the most sought-after objectives. So, when the aim is to reach the actual poverty level, Table 9 shows that the alternative program would allow achieving this goal while enabling to save 47% to 73% of the available funds according to whether poverty is measured by the head count ratio or a distribution-sensitive measure.

The reduction of poverty that would arise from this change is more important if one uses the lower poverty line. This means that the poorest should profit more from this change than the vulnerable. This result would be strengthened if it could be shown that the

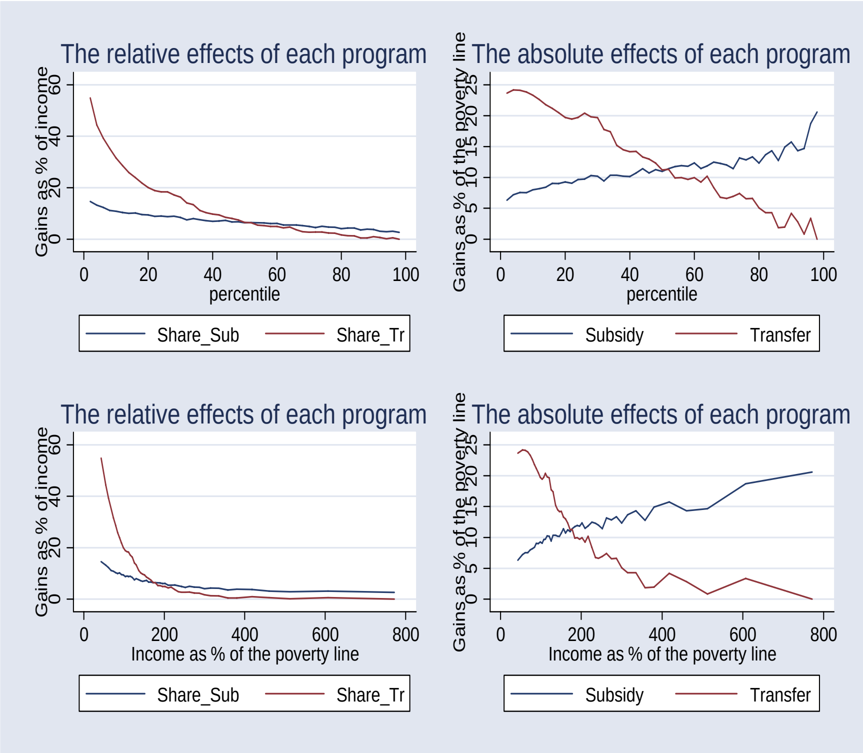
[35] Bibi (2001) found that the aggregate deadweight loss amounts to approximately 16.7% of the total food subsidy budget. The cost of this excess burden should be added to the leakages of food subsidy to the non-poor.

relative contribution of the direct transfers to total expenditure, (T^h/Y^h), declined monotonically with increases in income. On the left hand side of Figure 1, the results of the link between these two variables obtained using a non-parametric estimation are displayed.

The results are revealing, since they confirm the larger progressivity of the counterfactual program (referred to as share_tr) as compared with food subsidy (referred to as share_sub). Interestingly enough, and contrary to the food subsidy program, the right hand side of Figure 1 shows that even the absolute contribution of the simulated program (expressed as percentage of the upper poverty line and referred to as *transfer*) exhibits a downward sloping across different income quantiles (top right) or income groups (down right). This reform would enable the movement from a situation where more absolute benefits are transferred to the rich than the poor to a better situation that disproportionately benefited the poor.

Poverty status analysis at the household level is complex. In part, this complexity arises because of the grouping together of several different groups of households, complex units themselves. Often this complexity encourages the study of types of households that are more homogenous in nature; and the regional level analysis follows naturally.

Figure (1)
The effects of food subsidy and the simulated direct transfer (based on proxy means tests) on the distribution.



5. Regional Level Analysis

This section focuses on the effects of some public intervention on economic growth, inequality, and poverty. For this purpose, regional data at the governorate level over the period 1980–2000 are used. This level of analysis highlights some features of the link between public spending, growth and poverty that the household level analysis does not yield, primarily due to the absence of panel data at the household level. However, the analysis of the regional level is also constrained by data availability. Many assumptions have been made to run the estimation. Thus, the results are only indicative. Nevertheless, it serves as a first step to stimulate the debate and to decode the macroeconomics link between investment in human capital, growth and redistribution.

To highlight and summarize the links between poverty, growth, and inequality, the three commonly used FGT poverty measures at the governorate level are regressed on the mean expenditure *per capita*, the inequality measure and other factors that may affect poverty, e.g. employment rate, illiteracy rate and other variables shown in Table 10. The mean expenditures *per capita* are expressed as percentage of the pertinent poverty line to account for spatial and temporal price variations. The following equation is fitted to combine cross section (at the governorate level) and time series data:

$$\log(\mathrm{P}_{\alpha,c,t}) = \delta_{\alpha,0} + \delta_{\alpha,1}\log(\bar{y}_{c,t}) + \delta_{\alpha,2}\log(S_{c,t}) + \delta_{\alpha,x}\log(X_{c,t}) + \mu_{\alpha,c} + \varepsilon_{\alpha,t}$$
$$\alpha = 0,1,2; \qquad c = 1,\ldots,C; \qquad t = 1980,1985,1990,1995,2000.$$

(Equation 5)

where $X_{c,t}$ is a set of control variables which characterize the governorate *c* at the period *t*; $\bar{y}_{c,t}$ is the mean expenditures *per capita* adjusted by the relevant poverty line ($z_{c,t}$); $\mathrm{P}_{a,c,t}$ is the extent of poverty as measured by the incidence of poverty (a = 0). The deficit of poverty (a = 1), or the severity of poverty (a = 2); $\mu_{a,c}$ is a time invariant term error specific to the governorate *c* given a, $\varepsilon_{a,t}$ is a standard residual term given a; and $S_{c,t}$ is the inequality index of Atkinson (1970) given by:

$$S_{c,t} = 1 - \frac{\exp\left(\frac{1}{H_{c,t}}\sum_{h=1}^{H_{c,t}} n_{c,t}^{h}\log(y_{c,t})\right)}{\bar{y}_{c,t}}$$

Turning now to the main parameters of Equation 5, $\delta_{a,1}$ and $\delta_{a,2}$. $\delta_{a,1}$ is the pure growth effect and $\delta_{a,2}$ is the inequality effect in Kakwani and Pernia (2000) terminology. The former is then the elasticity of poverty to growth all thing being equal, while the latter is the elasticity of poverty to inequality changes *ceteris paribus*. Whenever economic growth is sufficiently spread over the population, absolute poverty will decline and $\delta_{a,1}$ will be negative. Nevertheless, $\delta_{a,2}$ is expected to be positive, meaning that the growth effects will be either enhanced or curbed according to whether the income of the poorest grows at a faster or a lower rate than the income of the non-poor.

To capture the effects of consumption, inequality, and other relevant variables on the change of poverty within each governorate and over time, Equation 5 could be estimated using either fixed-effects to control for the unobservable time invariant regional effects, or random-effects. The test of Hausman (1978) rejects the fixed effects model and the estimated results are reported in Table 10 are then those of the random effects model. There are three panels of results in this table. The left panel presents estimation with the head count ratio as a dependent variable. The middle panel displays the elasticities of the deficit of poverty to the different explanatory variables, while the right panel exposes the same elasticities with the severity of poverty.

Table(10)
Estimation Results of Equation 5 Using Regional Level Data

Explanatory Variables	P_0	P_1	P_2
Constant	5.1	4.41	4.07
	(5)	(3.4)	(2.21)
Log(real income *per capita*)	-2.89	-3.65	-4.36
	(-16)	(-15)	(-13)
Log(inequality index of Atkinson, 1970)	1.95	2.57	3.21
	(9.9)	(10)	(9)
Log(illiteracy rate)	0.14	-0.06	-0.23
	(1)	(-0.3)	(-0.9)
Log(employment rate)	-0.65	-1.09	-1.38
	(-1.2)	(-1.55)	(-1.4)
Log(demographic dependency rate)	-0.24	0.11	0.45
	(-1)	(0.4)	(1)
Log(classroom per pupil)	-0.26	-0.4	-0.42
	(-0.8)	(-1)	(-0.7)
Log(hospital bed *per capita*)	-0.21	-0.13	-0.12
	(-2.3)	(-1)	(-0.7)
Log(dwellings *per capita*)	0.26	0.02	-0.25
	(1.3)	(0.1)	(-0.7)
Log(hovels/dwellings)	0	-0.02	-0.02
	(0)	(-0.3)	(-0.2)
Log(dwellings with electricity/total	0.47	0.31	0.34
dwellings)	(2.5)	(1.3)	(1)
	0	0.04	0.06
Log(annual rainfall/average rainfall)	(0)	(0.7)	(0.7)
	0.1	-0.05	-0.12
Log(irrigated area *per capita*)	(0.4)	(-1)	(-1.6)

Values between parentheses indicate the t – ratio.

Reading across the three panels, the general pattern of findings is that income growth and the drop in inequality have the largest effects on poverty, irrespective whether poverty is measured by a distribution sensitive yardstick or not. Not surprisingly, the elasticity of poverty to growth and poverty to inequality are more important (in absolute values) when poverty is measured by distribution-sensitive index (P_2) rather than poverty measures that are more sensitive to the welfare change of the less-so-poor (P_0).

The estimates of elasticities of poverty to growth are high, ranging between 2.9 for $\alpha = 0$ and 4.4 for $\alpha = 2$.[36] Since the annual economic growth *per capita* between 1980 and 2000 was about 2% (see Table 3), this should entail an annual decrease in poverty by about 5.8% at least. If the inequality has not increased during that period within each governorate, all poverty would have been eradicated by 2000. However, the positive elasticity of poverty to inequality slows down the impact of growth approximately by two thirds whenever income and inequality grow at the same rate. For instance, a 10% rise in (*per capita*) consumption decreases the incidence of poverty roughly by 29% whilst a 10% rise in inequality is associated with a 19.5% increase in poverty, so that the net effect is about 9.5% fall in poverty. The net elasticity ($|\delta_{\alpha,1} + \delta_{\alpha,2}|$) ranges between 0.94 for $\alpha = 0$ and 1.15 for $\alpha = 2$, indicating that economic growth remains to a large extent pro-poor, as long as inequality does not rise at a faster rate than the mean income.

As Table 10 reveals, most other estimates included to capture the impact of some public policy on poverty, are not statistically significant at the conventional level of 5%. For instance, the investment in education infrastructure (captured by the number of classroom evolution) does not show an important effect on poverty. On the other hand, investment in health infrastructure appears to have the expected effects on poverty, but only when deprivation is calculated by the head count ratio; that is, by an index which is sensitive only to the well being variation of the less-so-poor. In reality, this is hardly a surprising result in the light of many other empirical studies. For instance, The World Bank report (2004b) indicates that despite the fact that governments devote about a third of their budgets to education and health, only a small share profits the poor. Dollar and Kraay (2002) consider that social spending in developing countries often benefits the middle class more than the poor so that an increase on investment for education and health do not necessarily lead to a higher income for the poor. Kakwani and Pernia (2000) argue that public spending on education and health are usually biased toward urban areas and against rural areas where most of the poor reside.

Another explanation of these inconsistent results may be attributed to the limited number of observations, to the necessity to introduce lagged variables concerning public investment in education and health, and the endogeneity of some regressors of Equation 5. Most of the poverty-growth elasticities reported in the literature do not acknowledge the potential endogeneity problem that arises from the fact that average income, the inequality index and poverty measures are computed by using basically the same information. To address

[36] These results are comparable to other studies using cross-country data. On this, see among many others, Dollar and Kraay (2002).

this problem, Dollar and Kraay (*op cit.*) deal with this by using instrumental variables and also address the problem arising with the inclusion of lagged endogenous variables. Lundberg and Squire (1999) suggest however, to account for simultaneity in the determination of poverty, inequality and growth. The simultaneous treatment of these variables should enable to capture the public tools affecting directly and/or indirectly these key determinants of social welfare. This makes easier the design of inexpensive and effective public spending package that meet both efficiency and equity goals. For this purpose, the following equation system is considered:

$$\Delta \log(\bar{y}_{c,t}) = f(INVEducation,\ INVagr,\ Employment\ rate,\ S_{c,0},\ S^2_{c,0},\ \bar{y}_{c,0})$$

$$\log(S_{c,t}) = g(\Delta \log(\bar{y}_{c,t}),\ \log(Employment\ rate),\ \log(classroom_{c,t-1}),$$

$$\log(hospital\ beds_{c,t-1}))$$

$$\log(\mathrm{P}_{\alpha,c,t}) = h(\log(S_{c,t}),\ \log(\bar{y}_{c,t}),\ \log(enrolment),\ \log(hovel\ /\ dwelling))$$

(Equation 6)

The first equation of Equation 6 aims to capture some determinates of growth. For this purpose, investment in education and agriculture as well as employment rate are introduced as independent variables. To test the existence of an inverted U-shape relationship between growth and inequality, the initial level of inequality and its square are introduced as regressor. The last variable that is used in the growth equation is the initial level of *per capita* expenditure.

The second equation of Equation 6 tries to link the changes in inequality to the economic growth, employment rate and public spending on education and health infrastructure.

The last equation of Equation 6 should capture unbiased elasticities of poverty to growth and poverty to inequality. The others variables are control variables, which characterize the governorate *c* at the period *t*. As in Equation 5, three poverty measures are used. As compared with other applications on cross-countries, the equation of poverty does not include as regressor the poverty line, since this last is constant in real terms over regions and over time.

The estimated results are reported in Table 11 and as with Equation 5, there are three panels of results in this table. The left panel presents estimation with the head count ratio as a dependent variable in the third equation of Equation 6. The middle panel is linked to the poverty gap and the last panel to the severity of poverty.

Table (11)
Estimation Results of Equation 6 Using Regional Level Data

Explanatory Variables	P_0	P_1	P_2
Growth equation			
Constant	-1.72	-1.67	-1.67
	(-3)	(-2.9)	(-2.9)
ΔLog(classroom per pupil)	1.04	1.02	1.04
	(3.4)	(3.3)	(3.4)
ΔLog(irrigated area *per capita*)	-0.16	-0.16	-0.16
	(-2.4)	(-2.4)	(-2.4)
Employment rate	0.64	0.62	0.61
	(1.5)	(1.5)	(1.5)
Initial inequality index of Atkinson (of 1980)	11	10.7	10.7
	(2.8)	(2.7)	(2.7)
(Initial inequality index of Atkinson)^2 (of 1980)	-23	-22.2	-22.2
	(-2.7)	(-2.6)	(-2.6)
Initial Log(real income *per capita*) of 1980	-0.04	-0.03	-0.03
	(-0.9)	(-0.9)	(-0.9)
Inequality Equation			
Constant	-1.93	-1.94	-1.95
	(-9.8)	(-9.8)	(-9.8)
ΔLog(real income *per capita*) : proxy of growth	0.5	0.5	0.5
	(3.9)	(3.8)	(3.8)
Log(employment rate)	-0.77	-0.8	-0.8
	(-2.4)	(-2.5)	(-2.5)
Log(tutors per people) at period (*t*-1)	0.02	0.02	0.03
	(0.3)	(0.3)	(0.4)
Log(hospital bed *per capita*) at period (*t*-1)	0.1	0.1	0.1
	(2.7)	(2.7)	(2.7)
Poverty Equation			
Constant	-0.07	0.01	-2.7
	(-0.02)	(0.0)	(-0.4)
Log(inequality index of Atkinson)	2.5	3.3	3.9
	(6.5)	(6.5)	(4.9)
Log(real income *per capita*)	-3.4	-4.0	-4.5
	(-16)	(-14)	(-11)
Log(enrolment rate)	0.85	0.9	1.4
	(1.5)	(1.1)	(1.1)
Log(hovels/dwellings)	-0.02	-0.06	-0.07
	(-0.3)	(-1)	(-0.8)

Values between parentheses indicate the t – ratio.

Investment in education appears to be an important determinant of economic growth. This variable impacts indirectly on poverty and inequality through economic growth. The inequality and its square describe a parabolic inverse-U shape effect on growth that is consistent with Kuznets' theory (1955). The initial level of expenditure does not, however, evidence the existence of conditional income convergence across the different governorates.

Turning now to the inequality equation, this variable appears to be positively associated with economic growth. This means that even if the poor profits from growth, they profit less than the richest segment of the society. Interestingly enough, the activity rate also has an indirect effect on poverty through its negative effect on inequality. Yet, public spending in health infrastructure is positively associated with inequality and, so, with poverty. Once again, these investments appear to be biased toward urban areas and against rural areas where at least 65% of the poor live.

Finally, for the poverty equation, growth and inequality remain the main factors that impact on the less well-off. Yet, these results are quite different from those given by Equation 5 since the higher the value of α is, the smaller is the absolute value of the net elasticity. In other words, the greater the weight attached to the incomes of the poorest individuals is, the smaller the gains from growth adjusted by the elasticity from inequality would be. In addition, the gap between the elasticity of poverty to growth and poverty to inequality is by far, less important than that deduced from the estimation of Equation 5. Indeed, when simultaneous links between growth and inequality, inequality and investment in health, and so on, are accounted for, the net elasticity ranges rather between 0.65 for $\alpha = 2$ and 0.9 for $\alpha = 0$ and not between 0.94 for $\alpha = 0$ and 1.15 for $\alpha = 2$ as Equation 5 reveals. The conclusion is that living standards at the bottom of the distribution improve with growth, but cannot be said that the poorest of the poor gain proportionally the same as the average individual.[37]

These results give evidence that while growth contributed to reduce poverty substantially during the last four decades, inequality appears to have slowed down slightly this pattern during the same period. Some of the policies that led to economic growth may have also increased inequality. Since an increase in inequality works against poverty reduction, there may exist some trade-offs between pro-growth policies and pro-poor policies.

6. A General Equilibrium Analysis

Trade liberalization is expected to help the poor, given the positive association between openness and growth, and growth and poverty reduction. However, trade liberalization alone, is not a panacea. Relying solely on the growth effect of a liberal trade policy is not sufficient to address the poverty issue. Trade liberalization should be supported by investments in infrastructure and in human capital. Furthermore, as this change could hurt the poor in the short run, it should be supplemented by a cocktail of other pro-poor policies to smoothen the effects on the vulnerable segments of society.

The aim of this section is to compute the dynamic impact of trade liberalization and public investment on poverty, while accounting for many of the above structural features of the Tunisian economy. Indeed, trade liberalization has been on one hand, an integral part of the structural adjustment program,[38] on the other hand, public investment in infrastructure and human capital should go a step

---

[37] This conclusion is at odds with Dollar and Kraay (2002) who argue that the poor gain one-for-one from growth in the mean income.

[38] The trade policy reform has been pursued and consolidated by joining the WTO in 1990 and by concluding a Free Trade Agreement with the EU in 1995. The agreement aims to remove gradually tariff and non-tariffs barriers on industrial European imports over a twelve year-transition period ending by 2008.

further to avoid both the marginalization of the less well-off and the failure of the openness process.

The extreme complexity of the linkages between investment in human capital and infrastructure, trade reforms and poverty over time motivates the use of a layered dynamic computable general equilibrium (CGE) microsimulation approach to check whether the great openness of the Tunisian economy to the world market hurts the less well-off of the society. As a first layer, a recursively dynamic computable general equilibrium model (DCGE) is constructed. The DCGE provides the resulting price and income changes from the projected reforms over the period 1998–2015. These changes will be used in turn to communicate with the second layer microsimulation model. Finally, estimates of the impact of the simulated reforms on poverty over the period 1998–2015 in the context of the Millennium Development Goal are provided.

DCGE Model Broad Features

The DCGE used is a deeply inspired model from the mini integrated macroeconomic model for poverty analysis (henceforth MINI-IMMPA) framework, developed by Agénor (2003) and Agénor *et al.* (2003). The model is calibrated to data for 1998, the latest year for which definitive information is available at the sectoral level. The Tunisian economy in 1998 has been desegregated into 14 production sectors, one rural agriculture and 13 urban industries and services. Except for the urban government public services, the composite output of the remaining 12 urban sectors come from at least one among three types of enterprises: (a) private, (b) informal, or (c) public enterprises.[39] They are assumed to produce imperfect substitutes in local demand. The National Accounts data of the *Institut National de la Statistique* (2001) reveal that the three types of firms do not co-exist in all sectors. Some sectors are only informal like construction, while others are only public like water and electricity. There are also sectors with both private and public or private and informal firms.

Since the focus in this study is about poverty and income distribution, the household sector is disaggregated in the reference year into six household groups, identified by source of income: two rural and four urban.

Production Structure. Production functions in the model are of the nested form and exhibit constant returns to scale over private inputs. Gross output of all categories of firms is produced by combining in fixed proportions intermediates goods and primary factors composite. The primary factors composite is either Cobb-Douglas or constant elasticity of substitution (henceforth CES) aggregate of the various factors used in production. Four broad categories of factors are

[39] The informal sector may be defined in various ways. In Tunisia, the official statistics (see INS, 1998) consider an informal small sized non-agricultural firm as having less than 6 employees.

distinguished in the model: (a) unskilled labor, (b) skilled, (c) land and (d) specific physical capital.

Land is specific to the production of agriculture. Physical capital is specific to the firms to which it belongs. Unskilled and skilled labors are treated as predetermined policy variables in the government public services sector.

In addition to private inputs, it is assumed along the lines of Rioja (1999) and Kato (2002) that private and public firms as well as agricultural enterprises use the economy-wide composite public stock of infrastructure and health, which is provided by the government, as a given external input. On this, the model relies on Morrison and Schwartz (1996) and Kamps (2004) who give evidence that public capital is productive and pays off in terms of increases in sectoral value-added and private investment. It is assumed that the total output of the latter firms is distributed entirely to the private inputs and the consideration of the return to the government from the public capital stock is ignored.

All informal firms produce non-tradable goods, as well as almost all public firms. Two exceptions for the latter categories of firms are represented by the transport and telecommunications services, and mining and petroleum, since public firms are the only ones involved in export activity. The private formal firms are the main exporters in all the tradable sectors. Finally, exporting firms allocate their output to the local and international markets according to the constant elasticity of transformation aggregation.

Labor Market Segmentation. The model accounts for various sources of labor market segmentation. Unskilled workers are employed both in the rural agriculture and the urban economy. Skilled workers, however, are employed only in the urban formal economy.

There is no unemployment in the rural region. Nominal wage is flexible and adjusts to clear the rural unskilled labor market. The supply of labor in the rural area is predetermined at any point in time, but grows over time at the exogenous rural population growth rate net of workers migration to urban area. Following Harris and Todaro (1970), the incentive to migrate is taken to depend negatively on the ratio of the expected real wage in rural area to that prevailing in urban area.

Unskilled workers in the urban economy may be employed either in the informal, private or public enterprises. However, skilled workers who are unable to find a job in the formal economy opt to remain openly unemployed, instead of entering the informal economy.

In the formal activities, it is assumed, along the thinking of Kheo *et al.* (1995), that unions fix the uniform (skilled and unskilled) labor real wage while the firms determine the employment level accordingly. In the skilled labor market, although the bargaining power of the unions depends negatively on the skilled labor unemployment, the resulted real wage is higher than that would have been cleared this labor market. For the unskilled real wage in the formal sector, it is greater than that paid in the informal sector. This gives an incentive to unskilled workers to seek a job in the private and public firms first.

The total supply of unskilled workers in the formal sector is allowed to adjust over time according to the expected wage differential between the informal and formal sectors. The total supply of unskilled workers in the informal labor market is instead determined residually and it always equals the induced demand for unskilled labor by all informal enterprises. The wage in the informal market is therefore uniform and flexible.

The supply of unskilled labor in the urban sector evolves as a result of (exogenous) natural urban population growth and migration of unskilled labor from the rural economy. Moreover, given the skilled and unskilled wage differential and the public capital stock of education *per capita*, some urban unskilled workers become skilled and leave the unskilled work force to increase the supply of skilled labor. Thus, the growth of the skilled labor force supply depends on the rate at which unskilled workers acquire skills.

The distribution of unskilled employment in the reference year reveals that the rural agriculture and the urban informal sector provide together 51.2% of unskilled labor employment, whereas each of the public and private sectors offers around 16% of unskilled jobs. As a consequence of this unskilled job distribution, 16.8% of the unskilled work force is unemployed in the reference year.

Job provision for skilled workers in 1999 is such that the public sector is the main sector creating jobs for the more-educated workers, as it employs 82% of the skilled work force in the base year.[40] Government administration accounts for 91% of total public sector skilled labor employment, while public enterprises account for the remaining 9%. Compared to the public sector, the private sector absorbs only 8.7% of the skilled work force.

Since agriculture and the informal sectors do not rely on skilled work in their production process, the remaining 8.6% of the skilled find themselves without a job.[41] This figure shows that the public sector plays an important role in skilled labor policy for the economy as a whole. More details about the distribution of labor between the different sectors and firms may be found in Table 12.

[40] Although the authors used a 1998 SAM, they rely on information from the 1999 population census to allocate all the labor force between sectors and firms.

[41] In reality, the agriculture and the informal sector employ very small shares of the skilled work force, 0.1% in agriculture (see INS, 2002) and 0.4% in the informal sector (see INS, 1998). Since data on the distribution of wages between skilled and unskilled are not available, it has been assumed that these two sectors do not rely on skilled work.

Table (12)
Sectoral Features of the Tunisian Sectors in 1998 (%)

Sector	**Status**	**VA/ GDP**	**uld/ tot_uld**	**Sld/ tot_sld**	**USAL/ tot_USAL**	**SSAL/ tot_SSAL**
Agriculture	Rural	14.6	24.7	0.0	3.5	0.0
Food Processing	Public	0.5	0.9	0.3	1.0	0.3
	Private	1.4	1.2	0.3	1.3	0.3
	Informal	1.7	1.6	0.0	0.9	0.0
Quarrying Products	Public	0.7	0.7	0.3	0.8	0.3
	Private	0.8	0.6	0.3	0.7	0.3
	Informal	0.4	0.5	0.0	0.3	0.0
Mechanical	Public	0.5	0.8	0.4	0.9	0.4
	Private	1.9	1.9	0.8	2.1	0.8
	Informal	0.4	0.2	0.0	0.1	0.0
Chemicals	Public	1.4	0.7	0.4	0.8	0.4
	Private	1.0	0.7	0.3	0.8	0.3
	Informal	0.1	0.1	0.0	0.0	0.0
Textile, Apparel and Leather	Public	0.0	0.0	0.0	0.0	0.0
	Private	6.6	6.5	1.5	6.9	1.5
	Informal	1.0	1.8	0.0	1.1	0.0
Miscellaneous Manufacture	Public	0.2	0.2	0.1	0.3	0.1
	Private	1.2	1.0	0.5	1.2	0.5
	Informal	1.3	0.7	0.0	0.4	0.0
Mining and Petroleum	Public	2.5	1.2	1.2	1.7	1.2
	Private	1.3	0.1	0.1	0.1	0.1
	Informal	0.0	0.0	0.0	0.0	0.0
Electricity	Public	1.8	0.6	1.2	1.1	1.2
	Private	0.0	0.0	0.0	0.0	0.0
	Informal	0.0	0.0	0.0	0.0	0.0
Water	Public	0.5	0.5	0.4	0.7	0.4
	Private	0.0	0.0	0.0	0.0	0.0
	Informal	0.0	0.0	0.0	0.0	0.0
Construction	Public	0.0	0.0	0.0	0.0	0.0
	Private	0.0	0.0	0.0	0.0	0.0
	Informal	5.3	16.9	0.0	9.9	0.0
Transport and Telecom.	Public	6.7	5.8	3.9	7.1	3.9
	Private	1.2	0.9	0.6	1.1	0.6
	Informal	1.0	1.7	0.0	1.0	0.0
Other Services	Public	0.0	0.0	0.0	0.0	0.0
	Private	8.9	6.4	5.0	8.2	5.0
	Informal	18.9	13.4	0.0	7.9	0.0
Public Services	Public	15.9	7.6	82.3	38.2	82.3
Total		100.0	100.0	100.0	100.0	100.0

N.B. VA/GDP represents the contribution of each type of firm in each sector to GDP; uld/tot_uld is the share of each type of firm in each sector in total unskilled labor demand; sld/tot_sld is the share of each type of firm in each sector in total skilled labor demand; usal/tot_usal is the contribution of each type of firm in each sector to total unskilled labor wage bill; ssal/tot_ssal is the contribution of each type of firm in each sector to total skilled labor wage bill.

Demand Structure. Producers demand composite goods, imported and local, for intermediate use, according to a Leontief input-output technology; i.e., the coefficients of intermediate goods in production are fixed. The model also explicitly features the expenditures flows arising from government behavior and the activities of private investors.

It is assumed that both government expenditures, saving and transfers to households are in fixed proportion of its revenue. Government expenditures consist of current unproductive expenditures as well as productive public investment. The model makes a distinction between the investments in infrastructure, education and health. In 1998, public investment in infrastructure accounts for 1.7% of current GDP, whereas public investments in health and education represent respectively 0.3% and 1% of GDP.

Each distinguished type of public investment allows the endogenous accumulation of the corresponding public capital stock. The accumulation process is modeled in a conventional way, where the next period stock of each public capital stock is equal to the amount invested in the current period plus the surviving stock. Geometric depreciation is also assumed, i.e, the capital stock depreciates at a constant rate.

The public stock in education affects positively the skills formation. The public stock of infrastructure however, has in one hand a positive effect on private investment and combines, on the other hand, with the public stock of health to increase the total factor productivity in agriculture, public and private firms.

Following The World Bank (1996) estimations for Tunisia, an increase in public investment or government spending on education as a share of GDP by 1 percentage point would enhance the *per capita* GDP growth by 0.2%. Furthermore, a rise in the ratio of government consumption net of education spending to GDP by 1 percentage point would reduce the *per capita* GDP growth by 0.12%. Finally, an expansion of the share of exports in GDP by 1 percentage point would contribute to the augmentation of the *per capita* GDP by 0.06%. The analysis takes into consideration the latter estimates of the determinants of total factor productivity explicitly in addition to the productive contribution of the public stock in infrastructure and health. It is assumed that they affect simultaneously the shift parameter in the production function of agriculture, public and private firms. It is also assumed that the contribution of the change in the ratios of infrastructure and health expenditures to GDP is equal to that of education spending.

Government revenue is derived from the transferred returns on capital of public firms and from the collection of taxes on revenues, tariffs and consumption. In the base year, 30% of the government fiscal revenue has been derived from tariffs on imports and 34.2% from consumption taxes, whereas the contribution of households' income and corporate taxation to total fiscal revenue are respectively equal to 21.8 and 14.1%. This fiscal structure allows the government to reap 25% of the 1998 GDP.

As for investors, the investment demands for the different composite goods by sector of origin are also assumed to be in fixed shares of total investment demand, which is equal to total saving. Capital accumulation is assumed to occur only in the urban private firms, according to the same conventional process as the public capital stock accumulation. The decision to invest hinges positively on the after-tax rate of return to capital relative to cost of funds and on the public capital stock in infrastructure as well as the real GDP changes.

As mentioned above, the model identifies six household types grouped by socio-economic status and labeled by j, j=1,.., 6. Landholders in agriculture and agricultural workers represent two distinct households living in the rural area. The remaining four urban households are the unskilled households working in informal enterprises, the unskilled employees working both in the formal private and public sectors, the skilled households working in the formal private and public sectors and the capitalists. Classifying households groups in this way allows the model to identify the impact of economic reforms on income distribution and poverty. Household revenue is based on salaries and/or distributed profits, in addition to government and the rest of the world (ROW) transfers. Table 13 sets out the characteristics of each group, including shares of population, *per capita* income, and the incidence of poverty (P_0).

Table (13)
Characteristics of Household Groups

Household Type	Population Share (%)	Incidence of Poverty[a] (%)	*Per capita* income (TND)
HH_Land: Landholders	13.7	10.6	670
HH_AGR: Agriculture Laborer	9.9	19.7	498
HH_INF: Unskilled Households in the Informal Sector	29.3	4.1	747
HH_ULF: Unskilled Households in the Formal (Private And Public) Sector	33.8	4.8	764
HH_SLF: Skilled Households in the Formal (Private And Public) Sector	9.9	0	1937
HH_CAP: Capitalists in the Private and Informal Sectors	3.4	0	2957

[a] Percentage of households in the group below the poverty line, based on the 1995 household survey and lower World Bank poverty line. See *Banque Mondiale* (1999).

Households' preferences are represented by Cobb-Douglas utility indices defined over saving and the 14 composite goods reported in Table 12. Saving and demands are hence a constant fraction of households' disposable income.

Each composite consumption good is thus a sum of households groups, government and investors final consumption demands and all producers' intermediate composite goods demands. It is also assumed to be a CES aggregation of imported and composite domestic goods. The latter are deemed to be imperfect substitutes by the local demanders. Furthermore, it is assumed that the composite domestic good is a CES aggregation of informal, private and public domestic goods.

The above DCGE model is meant to capture the relevant structural features of the Tunisian economy. The price and income changes generated, embody both the effective direct and indirect effects of the policy reform and the attribution of these changes to the reform are unambiguous. In this way, any change of poverty obtained from the microsimulation model, will be as close as possible to what would be expected.

A Methodology for Evaluating the Effects of Any Change on Poverty

The integration of as many households as there are in a household survey directly into a DCGE model, would be certainly the ideal approach to address the question of the dynamics of poverty following any economic environment change. This is indeed the best way to keep all the information about the households' heterogeneity with regards to their pattern of endowment and consumption. Unfortunately, the INS household surveys are notable for their under-reporting of the source and level of each household member's income and its composition. The relevant information they record for the purpose of this study is the households' expenditures, the household's head level of education and occupation. The latter information is then used to roughly rank, not without making some assumptions, the sample of 2500 households from the 1995 household survey into the closest six groups in the DCGE model. The aim is to proceed to a layered DCGE-microsimulation analysis.

As a first step, the DCGE model provides an estimation of the path of consumption goods prices, $\mathbf{p}_t$, resulting from the economic environment change. For each household group, it also yields the growth rate in his or her nominal income, g_t^j. In the second step, these results are applied to assess the real income of each household in a representative sample from the 1995 household survey, and so the variation of any poverty index. Since households within the same group j do not have the same budgetary share for each of the 14 goods they consume, the real income resulting from a policy change varies from one household to another even within the same group.

More precisely, it is assumed that each household h within a group j has an original income *per capita* $Y_0^{j,h}$ and faces the price system $\mathbf{p}_0$ in the base line year. Normally, from one year to the other, each one faces a new vector of prices and income ($\mathbf{p}_t$, $Y_t^{j,h}$).

Since it is aimed to compare the levels of an individual's welfare over time, the base line price vector ($\mathbf{p}_0$) is considered as the reference price system.[42] Then, following King (1983), the concept of *equivalent income* is defined. For a given budget constraint ($\mathbf{p}_t$, Y_t), the equivalent income is defined as that income level which allows, at $\mathbf{p}_0$, the same utility level as can be reached under the given budget constraint.

$$v(\mathbf{p}_0, Y_e(\mathbf{p}_0, \mathbf{p}_t, Y_t)) = v(\mathbf{p}_t, Y_t) \qquad \text{(Equation 7)}$$

where $v(.)$ is the indirect utility function; $\mathbf{p}_t$ is a vector of price system at t; and Y_t is the *per capita* household's nominal income. Since $\mathbf{p}_0$ is fixed across all households, $Y_e(.)$ is an exact monetary metric of actual utility $v(\mathbf{p}_t, Y_t)$ because $Y_e(.)$ is an increasing monotonic transformation of $v(.)$. Thus, inverting the indirect utility function, the *equivalent income*, $Y_e(\mathbf{p}_0, \mathbf{p}_t, Y_t)$ is obtained.

The predicted price and income changes from the DCGE model are taken as given for the analysis of welfare impacts in the micro-simulation model. Since it is assumed that the nominal income growth rate within each household group is the same for all households belonging to the same group (but variant between groups) and equal to g_t^j, it follows that: [43]

$$Y_t^{j,h} = (1 + g_t^j) Y_0^{j,h} \qquad \text{(Equation 8)}$$

By Equation 8, and assuming a Cobb-Douglas indirect utility function, the indirect utility function, $v(.)$ for each household in the sample can be computed:

$$v(\mathbf{p}_t, Y_t^{j,h}) = \frac{1}{(1 + g_t^j) Y_0^{j,h}} \prod_{k=1}^{K} (p_{k,t})^{w_k^{j,h}} \qquad \text{(Equation 9)}$$

where $p_{k,t}$ is the price of good k at the period t and $w_k^{j,h}$ is the budget share devoted to the good k by the household h within j. Using Equations 7 and 9, the *equivalent income* of each household in the sample at each period t is then given by:

$$Y_e(\mathbf{p}_0, \mathbf{p}_t, Y_t^{j,h}) = \prod_{k=1}^{K} \left(\frac{p_{k,0}}{p_{k,t}} \right)^{w_k^{j,h}} (1 + g_t^j) Y_0^{j,h} \qquad \text{(Equation 10)}$$

In addition to information about the distribution of the equivalent income among households, poverty measures should be rewritten in

---

[42] Following King (1983), the choice of the reference price system is, to some extent arbitrary, although for the analysis based on computable general equilibrium models, the baseline price vector, $\mathbf{p}^0$, is a natural choice. The reason for this is that any comparison must use a common reference price system.

[43] The assumption of a common nominal income shift for all households within the same representative group represents a limitation of this approach. It can be easily relaxed, if the source of income of each household's member is identified.

terms of equivalent income; to make them sensitive to both income and prices variations. Thus Equation 1 becomes:

$$\begin{aligned} \mathrm{P}_{\alpha}^{t}(z_0, y_e^t) &= \frac{1}{N}\sum_{h=1}^{H} n^{j,h}\left(1-\frac{Y_e(\mathbf{p}_0,\mathbf{p}_t,(1+g_t^j)Y_0^{j,h})}{z_0^j}\right)_+^{\alpha} \quad \text{(Equation 11)} \\ &= \frac{1}{N}\sum_{h=1}^{H} n^{j,h}\left(1-y_e\left(\mathbf{p}_0,\mathbf{p}_t,(1+g_t^j)y_0^{j,h}\right)\right)_+^{\alpha} \end{aligned}$$

where z^j_0 is the poverty line at the baseline year applied for the group *j* and which is fixed in real terms over time.[44] It is set at TND290 for the urban households and TND242 for the rural ones.

Simulations Results

To analyze the impact of public spending restructuring on welfare of the less well-off, the authors applied a step-by-step procedure and ran four alternative simulations to isolate the contribution of each one to poverty change. The first one, labeled *ref*, illustrates the path of growth of the Tunisian economy between 1998 and 2015, in the absence of any technical progress or trade reform. The dynamics of the economy is the fact of rural and urban labor force growth and both private and public capital accumulation.[45] This first simulation provides a benchmark against which to judge the contribution of the remaining scenarios to poverty alleviation.

Since Tunisia has committed itself to remove gradually all tariffs and non-tariff barriers on industrial European imports over a twelve-year transition period starting from 1996, it is important to assess the contribution of this intensive ongoing reform on poverty. This is especially in the light that EU imports represent 70% of Tunisia's global imports and contribute through tariffs to 20.5% of government fiscal revenue in 1996. In this paper, no distinction is made between imports from EU and the rest of the world. However, in the second simulation, labeled *opn,* an annual 10% decrease of all tariffs on non-agricultural imports during the first decade, compensated by an annual 9% increase of all consumption taxes until 2008, the year of the complete achievement of the agreement with the EU, has been considered.[46] From the latter date, consumption taxes become fixed to the level they have reached.

---

[44] Note that $Y_e(\mathbf{p}_0, \mathbf{p}_t, z^j_t) = Y_e(\mathbf{p}_0, \mathbf{p}_0, z^j_0) = z^j_0$. z^j_0 appears as the equivalent poverty line, i.e. the minimum expenditure level required at $\mathbf{p}^0$ to reach the indifference curve corresponding to the minimum standard of living one.

[45] For the active labor natural population growth, the trend projected in the INS (1996) for the period of interest is used, assuming it is the same for rural and urban unskilled labor. As to the skilled labor growth, it is endogenously determined by the model, starting with an average of 2.5% between 1997 and 1998, as it is suggested in the World-Bank (2004a).

[46] The growth rate in all consumption taxes until 2008 is calibrated so as to maintain approximately constant the government fiscal revenue as a share of GDP.

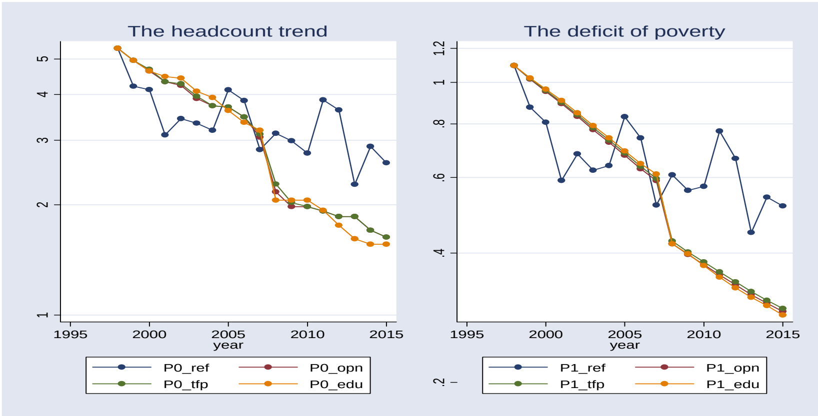
In the second simulation, *opn*, trade reform is not sustained by total factor productivity change, in order to isolate the contribution of openness to poverty reduction, while there is an additional technical progress in the third simulation labeled *tfp*. As explained above, the technical progress comes from both the activities of exports and public investments.

In all the previous scenarios, subsidies on agricultural goods and food processing have been maintained unchanged.[47] In the fourth scenario, the subsidies on these goods over the transition period 1998–2015 have been eliminated progressively and uniformly. Each year, the saved amount of subsidies is allocated to increase investments in education, health and infrastructure according to the share of each one in the total public investment. This simulation is labeled *edu* and it aims to check whether investment in infrastructure and human capital is a better tool to combat better and more poverty than food subsidies.

Figure 2 displays the incidence of poverty trend in the reference scenario (referred to as P0_ref); the trade reform (referred to as P0_opn); the trade reform with total productivity progress (referred to as P0_tfp); and in the final scenario when the saving from food subsidy removal are used to enhance investment in education, health and infrastructure (referred to as P0_edu). The left side of this figure displays the head count ratio trend under these different scenarios. Interestingly enough, trade liberalization and food subsidy removal does not appear to be pro-poor in the short run, but really pro-poor in the long run. The left side of Figure 2 shows that until 2005 and precisely until 2008, the year of the complete achievement of tariffs dismantlement, the simulated reforms and primarily removing subsidy, would flatten the downward trend of poverty. Yet, from 2008 onwards, the substitution of public investment to food subsidy would contribute most to the achievement of the Millennium Development Goal of reducing extreme poverty by half, as measured by the head count ratio in 2015. Indeed, while more than 5% are in extreme poverty in 1998, by 2015, less than 2% of the population would remain in extreme poverty under the last scenario.

[47] This reform route departs from that of Bibi and Duclos (2006a) who have checked the likely effects on poverty of the restructuring of the subsidy system in Tunisia, not its elimination.

Figure (2)
Poverty trend over 1998–2015.



The head count ratio may fail to evaluate accurately the marginal impact of any change on poverty. Indeed, the head count ratio only records those who escape or reach the segment of the poor. Thus, it could underestimate the effectiveness of other reforms, since most poor people could find their welfare improved but not enough to lift poverty. To curb this likely drawback, the right side of Figure 2 displays the estimates of the poverty deficit, $P_1(.)$, during the period under consideration resulting from the alternative simulations. These curves show similar decreasing trend as the poverty incidence, meaning that the average income of those staying below the poverty line has increased. Furthermore, from 2008 onwards, the poverty deficit curve resulting from the elimination of subsidies will lie always below the others.

The above analysis is not fully satisfactory for two reasons. Firstly, it could depend critically on the choice of poverty line and poverty measures. Since both of these choices are somewhat arbitrary, so could be the dynamics of poverty characterized using them. Secondly, it is instructive to highlight the impact of public spending restructuring on the vulnerability, which is an important issue along with extreme poverty in the Tunisian context. Drawing on the recent study of Ravallion and Chen (2003), fortunately, it is possible to address both of these problems by computing the growth rate in the mean of each income quantile:

$$g(q) = \frac{y_e^t(q)}{y_e^{t-1}(q)} - 1 \qquad \text{(Equation 12)}$$

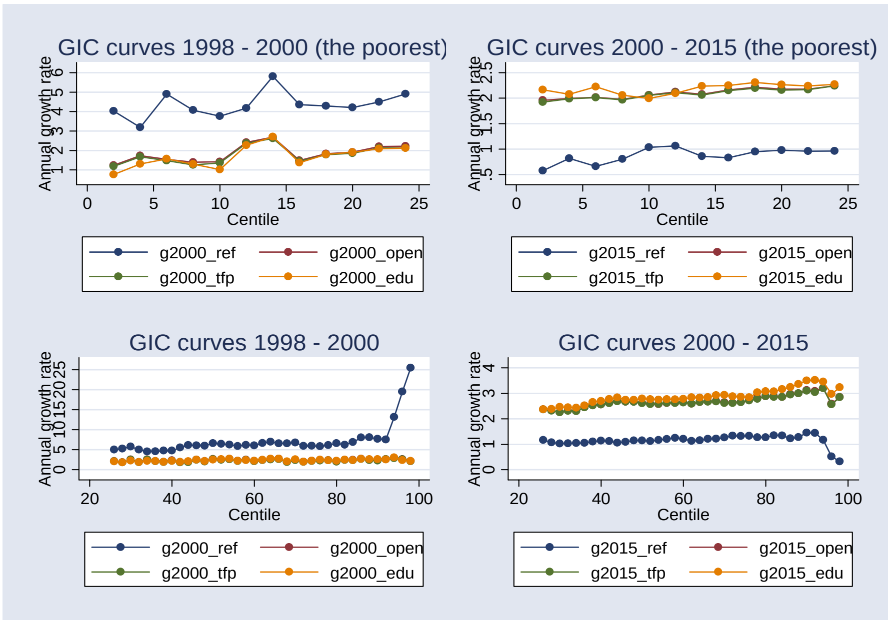
where $g(q)$ is the growth rate in the King (1983) equivalent income of the qth quantile between t and t-1 and $y^t_e(q)$ is the mean of $y_e(\mathbf{p}_0, \mathbf{p}_t, y_t)$ within the quantile q at the pertinent period.[48] Considering the full range of possible q, $g(q)$ traces out the *growth incidence curve*

[48] Alternatively, $y_e(q)$ could be expressed as $y_e(\mathbf{p}_0, \mathbf{p}_t, y_t(q))$.

(henceforth GIC curve), showing how the growth rate is distributed across different quantiles; ranked by equivalent income.

Figure 3 splits the period of transition in two: (a) one going from 1998 to 2000 and (b) the other from 2000 to 2015. For each period, the average annual income rate of growth is displayed for the least endowed quartile of the population and for the remaining segments of the society, under the different reforms.

Figure (3)
GIC curves under different scenarios.



The top left and right sides of Figure 3 shows that in the first period, the income growth pattern of the less well-off is the lowest under food subsidies removal reform (referred to as g2000_edu), while it becomes the highest within the same scenario in the second period, once the indirect effect of investment in infrastructure and human capital begins to bear fruit on the extremely poor and the vulnerable.

The right side of Figure 3 also shows that from 2000 onwards, trade reform improves the equivalent income of all the individuals. However, the total productivity progress (referred to as g2015_tfp) considered in addition to openness reform (referred to as g2015_opn), adds virtually nothing to the gains achieved through better allocation of scarce resources, since the two GIC curves are very close. As to the subsidies program reform (referred to as g2015_edu), it even dampens the gains obtained from trade liberalization.

Finally, all the GIC curves displayed in Figure 3 lie nowhere below 0. This means that poverty will certainly fall within the period under consideration, regardless of the chosen poverty line and the poverty measure. In the stochastic dominance literature, this finding is known as "first-order dominance" FOD. [49] As lower order dominance entails higher orders, there is then no need to test higher order dominance to study less robustly the dynamics of poverty.[50]

Testing FOD conditions also sheds light on the distributional pattern of economic growth. For instance, the GIC curves displayed on the left side of Figure 2 are approximately horizontal. This means that the Lorenz curve does not really shift at the beginning period under consideration, and the economic growth is to some extent, distribution-neutral. Nevertheless, the right side of Figure 2 shows that growth rate exhibits an upward sloping across different income centiles. Thus, while curbing absolute poverty, this growth pattern will worsen all inequality measures, and then worsen relative poverty, since the richest quantiles profit more from economic growth than the poorest ones. This means that these pro-poor policies are compatible with a fair amount of "vertical and horizontal" inequality.[51]

7. Conclusion

One of the main goals of this study is to assess the extent of contribution of public spending in the enhancement of economic growth and poverty reduction. For this purpose, multi-level analysis approaches are followed to capture the likely effects of some public expenditure on growth, inequality, and poverty.

The main results of all the analysis levels are pretty straightforward. Improving the allocation of scarce resources through a better targeting is in some cases, possible. For instance, the use of proxy means tests to allocate the available funds for food subsidies, household level analysis shows that it is possible to fight more and better poverty than the use of targeting by commodities. Yet, improving the allocation of resources through trade liberalization may sharpen the vulnerability issue in the short run, but they enable more poverty reduction and less vulnerability in the long run through higher economic growth.

Investments in infrastructure and human capital are at the heart of the combat against poverty and also amplify the positive impacts of growth on the less well-off, and therefore, should have high priority in terms of economic policy. The pace of investments in infrastructure and in human capital will depend on the country's ability to finance them. For this reason, the impact of food subsidies removal to enhance public spending on these items is simulated. One of the most important results of this study is that policies aimed at

---

[49] See, among many others, Atkinson (1987) for a detailed description on the stochastic dominance tests.

[50] On the higher dominance tests about the link between economic growth and poverty, see for instance Son (2004) and Bibi (2005).

[51] For a discussion of this, see for instance Bibi and Duclos (2006b).

enhancing the purchase power of the less well-off, are more effective in reducing poverty than policies targeted to improve infrastructure and human capital in the short run. Yet, in the long run, the second route enables the acceleration of income growth over all the segments of the population.

These results give evidence that there is some trade-offs between short- and long-run policies. Thus, it seems that policies like conditional cash transfers are needed in the short run to smooth the negative impact of the policy changes that enhance economic growth, curb vulnerability, and boost poverty reduction in the long run. Indeed, in the absence of these transfers, it is very difficult to ensure that people living either in extreme poverty or in vulnerability, will benefit from more investment in human capital due to the opportunity cost of schooling time that is higher for the poor.

Finally, perceptions of what “poverty” means, should be evolving in Tunisia. It is hardly surprising to discover that the standards defining poverty 25 years ago, have lost relevance to an economy that has doubled its mean income over that period. For this reason, the authors have focused **both on the extreme poverty issue and** the vulnerability issue which is called to become more relevant to the Tunisian case than the extreme poverty issue as such. In addition, Tunisia could well be entering a stage of development in which relative poverty becomes a more important concern. Enhancing pro-poor growth should be the leading instrument for fighting relative poverty in the future in addition to the vulnerability issue.

References

Agénor, P.R. 2003. Mini-IMMPA: A framework for analyzing the unemployment and poverty effects of fiscal and labor market reforms. The World Bank, Washington, D.C.

__________, D.H.C. Chen and M. Grimm. 2003. Linking representative household models with household surveys for poverty analysis: A comparison of alternative methodologies. The World Bank, Washington, D.C.
.
Atkinson, A.B. 1970. On the measurement of inequality. *Journal of Economic Theory* Vol. 2: 244-263.

Banque Mondiale. 1999. *République Tunisienne, Revue Sociale et Structurelle, Groupe Développement Economique et Social, Région Moyen-Orient et Afrique du Nord.*

__________. 1987. On the measurement of poverty. *Econometrica* Vol. 55: 749–764.

Bibi, S. 2001. *Le Ciblage de la Population Pauvre en Tunisie: Fondement Théoriques et Evidence Empirique.* Ph.D. Dissertation. *Faculté des Sciences Economiques et de Gestion de Tunis.*

__________. 2003. On the impact of better targeted transfers on poverty in Tunisia. *Review of Middle East Economic and Finance* Vol 1(1): 17–35.

__________. 2004. Poverty trend in Tunisia. Background paper for the IFPRI/API Collaborative Research Project. Workshop at the Arab Planning Institute, Kuwait, October 2004.

__________. 2005. When is economic growth pro-poor? CIRPEE Working Paper WP 05-22. Université Laval, Quebec, Canada.

__________ and J.-Y. Duclos. 2006a. Poverty-decreasing indirect tax reforms: Evidence from Tunisia. Forthcoming in: *International Tax and Public Finance.*

__________ and __________ 2006b. Equity and policy effectiveness with imperfect targeting. Forthcoming in: *Journal of Development Economics*.

Deaton, A. 1997. *The Analysis of Household Surveys: A Microeconometric Analysis for Development Policy*. Published for The World Bank by: The Johns Hopkins University Press. Washington, D.C. pp. 133-181.

Dollar, D. and A. Kraay. 2002. Growth is good for the poor. *Journal of Economic Growth* Vol 7: 195 – 225.

Foster, J., J. Greer and E. Thorbecke. 1984. A class of decomposable poverty measures. *Econometrica* Vol 52: 761–765.

Glewwe, P. 1991. Investigating the determinants of household welfare in the Côte d'Ivoire. *Journal of Development Economics* Vol 35 (2): 307–337.

_________. 1992. Targeting assistance to the poor, efficient allocation of transfers when household income is not observed. *Journal of Development Economics* Vol 38: 297–321.

Global Development Network. www.gdn.org

Grosh, M. E. and J. Baker. 1995. Proxy means tests for targeting social program simulation and speculation. LSMS Working Paper # 118, The World Bank, Washington, D.C.

Harris, J. and M. Todaro. 1970. Migration unemployment and development: A two-sector analysis. *American Economic Review* Vol 60: 126-142.

Hausman, J.A. 1978. Specification tests in Econometrics. *Econometrica* Vol. 46: 1251-1271.

Heckman, J. 1976. The common structure of statistical models of truncation, sample selection, and limited dependent variables and a simple estimator for such models. *Annals of Economic and Social Measurement* Vol 5: 475–492.

Institut National de la Statistique. 1980. *Enquête sur le Budget et la Consommation des Ménages 1980.* (www.ins.nat.tn). Tunisia.

_________. 1985. *Enquête Nationale sur le Budget et la Consommation des Ménages - 1985.* (www.ins.nat.tn). Tunisia.

_________. 1990. *Enquête Nationale sur le Budget et la Consommation des Ménages - 1990.* (www.ins.nat.tn). Tunisia.

_________. 1995. *Enquête Nationale sur le Budget et la Consommation, et le niveau de vie des Ménages - 1995.* (www.ins.nat.tn). Tunisia.

_________. 1996. *Projections de la Population Active et de la Demande Additionnelle d'Emplois*: *1995-2015.* (www.ins.nat.tn). Tunisia.

_________. 1998. *Les Micro Entreprises en 1997.* (www.ins.nat.tn). Tunisia.

_________. 2000. *Enquête Nationale sur le Budget et la Consommation, et le niveau de vie des Ménages - 2000.* (www.ins.nat.tn). Tunisia.

__________ 2001. *Les Comptes de la Nation.* (www.ins.nat.tn). Tunisia.

_________. 2002. *Recensement Général de la Population et de l'Emploi en 1999.* (www.ins.nat.tn). Tunisia.

Kakwani, N. and E. M. Pernia. 2000. What is pro-poor growth? *Asian Development Review* Vol 18(1): 1–16.

Kamps, C. 2004. The dynamic macroeconomic effects of public capital: Theory and evidence for OECD countries. Kiel Studies 331. Springer, (www.spinger.de)

Kato, R.R. 2002. Government deficit, public investment, and public capital in the transition to an aging Japan. *Journal of the Japanese and International Economies* , Vol 16: 462–491.

Kheo, T.J., C. Polo and F. Sancho. 1995. An evaluation of the performance of an Applied General Equilibrium Model of the Spanish economy. *Economic Theory* Vol 6: 115–141.

King, M.A. 1983. Welfare analysis of tax reforms using household data. *Journal of Public Economics* Vol 21: 183–214.

Kuznets, S. 1955. Economic growth and income inequality. *American Economic Review* Vol 45: 1-28.

Lundberg, M. and L. Squire. 1999. Growth and inequality: extracting the lessons for policy makers. Mimeo, The World Bank, Washington, D.C.

Ministère de l'Economie Nationale. 1991. *La Caisse Générale de Compensation : Analyse Rétrospéctive et Premières Orientations Pour le VIII Plan.* Tunisia.

Morrison, C. J. and A.E. Schwartz. 1996. State Infrastructure and Productive Performance. *American Economic Review* Vol.86: 1095–1111.

Morrisson, C. and B. Talbi. 1996. *La Croissance de l'Economie Tunisienne en Longue Période. Etudes du Centre de Développement de l'Organisation de Coopération et de Développement Economiques* (OECD), Paris, France.

Nsouli, S. M., S. Eken, P. Duran, G. Bell and Z. Yucelik. 1993. The path to convertibility and growth. Occasional Paper No. 109. International Monetary Fund, Washington, D.C.
.
PNUD. 2004. *Stratégie de Réduction de la Pauvreté : Etude du Phénomène de la Pauvreté en Tunisie. Bureau du Coordinateur Résident en Tunisie.* Tunisia.

Ravallion, M. 1998. Poverty lines in theory and practice. The World Bank, Washington, D.C..

_________ and K. Chao. 1989. Targeted policies for poverty alleviation under imperfect information: Algorithms and applications. *Journal of Policy Modeling* Vol 11: 213–224.

_________ and S. Chen. 2003. Measuring pro-poor growth. *Economics Letters* Vol 78: 93 – 99.

Rioja, F.K. 1999. Productiveness and welfare implications of public infrastructure: A dynamic two-sector general equilibrium analysis. *Journal of Development Economics* Vol 58: 387–404.

Slesnick, D.T. 1998. Empirical approaches to the measurement of welfare. *Journal of Economic Literature* Vol XXXVI: 2108–2165.

Societé Tunisienne d'Electricité et du Gaz. 2000. STEG – 2000. www.steg.com.tn

Son, H.H. 2004. A note on measuring pro-poor growth. *Economics Letters* Vol 82 (3): 307–314.

UNDP. 1997. *Human Development Report*. Published for the UNDP. New York: Oxford University Press pp. 15–21 and 117–121.

_________. 1999. *Republic of Tunisia*: *National Report on Human Development*. Republic of Tunisia.

World Bank. 1995. Republic of Tunisia. Poverty alleviation: Preserving progress while preparing for the future. Report No. 13993-TN. The World Bank, Washington, D.C.

_________. 1996. *Tunisia's Global Integration And Sustainable Development: Strategic Choices For The 21st Century*. International Bank for Reconstruction and Development, Washington, D. C., August 1996.

_________. 2003. Republic of Tunisia. Poverty update. The World Bank, Washington, D.C.

_________. 2004a. Republic of Tunisia. Development policy review. Making deeper trade integration work for growth and jobs. Report No. 29847-TN. The World Bank, Washington, D.C.

_________. 2004b. *World Development Report*. The World Bank, Washington D. C.

Chapter Nine

Harnessing Public Spending for Poverty Reduction in Yemen

Mohamed Abdelbasset Chemingui

1. Introduction

Yemen is among the poorest countries in the world, with a GDP *per capita* of US$460. It faces structural and policy constraints to achieve sustainable employment-generating growth and delivering the necessary public services to achieve the Millennium Development Goals (MDG) targets. The country is compounded by high population growth (about 3% per year) and the resulting young age distribution (i.e. half of the population below age 15). The decade of the 1990s was one of the most dramatic periods in Yemen's rich history. Unification of the two Yemenis, rapid development of an oil sector, and a radically changed external environment, fundamentally transformed the opportunities and challenges the Yemeni people face.

Currently, the most important challenges for Yemen's economy are to accelerate economic growth and to reduce poverty. Public spending is shown as an important instrument to achieve such targets in the absence of strong private contribution in the economic activity in the country, although such spending should help indirectly to develop the private sector. In fact, public spending can have a direct impact on the poor, both through direct transfers to households and through the distribution implications of public spending on social services and public investment. Furthermore, budget management, public administration, governance, transparency, and accountability can also benefit the poor in terms of more efficient and better targeted use of public resources (Ames *et al.*, 2001).

In the current context of Yemeni economy characterized by a strong public finances consolidation and subsidy rationalization, the government of Yemen is committed to meet the MDG by reducing the number of the poor by half in 2015. In this respect, and according to the ongoing Yemen's Five-Year Plan, the target of reducing poverty is expected to be realized through the implementation of a package of reforms including universalizing education and improving its quality, ensuring gender equality, reducing child mortality and child malnutrition, improving the health sector, ensuring sustained economic growth, and good governance.

For these reasons, it is important to evaluate the contribution of public spending in poverty reduction both directly and indirectly. In this respect, the government is required to do more with less resources. The objective of this study is to evaluate the impact of different types of government spending to better target available resources to achieve more efficiency towards higher economic growth and faster poverty reduction. This study is a part of the cooperative project between the International Food Policy Research Institute (IFPRI) and the Arab Planning Institute in Kuwait (API) to improve the understanding of how public policy including government spending can bring about poverty reduction in the context of the MDG of reduction of poverty.

Empirical evidence shows the importance of investment in social services in improving human capital and mainly for the poor to reduce poverty over the long run. Good education and health care help the poor lead more productive lives, increasing the return on investments. As growth is mostly driven by labor and total factor productivity (TFP) including human capital, any investment intended to improve the productivity of labor and the TFP will improve the sustainability of economic growth in a given country. A more healthy and productive labor force helps to stimulate development of the private sector.

While theoretical and empirical studies confirm that public spending in education and basic health care is anti-poverty, only few studies assessing the effect of targeted public spending on poverty are available. None of these studies focuses on Arab countries however. At a time when most developing countries need to reduce subsidies and other public spending to reduce budget deficit, targeting public spending on specific sectors for poverty reduction must be assessed in order to prioritize them. Then, several legitimate questions do arise: How effective has the different public spending been? What seems to work better for poverty reduction? Which ones are most likely to generate the highest rate of poverty reduction with minimum cost for the economy?

It is widely admitted that gains in TFP, reflecting more efficient use of inputs, have long been recognized as an important source of improvement in income and welfare. According to many recent studies, such as those conducted by Klenow and Rodriguez-Clare (1997) and Easterly and Levine (2000), cross-country differences in income levels and growth rates are mostly due to differences in productivity. Public spending in R&D, infrastructure and human capital is believed to be one of the determinants of economic growth, mainly through improving TFP.

Thus, an indirect way for assessing the effect of public spending on economic growth is to use TFP as a dependent variable and to regress other variables on it, mainly those related to public spending, assuming that targeted public spending will improve TFP. Through improvement of the TFP, the economy will grow faster and consequently, poverty will decline. To do so, estimation of trends in TFP is required. However, some issues related to the estimation and the interpretations of TFP, tend to make such an approach problematic mainly for a country where good data are missing.

In general, public investment in R&D, in roads and other infrastructures, is translated into returns in the future. There is a tendency to underestimate the true value of the independent variable which is public spending today, that yields rewards in the future. According to the World Bank (2000a), estimation of TFP growth is very sensitive to the data used. Usually, estimation of TFP growth requires data on real GDP growth rate, physical capital and human-capital adjusted labor input. While real GDP growth rates are available from many sources, measuring growth rates of capital stock and human capital adjusted labor input is more difficult. Measuring growth rates of capital stock is very sensitive to assumptions regarding initial stocks and depreciation rates. In addition, estimating human-capital-adjusted labor input is, in itself, problematic (World Bank, 2000a). Accordingly, the estimation of TFP growth carried out by the World Bank (2000a) are very sensitive to the choice of the production function and to the degree of scale economies.

Finally, the interpretation of estimates of TFP growth in itself matters, since TFP includes numerous specific sources of efficiency gains – sources which can only be discovered with analysis of the TFP itself. In addition to these drawbacks of estimating TFP growth, the other option is to estimate directly the production function econometrically to avoid assumptions of constant returns and perfect competition by regressing output growth on input growth. There are also econometric problems related to such approach, i.e. data are missing for Yemen. Therefore, such an approach is not possible to perform.

For these reasons, rather than doing regressions, it is justifiable to use results on growth elasticities of public spending obtained from other studies, mainly through cross-country analysis. Thus, the elasticities used in the empirical assessment of public spending on poverty in Yemen for this study came from the empirical literature devoted to the determinants of economic growth at aggregate level and for the agricultural sector. They are not specific to Yemen. Using these elasticities is appropriate if one believes that Yemen's economy will adjust and respond to the same basic economic forces of health and education that make its human capital more productive as seen in a cross section of many other countries (see for instance Barro,1997; Mundlak *et al.,* 1997).

To assess the effect of public spending on poverty changes, the use of a comprehensive analytical tool – a computable general equilibrium model (CGE) – is needed. Such type of model has become a standard tool for the integrated assessment of public policies and income distribution for small economies.[1] Its main advantage lies in the possibility of combining detailed and consistent databases with a theoretically sound framework. It is able to capture feedback effects and market interdependencies that may either mute or accentuate first-order effects.

For this purpose, a dynamic CGE model is constructed to provide a baseline scenario for the economy and poverty changes in Yemen during the period 1998-2016 to which alternative policy scenarios may then be compared to isolate the specific impact of the latter. The alternative scenarios assume an increase in public spending devoted to a given sector, which will increase the TFP. Such improvements in TFP will affect the whole economy, in general, and poverty level, in particular. The CGE model is used to assess the detailed effects of the alternative scenarios related to public spending experiments. Finally, the elasticity of growth of real *per capita* consumption for poverty reduction is used to calculate the new poverty measures generated both in the baseline scenario and the public spending experiments.

2. Recent Economic Trends

Since the unification, the government of Yemen has worked to integrate two relatively disparate economic systems. However, severe shocks, including the return in 1990 of approximately 850,000 Yemenis from the Gulf States, a subsequent major reduction of aid flows, and internal political disputes culminating in the 1994 Civil War, hampered economic growth. As a result, economic growth has been lower than population growth; financial imbalances increased; workers' remittances decreased substantially; inflation rate reached 71%; and external debt mounted. As a result of the depreciation of the parallel market exchange rate in 1992-94, GNP *per capita* dropped substantially in dollar terms from US$701 in 1990 to US$318 in 1995 (World Bank, 2002).

Since the end of the war in 1995, the government entered into agreement with the International Monetary Fund (IMF) to institute a macroeconomic adjustment and structural reform. The program included strong fiscal adjustment measures, liberalization of most interest rates and reform of the exchange rate system, including in 1996 the elimination of the official exchange rate and unification of exchange rates at the free market level, and the adoption of a floating rate regime (IMF, 2001). The impact of these measures on the balance of payments has been favorable. The current account recorded a surplus throughout 1996 to 2002 (with the exception of 1998) and the surplus peaked at about 14.2% of GDP in 2000, but dropped to 7% in 2001 and 5.4% in 2002. Furthermore, inflation rates continued to decline and reached a single digit in 1997

---

[1] See for instance Rutherford, Rustrom and Tarr (1997) for Morocco, or Dessus and Suwa (2000) for Egypt and Tunisia.

reflecting success in reducing the fiscal deficit, which allowed for tight monetary growth (World Bank, 2002).

Following a minor discovery in 1982 in the south, the share of oil and gas in the economy has increased from 13% of GDP in 1995 to 34% in 2000, while the share of agriculture dropped from 24% to 15% during the same period. Oil dependency is even more pronounced in public finances with oil and gas accounting for almost 90% of total government revenues, creating a boom-bust cycle in public finances affecting the government's ability to finance essential services and investments.

Overall, and despite severe shocks during the first half of the 1990s, GDP growth was particularly high relative to regional standards during the 1990s. During the pre-reform period (1991-1994), real GDP growth averaged 4.1%, mainly due to high growth in the oil sector and government services. During the post-reform period (1995-2002), economic growth averaged 5.4% per year, driven mainly by the increase in agriculture value-added and the service sectors. Since most of the poor work in services and in the agriculture sector, it is most probable that the economic performance during the post-reform period has positively affected the poverty incidence of the Yemeni population. It is clear that there was a significant difference between the patterns of growth in the two periods. In the first period (1990-1994), there was a significant growth rate only in 1992 whereas the second period witnessed significant growth rates during the years 1999, 2001, and 2002 (See Appendix Table 1A). In-depth analysis shows these growth rates were not an outcome of the same forces. A closer look at the economic sectors is required to explore how they contributed to the economic growth of Yemen.

Agriculture remains to be an important sector in the economy of Yemen. During the period 1990-2002, it accounted for about 19% of GDP and it employs more than 50% of the total employment force. However, reliance on irrigation in a country with scarce water resources, coupled with a prevalence of traditional methods of cultivation and the development of the cultivation of *Qat*[2], reduced the share of agriculture in the country's GDP during the last thirteen years, which passed from 24% in 1990 to about 15% in 2002. During the period 1990-2002, the real growth in the value-added of the agriculture sector averaged 5% per year. This rate was only 2.7% during the pre-reform period while a significant growth was achieved during the post-reform period (6.1%). However, fluctuations of production are a typical characteristic of Yemeni agricultural sector reflecting hard climatic conditions. For the years 1999 and 2002, the real GDP for agriculture sector grew only at the rates of 1.2% and 3.6%, respectively.

[2] *Qat* is a tree branch, or leaves of a plant scientifically known as *Katia-adeblions*. It is a light drug obtained from the leaves of a cultivated and irrigated tree and is largely consumed in Yemen, chewed by people every afternoon

Regarding the industrial sector, its contribution to real GDP averaged 34% during the period 1990-2002 with an average annual growth rate of about 5% (3.2% during the pre-reform period and 6.0% during the post-reform period). However, during the last three years of the post-reform period (2000, 2001 and 2002) the industrial sector's real GDP declined by 1.8% in 2000 and grew only by 2.5% and 1.7% respectively during the two following years. The decline in performance may be explained largely by the drop in the international prices of oil during this period. Thus, the performance of the industrial sector in Yemen is highly correlated with the growth in oil revenues. In this context, the annual growth rate in oil incomes registered an average annual growth rate of 7.4% over the period 1991-1995 compared to 6.4% in the period 1996-2001.

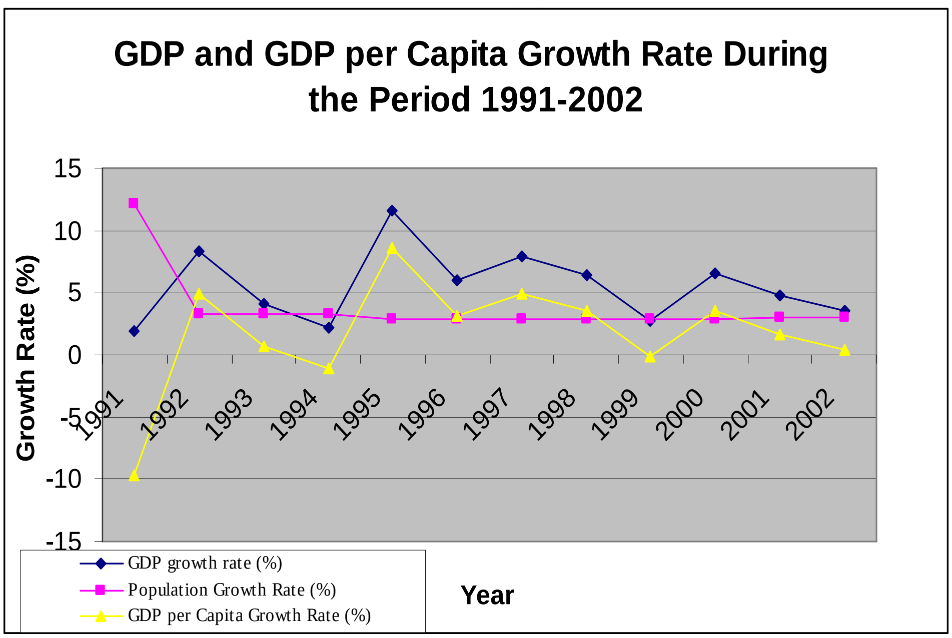
Finally, despite growth in the oil sector, the service sector remains the largest contributor to GDP in the country. Its contribution averaged 47% during the period 1990-2002. The average growth rate in real GDP for the service sector is the highest compared to the agricultural and industrial sectors. Its real value-added grew by 6% per year on the average, during the period 1990-2002. However, despite the average growth rate of real GDP for the service sector being higher in the post-reform period (6.3%) than in the pre-reform period (5.2%), its contribution to GDP declined from 49% in 1990 to 44.4% in 2002.

While GDP growth during the post-unification period (1990-2002) has been relatively high, it translated into only 1.6% increase in GDP *per capita* due to the high population growth rate (Figure 1). This modest increase in GDP *per capita* is reflected in the trend of private consumption *per capita*, which increased only by 1% during the same period. Furthermore, during the post-reform period, real private consumption per capita declined by 0.3%. The development of other economic indicators is more encouraging. Investment and saving rates grew significantly but still relatively low by international standards. Meanwhile, the government's final expenditure grew by 3.5% on the average during the period 1990-2002. The budget deficit was reduced to only 3% of the GDP, which indicates that the economic reform successfully stabilized the economy, mainly through reducing indirect subsidies and transfers. As a result, the inflation rate dropped to about 5% and current account balance was in surplus in all post-reform years, except the year 1998. Nevertheless, this situation is not sustainable, and the public revenues have increased at a slower pace than the increase in general expenditure. This success in macroeconomic stabilization does not improve the attractiveness of the country for foreign direct investment, which remains very low and concentrated in the oil sector. While Yemen is a highly open economy, its trade structure is dominated by oil on exports and by consumption products (mainly industrial) for imports (Appendix Table 2A).

3. Poverty Profile

Both poverty description and poverty indicators used in this section are directly based on two recent studies carried out by the World Bank (2002) and the Central Statistical Organization of Yemen (1999) using the 1998 Household Budget Survey data (HBS). Earlier poverty estimates were based on the 1992 HBS as well as the 1999 National Poverty Phenomenon Survey (NPPS). The 1992 HBS is biased at the level of fixation of the sample of households. In fact, urban observations represent 72% in the sample used, whereas the share of the urban population is estimated at about 20% for the same year. This lack of representative weight prevents any meaningful poverty comparisons with the 1998 HBS. On the other hand, the 1999 NPPS, although covering more households than the 1998 HBS (49450 *vs* 3780) and the sample is representative at the governorate level, its purpose was primarily to provide detailed information on access to services and other aspects of non-income living standards. The results of this survey are biased by seasonality effects as it was conducted over only one month.

Figure (1)



Overall, the 1998 HBS is considered the only household budget survey providing adequate information on incomes and expenditures. Seasonal patterns in consumption, expenditures and incomes are adequately taken into account in the 1998 HBS as it was carried out during a full year and over four rounds. For the above reasons, estimating trend of poverty between 1992 and 1999 can not be made. Thus, the analysis will focus on only one year of observation: 1998.

Poverty Line and Poverty Measures in Yemen.

Three main indicators are often used for poverty measures.

- Poverty Incidence (P0)
- Poverty Gap Index (P1)
- Severity of Poverty (P2).

The Gini coefficient (Gin) is the indicator used for measuring the inequality of the income distribution and consumption expenditures. Most of the poverty indicators related to the case of Yemen are already estimated by the World Bank (2002) and the Central Statistical Organization (1999).

Poverty Incidence (P0). The most common standard indicator is the incidence of poverty (also called poverty rate or head count rate). This describes the percentage of the population whose *per capita* incomes, or total expenditures, are below the poverty line, i.e. the population that cannot afford to buy an internationally recognized basic basket of goods. The methodology used by the World Bank (2002) follows the approach developed by Ravallion (1994). According to this approach, people are classified as poor if their consumption expenditure falls below a poverty line, which is defined as the value of a commodity basket containing both basic foodstuffs and non-food goods. Hence, poverty lines are made up of two components: (a) a food poverty line, setting the cost of a food bundle attaining a food energy requirement equal to 2,200 calories per person per day: and (b) an allowance for basic non-food goods. Using the 1998 HBS, estimation for the food poverty lines for Yemen are Yemeni Ryal (YR) 25,212 per person per year at the national level, YR25,116 in urban areas, and YR25,236 in rural areas.

Using food poverty lines, 17.6% of the population are classified as poor at the national level. The incidence of food poverty is 10% in urban areas, and 20% in rural areas.

As food poverty lines provide a measure of extreme poverty, food poverty lines usually add an allowance for non-food basic consumption. The resulting lines are usually referred to as lower poverty lines. Nationally, in 1998 the lower poverty lines for Yemen were YR38,520 per person, per year, YR38,340 in urban areas, and YR 38,580 in rural areas. Using the lower poverty lines, the incidence of poverty in Yemen was 41.8% in rural areas, 30.8% in urban areas, and 45% in rural areas. The upper poverty lines are estimated by adding the average non-food spending among households who actually spend on food an amount that is equal to the food poverty lines. In 1998, the upper poverty lines for Yemen were YR56,640 per person per year at the national level, YR57,168 per person in urban areas, and YR56,484 in rural areas. Based on the upper poverty lines, the incidence of poverty in Yemen reaches 66.9% at the national level, 69.6% in rural areas, and 57.8% in urban areas.

Poverty Gap Index (P1). The poverty gap index[3] measures the depth of poverty, considering both the number of poor people, and how poor they are. The poverty gap index is the combined measurement of incidence of poverty and depth of poverty. The estimated 13.2% at the national level in 1998 provides a measure of the ratio of the minimum cost of eliminating poverty with perfect targeting to the maximum cost with no targeting. As far as the severity of poverty is concerned, Table 1 below shows the estimates of the squared poverty gap index, a measure which takes into account not only the distance separating the poor from the poverty line, but also the degree of inequality among the poor. It is the average value of the square of depth of poverty for each individual. Poorest people contribute relatively more to the index. For Yemen, this indicator equals 5.8% at the national level. However, rural poverty (6.7%) appears to be, by far, more severe than urban poverty (3.2%).

Severity of Poverty (P2). While P1 has clear advantages for some purposes such as comparing policies which aim to reach the poorest, the key point is that a ranking of dates, places or policies in terms of the P2 should reflect well their ranking in terms of the severity of poverty. It is the ability of the measure to order distributions in a better way than the alternatives that makes it useful, not the precise number obtained (Coudouel Hentschel, 2000). Table 1 reports poverty estimates using three different poverty lines for the year 1998.

Table (1)
P0, P1 and P2 Estimates for Yemen, 1998 (%)

	Urban	**Rural**	**National**
Food Poverty Line			
P0	10	19.9	17.7
P1	2.1	5.2	4.5
P2	0.7	2.0	1.7
Lower Poverty Line			
P0	30.8	45.0	41.8
P1	8.2	14.7	13.2
P2	3.2	6.7	5.8
Upper Poverty Line			
P0	57.8	69.6	66.9
P1	19.8	28.7	26.6
P2	9.1	15.1	13.7

Source: World Bank (2002)

Gini Coefficient. For measuring inequality in the distribution of income and consumption expenditures, the Gini coefficient is a widely used indicator. Its value for the year 1998 and at the national level is

[3] Also called the Foster-Greer-Thorbeke (FGT) P1 measure.

estimated at 0.32. The estimation of the Gini coefficient at the regional level shows a high disparity in inequality between regions, which is more pronounced at the rural (0.43) than at urban areas (0.40).

Distribution of Total Expenditures Shares. The distribution of total expeditures shares across population shares ranked by *per capita* expenditure is the second indicator that is often used for measuring inequality at the expenditures level. According to the 1998 HBS, the richest 50% of the population makes 73% of the total expenditure at the national level, while the top 10% accounts for more than 25% of the total expenditure on consumption (Table 2).

Table (2)
Distribution of Total Expenditures Value
by Decile at the National Level

Decile	1	2	3	4	5	6	7	8	9	10
Consumption Share (%)	3.5	4.5	5.0	6.0	8.5	9.0	10.5	12.0	15.5	25.5

Source: Central Statistical Organization, Yemen (1999)

Socio-demographic Characteristics of the Poor in Yemen

The socio-demographic profile of the poor in Yemen fits a pattern common to many developing countries. According the World Bank (2002) and the Central Statistical Organization of Yemen (1999), poverty in Yemen is highly correlated with the following characteristics:

Household Size. Data shows that incidence of poverty in Yemen increases sharply with rising household size. In 1998, the average size of poor households was 8.2 (9.2 in urban areas and 8.0 in rural areas), compared to the national average of 7.1.

Child-Adult Ratio. Incidence and depth of poverty steadily increase with rising child-adult ratios. In 1998, in households having more adults than children about 35% are poor, compared to 50% for households having a child-adult ratio between 2 and 3, and compared to 66% for child-adult ratios greater than 4.

Dependency Ratio. This ratio measures the number of the very young (less than age 15) and the very old (greater than age 65) per 100 persons who are between the ages 15 and 64, the most economically productive years. In 1998, the dependency ratio in Yemen is higher in poor households (158) than in better off households (111).

Working Age of the Household Head. The higher incidence of poverty (42%) occurs in households headed by working people aged between 26 and 64 years old. The lowest incidence is found among the youngest breadwinners (less than 25 ages old), for which 38% of the households are poor, and for the oldest age range (39%).

Marital Status of the Head of the Household. In 1998, the poverty incidence was highest for households whose heads were widowed (43%), followed by married heads of household (40%), and was lowest for divorced heads of households (35%).

Age of Persons. Incidence of poverty among children in 1998, is 21.1% higher than among the adults: about 53% of the poor are children and about 46% of the total children are poor compared to 38% of the total adults.

Education Level. Education in Yemen has a strong correlation to poverty incidence, depth and severity. The higher the educational attainment of the head of the household, the lower the household risk to be poor. Results from the 1998 HBS show that poverty rates are highest for households headed by illiterate persons (47.3% nationally, 48.8% in rural areas, and 39.9% in urban areas), relatively high and similar among households in which the head can read and write or has attained primary level education (38.6%). Poverty rates are lowest for households headed by persons with a post-secondary educational, but strikingly high in absolute terms: 22% nationally, 42% rural, and 11% urban. At the national level, households headed by top-educated breadwinners account for 2.2% of the observed incidence of poverty as compared to 59% for households headed by illiterate persons. More than 86% of poor households headed by illiterate breadwinners live in rural areas. A similar pattern which points to a sizeable urban/rural divide is found in terms of both the depth and the severity of poverty.

Economic Characteristics of the Poor

The 1998 HBS data show that poverty is determined both by working status and the sector of employment of the head of household. Estimation carried out by the World Bank (2002) and the Central Statistical Organization (1999) show that at the national level, 84% of the poor live in households headed by employed persons, 2.5% by unemployed, and 13.5% by inactive breadwinners. This pattern does not change significantly in urban and rural areas.

The distribution of the poor by sector of activity of the head of household shows that, at the national level, most of the poor work in the agricultural sector (47.3%), followed by services (35.9%) and industry (16.8%). When compared to the overall distribution in the population, the poor are over-represented in industry and agriculture. In contrast, they tend to be under-represented in the service sector. More specifically, in urban areas 39% of the poor's breadwinners work in the merchandise service sector, 24% in public administration, and 21% in industry. In rural areas, 55% of the poor's breadwinners work in the agricultural sector, 29% in services and 16% in industry. Among poor households, 84% are in the private sector and 15% in the public sector.

Regarding sources of income, rural households derive their income from multiple sources within the rural economy and from the urban economy as well. According to the 1998 HBS, earnings from self-employment represent 39.1% of total income nationally, as compared to 28.2% of wage earnings, and 8.3% of income from transfers. The relative importance of wage earnings versus earnings from self-employment is very different between urban and rural areas. In urban areas, wage earnings accounts for 43.3% and earnings from self-employment for 28.5%, while in rural areas, the larger share of total income originates from self-employment activities (42.3%), and wage earnings account for 23.7%. In urban areas, capital income has a 15% share of total income, which is five times as much as the share shown by households in rural areas. Income from transfers represents 9.2% of total income in urban areas compared to 8% for rural areas.

The 1998 HBS data also show that the composition of total income changes significantly across per capita expenditures deciles. The share of wage earnings decreases from 37.5% for the poorest decile to 23.0% for the richest decile. For rural households in the top decile, wage earnings account for only 14%, as compared to 37% for urban households. Nationally, the share of income from self-employment increases from 32% for the richest decile to 43% for the poorest decile. In contrast, capital income as share of total income shows little tendency to vary across deciles, especially in rural areas. The share of income from transfers tends to increase mildly in urban areas (from 8.6% for households in the poorest decile to 10.6% for the richest decile), while it hardly varies in rural areas.

4. Structure of Public Spending in Yemen

Public Spending

During the period 1996-2002, public spending averaged 31.5% of GDP, compared to 28% during the first half of the 1990s. More than 80% of the total budget expenditure has been allocated to current spending with wages absorbing more than 41% of total spending. Nonetheless, it has declined since 1997 and currently constitutes about one-third of total spending. For the period 1996-2001, the government of Yemen has been paying greater attention to social sectors to improve the social conditions of the population. Total public spending in social sectors (including subsidies, education, health, social welfare, housing and utilities, and cultural and religious services) increased from 41% of total spending and 11% of GDP in 1991-95 to 50% of total spending and 17% of GDP in

1996-2001. Since subsidies are not targeted and are not pro-poor, including them in total social expenditures gives a misleading picture.

A more strict definition of social sectors (excluding subsidies) shows that government expenditures in the social sectors have averaged about 30% of the total public expenditure and 10% of GDP during the period 1996-2001. In real terms, and despite rapid population growth, public expenditures in the social sectors have increased faster than total expenditures during the second half of the 1990s. Real expenditures in social sectors per capita have increased by 13% per year during 1996-2001, compared to 6% per year for the total expenditures. Table 3 presents the recent trend in public spending during the period 1991-2002.

Table (3)
Evolution of Public Spending on Social Sectors during the Period 1991-2002
(values in billion YR and share in percentage)

	1991	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
Total Government Spending	44	56	68	87	118	228	303	294	336	476	502	532
% of GDP	29.2	29.3	28.4	28.3	23.1	30.9	34	34.2	28.7	31.7	32.7	28.7
Social Spending	18	23	30	34	47	115	163	164	164	272	212	
% of GDP	11.7	12.1	12.4	10.9	9.2	15.8	18.3	19	13.9	18	13.7	
% of total government spending	40.2	41.5	43.8	38.6	40	50.8	53.7	55.5	48.9	56.9	42.2	
1. Subsidies and Transfers	4	5	7	8	9	53	89	69	54	122	38	30
% of total government spending	8.3	8.9	9.9	9.1	7.6	23.5	29.3	23.4	16	25.5	7.6	5.6
2. Education Spending	9	11	14	17	23	37	46	57	67	89	108	
% of total government spending	19.3	19	20.1	19.3	19.5	16.4	15.2	19.3	20	18.7	21.5	
3. Health Spending	2.1	2.5	3.3	3.2	4.5	9.1	10	13.9	14.4	20.1	23.6	
% of total government spending	4.8	4.4	4.9	3.6	3.8	4	3.3	4.7	4.3	4.2	4.7	
4. Social Security and Welfare	0.6	0.7	0.8	0.9	1.1	1.6	1.7	4.4	5.9	7.7	8	
% of total government spending	1.4	1.3	1.2	1.1	1	0.7	0.6	1.5	1.8	1.6	1.6	
5. Housing and Utilities Spending	2	3	4	3	7	11	12	15	18	26	26	
% of total government spending	4.6	6.2	6.1	3.8	5.8	4.9	4	5.1	5.3	5.4	5.1	
6. Entertainment and Religious Spending	0.7	0.9	1.1	1.5	2.7	3.2	3.8	4.4	5.1	7.1	8.5	
% of Total Government Spending	1.7	1.6	1.7	1.8	2.3	1.4	1.2	1.5	1.5	1.5	1.7	

Source: World Bank (2002)

Regarding subsidies, as they were not targeted and not particularly pro-poor, food subsidies were entirely phased out in 1999. A recent assessment carried out by the World Bank (2002) shows that only 30% of the food subsidies reached consumers; the rest was used by exporters, distributors and smugglers to neighboring countries. The poorest groups of the population benefited very little from subsidies because they spent disproportionately less on subsidized food items than high-income groups.

On subsidies for diesel, it is considered as the only consumer good that continues to be significantly subsidized in the country. It appears to be used primarily to run irrigation pumps, electricity generators and fishing boats. The diesel subsidy is felt by some to be a source for excessive pumping and inefficient use of water to the detriment of the rural poor. According a recent study carried out by the IMF (2005), about 60% of the direct diesel subsidy used by households is captured by the two top (income) deciles, while less than 2% filters down to the two lowest deciles. At the same time, the aggregate impact of eliminating subsidies is regressive because of the dominance of the indirect impact through the rural labor market. The government is under the pressure of the IMF and the World Bank to phase out diesel subsidy by the year 2006.

To reduce any transitory negative effects associated with the removal of food subsidies in 2000, the government implemented different funds such as the Social Welfare Fund, the Agriculture and Fisheries Production Promotion Fund, and the Social Development Fund.

The Social Welfare Fund (SWF) is the government's main targeted social assistance program. This fund was originally conceived in 1996 as a way to compensate the poor for the progressive removal of food subsidies. In spite of drawbacks – such as problems in reaching beneficiaries and extremely bureaucratic procedures (van de Walle, 2002) – more than YR8 billion were spent on the SWF in 2001 to the benefit of 450,000 households, with a maximum of YR24,000 per household per year. For a family of 6 members, this translates to about YR333 per person per month or only about 10% of the 1998 national poverty line. Based on van de Walle's (*op cit.*) evaluation of the program, 4.2% of the target group, or 0.88% of the population, received SWF transfers and 57% of those who benefited from the program were not in the target group. Of those who were not in the target group, but who benefited from the program, 41% were non-poor and 16% were poor.

The Agriculture and Fisheries Production Promotion Fund (AFPPF) was launched in 1995 in the light of concerns that increases in diesel prices and eventual elimination of the diesel subsidy, would affect the poorest population groups in rural and coastal areas, who, both as consumers and producers, are highly dependent on agriculture and fisheries. The fund aims to promote agriculture, livestock and fisheries production through a wide range of activities in these sectors such as subsidizing the cost of agricultural inputs and equipment (e.g. seeds, fertilizer, etc.), water projects such as dam and construction of smaller works to reduce the risks of drought and recharge aquifers, and production marketing schemes. The AFPPF is financed through a system whereby YR2.5 (increased from YR1 since 1995) is deposited for every liter of diesel sold in the country. Resources also come from the general budget and foreign grants. The yearly budget is around YR 4.5 billion (US$25 to 27 million).

As for the Social Development Fund (SDF), it provides assistance for long-term development projects. These are aimed at providing social and economic services – including education, health care, water supply and microfinance – creating jobs and enhancing the capacity of local communities. According to the IMF (2005), the SDF has recently developed a strategy focusing on poverty alleviation in both rural and urban areas. However, the success is limited because banks still reluctant to extend credit to the strategy who focus on encouraging the development of small and medium enterprises.

An Assessment of the Efficiency of Public Spending

While various government programs towards poverty alleviation contributed to reduce the growing number of poor in the country, several drawbacks still limit the efficiency of these programs. Regarding the SWF, its budget is generally too low to cover all of the potentially eligible in addition that the regional dimension (governorates or district level) are not considered as determinant of the intervention of the fund. Concerning the AFPPF, resources are currently allocated to governorates on the basis of population and poverty indicators; governorates where Q*at* is grown, are considered rich and therefore excluded. In addition, poverty indicators are imprecise and the natures of beneficiaries are not clear.

Health Sector. While public spending in all social sectors has increased during 1996-2001, the level remains low in targeted sectors in comparison to other countries in the region. For the health sector, Yemen spends considerably less of its public budget in 1997 (3.3%) on health compared to most of its regional neighbors (unweighted regional averages of 6.7%). And a far large share of overall health expenditures comes from private sources – only 37.9% of health expenditures in Yemen are from the public sector compared to a regional average of 50.5% (World Bank, 2000b). Table 4 gives more information on health spending in Yemen compared to the rest of MENA (Middle East and North Africa) countries in 1997.

Table (4)
Health Spending in Yemen Compared to the Rest of MENA Countries in 1997

Country	Total (Public and Private) Health Exp. as % of GDP	Per capita Health Exp. (US$, official exchange rate)	Public Exp. as % of Total Health Exp.	Public Exp. on Health as % of Total Public Exp.
UAE	4.2	900	35.4	12.6
Kuwait	3.3	572	87.4	8.4
Qatar	6.5	1042	57.5	7.6
Bahrain	4.4	478	58.5	9.6
Oman	3.9	370	54.5	5.6
Saudi Arabia	3.5	260	80.2	9.4
Tunisia	5.4	111	41.7	7.2
Jordan	5.2	59	67.2	8.5
Lebanon	10.1	461	29.6	7.8
Morocco	5.3	66	40.7	6.5
Libya	3.4	296	54.2	2.7
Algeria	3.1	44	50.8	4.9
Egypt	3.7	44	27.0	3.3
Syria	2.5	151	33.6	2.9
Iran	4.4	108	42.8	7.2
Iraq	4.2	251	58.9	**???**
Yemen	3.4	12	37.9	3.3
Unweight Avg	**4.5**	**307**	**50.5**	**6.7**

Source: World Bank (2000b)

Education. According to the World Bank (2002), the recent rise in education spending in Yemen is a largely driven by rising employment opportunities for teachers and increasing wages than by increasing investment expenditures. These expenditures show a declining tendency. While, the Yemen enrollments have increased substantially at all levels[4], the coverage is still low, and access to education services is uneven between genders. Gaps between rural and urban areas and among governorates are still large (see World Bank, 2002 for a detailed assessment of education system in Yemen). The World Bank's assessment suggests that improving educational opportunities for the poor and under-served population should be considered as a top priority of the Poverty Reduction Strategy Paper (PRSP). In this context, increasing public spending in education and better targeting of additional spending for capital investment towards the poorest population, seem to be effective strategies that will contribute to poverty reduction.

Infrastructure. Despite improvements realized over the past years in infrastructure, it is still below the desired standard and is characterized by geographical variances and bias towards the urban areas and the most fortunate groups. Infrastructure services also suffer from numerous

[4] During the period 1995-2000, enrollments increased by some 30% in basic and 50% in secondary education. Higher education more than doubled; and vocational and technical training enrollments increase by about 40% (World Bank, 2002).

difficulties, due to population growth and high migration rate to the urban areas, leading to increased pressure on the infrastructure. Many projects and large financing are needed to improve infrastructure services especially in the rural areas. Thus, increasing water production for domestic uses, expanding the scope of wastewater sanitation services, rehabilitating existing power stations, increasing investment in electricity generation and distribution, construction of a road network to link industrial and agricultural production centers are among the priority areas of improvement of infrastructure identified in the PRSP.

Furthermore, expansion of basic education and heath services, improvement of vocational training and technical education, and reform of higher education are considered as the main key factors for improving human capital. Finally, the expansion of agricultural production which remains the source of income for most of the Yemeni population may be achieved mainly through irrigation improvement and by encouraging agricultural research to better manage irrigated agriculture and natural resources.

5. *Evaluation of Increasing Public Spending in Priority Areas on Poverty Reduction*

Description of the Model Structure and Main Features

The models used in this study originates from a prototype model (Beghin *et al.,* 1996) built for trade analysis at the Development Centre of the Organization of Economic Cooperation and Development. It is a standard neoclassical recursive dynamic model with imperfect substitution between domestic and foreign goods. Prices are endogenous in each market (goods and factors) and equalize supplies (imports, Yemeni production for the domestic market, factors supply) and demands (final demand from households, the government, investors and the rest of the world, intermediate demand from producers, factors demand), at the equilibrium. The equilibrium is general in the sense that it concerns all the markets simultaneously. The model is dynamic and is solved recursively every two years from 1998 to 2016.

Production. Supply is modeled using nested Constant Elasticity of Substitution (CES) functions, which describe the substitution and complement relations among the various inputs. Producers are cost-minimizers and constant return to scale is assumed. Output is produced from two inputs, an intermediate aggregate and a value-added aggregate. The intermediate aggregate is obtained by combining all products in fixed proportions (Leontief structure). The value-added components are decomposed in two parts: (a) aggregate labor and (b) capital. Given the crucial importance of labor demand and labor remuneration in poverty incidence variation, the labor modeling is described in more details below.

The capital bundle incorporates three types of capital: (a) land, (b) non-renewable resources in oil and gas, and (c) physical capital accumulated through past investment. The first two capital stocks are sector-specific. The third one decomposes itself between two generations of capital: "old" and "new". New capital results from contemporary investment. This is a putty/semi-putty technology for the production function. New capital may be allocated more flexibly than “old” capital. Substitution possibilities of all inputs and labor (that are functions of relative prices) will be greater with the new vintage of capital, that is, the contemporary investment, than with the other one, that is, the installed capital[5].

Income and Absorption. Income from labor and land is allocated between the various households using a standardized fixed-coefficient distribution matrix. Income from capital is allocated in the same way between households and the rest of the world. Income from oil is paid totally to the government. Household total demand is derived from maximizing the utility function derived from the Extended Linear Expenditure System (ELES). The household's utility is a function of consumption of different goods and savings, and is constrained by disposable income. Income elasticities are differentiated by product and households, and vary from 0.80 for agricultural and minerals products to 1.20 for services. The calibration of the model determines a *per capita* subsistence minimum for each product, whose aggregate consumption grows with population, while the remaining demand is derived through an optimization process. Household utility is a positive function of consumption of the various products and savings, with income elasticity for each product being set to unity. Households pay tax on this income and save the remainder. Government and investment demands are disaggregated in sectoral demands once their total value is determined according to fixed coefficient functions.

International Trade. The model assumes imperfect substitution among goods originating from domestic market and the rest of the world. Import demand results from a CES aggregation function of domestic and imported goods. Export supply is symmetrically modeled as a constant elasticity of transformation function. Producers decide to allocate their output to domestic or foreign markets responding to relative prices. Substitution elasticity between domestic and imported products is set at

---

[5] Elasticities are derived from the available relevant literature (see Burniaux, Nicoletti and Oliveira-Martins, 1992). For instance, the substitution elasticity between labor and old and new capital are set respectively at 0.1 and 1. Elasticities between intermediates and value-added are set to 0 (if the latter incorporates old capital) and 0.5 (in the case of new capital).

2.2. The elasticity of transformation between products intended for the domestic market and products for export is 5.0.[6]

The small country assumption holds. Yemen, being unable to change world prices, its imports and exports prices are therefore exogenous. Capital transfers are exogenous as well, and determine the trade balance.

Labor Specifications. The assumption of full employment and flexible wages for achieving equilibrium in labor market can not be used for any study related to labor market or poverty analysis. In fact, labor demand and remuneration by segment and skill are among the main factors explaining poverty. For this reason, a realistic modeling of labor market behavior and wage setting is crucial for any poverty analysis study.

The modeling of the labor market in the present study follows the work of Dessus and Suwa (1999) for Egypt. Labor supply at each period depends first on an exogenous factor affected by demographic trend and external migration. Between two periods, migration movements occur between segments, depending on relative expected earnings, i.e. wages multiplied by the employment rate of the previous period. A change in relative expected wages thus induces migration (the cost of migration and the non-wage benefit in the public sector being constant). Due to the segmentation of markets, it is assumed that a worker can only modify one of his job's characteristics at a time. For instance, a rural worker in the private sector would compare his state with that of a rural worker in the public sector or an urban worker in the private sector. Conversely, he cannot move directly to the urban public sector. Finally, it is assumed that households follow the migrants, and adopt the consumption behavior of their new location.

Labor supply in the private sector is also a function of real wages, differentiated by skills – the higher the skill, the higher the supply elasticity. The unskilled part of the private labor market accounts for the informal sector. It is assumed that most workers (skilled and unskilled) queuing for a public job, are actually working in this informal sector, thus augmenting the labor supply in that segment. This assumption is realistic in the case of Yemen as average wages in public sector are higher than in private sector by approximately 30%.

Model Closure and Dynamics. The model is solved for each period, under several macro-closures. Firstly, as the small country assumption is adopted and capital transfers are exogenous as well, therefore the

---

[6] Trade elasticities come from the empirical literature devoted to CGE models. They are not specific to Yemen. See for instance Burniaux, Nicoletti and Oliveira-Martins (1992), Konan and Maskus (1997) or more recently Gallaway, McDaniel and Rivera (2000). These elasticities are not distinguished by product, which explains to a large extent, their low levels. They are not statistically significant either.

trade balance is fixed, so as to achieve the balance of payments equilibrium. Secondly, the model imposes a fixed real government deficit and fixed real public expenditures. Thus, public receipts adjust endogenously to achieve the predetermined net government position, by shifting households' income tax.[7] Thirdly, investment is determined by the availability of savings from households, the government and abroad. Since government and foreign savings are exogenous in this model, changes in investment volumes reflect changes in household savings and changes in the price of investment. The sequential dynamic path of the model results from this closure on investment, the assumptions on labor supply exposed previously and exogenous growth rates for the natural reserves and the TFP. Agents are assumed to be myopic and to base their decisions on static expectations about prices and quantities. However, the closures rules for the model will be adapted for the purpose of the alternative simulations. In fact, any additional public spending needed for poverty reduction have to be financed. Many options exist for this, e.g. shifting the rate of current tax instruments to achieve a target, reducing expenditures in other sectors, or increasing foreign aid. For each available option, a sensitivity analysis may be carried to select the most appropriate tool able to improve public spending without compromising budget stability and economic growth in the country.

Policy Impact. Policy impacts are compared to the baseline scenario, in terms of macro-economic aggregates, trade volumes, sectoral outputs, households' welfare, and poverty indicators. The chosen yardstick for welfare is the assessment of equivalent variation, which is the sum of two terms. The first one measures the gain (or the loss) of disposable income caused by the reform (producers surplus), and the second one measures the income needed after the reform to obtain the same level of utility as before the reform (consumers surplus).

The Social Accounting Matrix and the Structure of the Economy in the Base Year

The model uses information contained in Yemen's Social Accounting Matrix (SAM) for 1998 built especially for the purpose of this study. It considers two representative Yemeni households, one rural and one urban. In all, nine economic sectors and eight types of work are taken into account, the latter being distinguished notably by their skills, areas, and status. T he model takes into account three types of capital: physical capital, land, and oil rent.

Appendix Table 3A shows the macro SAM for Yemen for the year 1998, which is a tabular presentation of the National Accounts. Each entry presents a payment by a column account to a row account, and the

---

[7] This closure policy may be understood as a net transfer from households to government (or the reverse).

corresponding row and column sums must be equal. They represent the income and expenditure accounts for various economic actors, and the SAM effectively shows the circular flow of income and expenditure from producers through factor markets to different non-government institutions – households and the rest of the world – and back to producers through commodity markets. The CGE model is based on a more detailed SAM – a “micro” SAM) – with disaggregation of activities, commodities, factors, domestic non-government institutions, and a macro-savings-investment account (S-I), The rest of the world is also an actor buying exports, selling imports, and providing and receiving transfers and factor income.

In the SAM, GDP at factor cost is the payment by activities to factors (YR714407.6 million). Government revenue is shown along the government row, and is largely from oil (42.4%) and transfers from abroad (17.3%). Tax revenue is also an important share of total government revenue. It represents 40.2% of total government revenue. Tax on income and profits are largely the most important source of government tax revenue (48.7%), followed by tariffs (27.8%) and indirect taxes on production net of subsidies (23.5%). Among its current expenditure, wages and salaries represents, so far, the most important share (60.2%) followed by public final consumption on goods and services (28.2%) and by direct transfers to households (11.6%). Government saving (government to S-I) is large, with a share equal to 37.6% of total savings. Aggregate saving from abroad is also important in Yemen, mainly in the oil and gas sector. Its share exceeds 13.5% of total savings in the country. Private saving represents about half of aggregate investment, where “private or households” refers to all domestic non-government saving. Exports (world to commodities) represent just under a third of GDP at factor cost, while imports (commodities to world) are much bigger (56.7%) ─ foreign savings (minus world to S-I, the current account balance) is then large.

Table 5 provides information about the sectoral structure of value-added and trade. Services (dominated by public administration and defense) represent 51% of total value-added and the next largest sector, mining and quarrying (mainly oil and gas), represents around 14.3%. Imports are concentrated in manufactured products (45.1% of total imports), services (27.7%) and plants (12.1%). On the other hand, exports are so far dominated by mining and quarrying products (83.5% of total exports), followed by services (10.6%), and plants (2.8%).

Table (5)
Economic Structure in 1998 (%)

	Value-added (VA)	Output (X)	Exports (E)	Export/ Output (E/X)	Imports (M)	Import/ Final Demand (M/Q)
Plants	9.1	7.4	2.8	5.6	12.1	31.3
Livestock	4.9	3.9	0.2	0.6	5.6	28.6
Fishing	2.3	1.7	1.8	14.7	0.1	2.3
Other agriculture	4.1	3.3	0.5	2.3	4.3	26.2
Mining and Quarrying	14.3	16.7	83.5	72.3	5.1	39.9
Manufacturing	8.9	18.0	0.6	0.5	45.1	53.7
Electricity, Water, and Gas	0.8	1.0	0.0	0.0	0.0	0.0
Construction	4.6	7.0	0.0	0.0	0.0	0.0
Services	51.0	40.9	10.6	3.8	27.7	49.5
Total	**100**	**100**	**100**	**14.5**	**100**	**38.8**

Source: Social Accounting Matrix for Yemen 1998.
N.B. Data are rounded to one decimal point.

Table 6 shows the distribution of workers among the different sectors of the economy. The public administration and defense are excluded. Most employment for the private workers is in the agriculture sector (mainly plants and other sectors). Private urban workers are mostly occupied in the services sectors. Public workers are mostly employed in the mining and services sectors. Regarding the source of income for households in Yemen, Table 7 shows that capital income represents the main income source (57.5%), followed by wages (20.2%), and by remittances from abroad (19.4%). The contribution of each source income is slightly different according to the areas of residence of the households.

Table (6)
Sectoral Distribution of Workers (%)*

	Private Rural Workers	Private Urban Workers	Public Rural Workers	Public Urban Workers	Total in persons
Plants	34.2	2.2	6.3	0.6	1157486
Livestock	18.4	1.2	4.6	0.5	625358
Fishing	0.4	0.1	14.9	16.0	26073
Other agriculture	15.7	1.0	1.4	0.3	530571
Mining and Quarrying	0.1	0.3	11.0	40.4	23719
Manufacturing	3.4	9.4	6.6	13.3	189582
Electricity, Water and Gas	0.1	1.8	14.8	7.3	26743
Construction	4.7	5.1	14.3	9.3	205482
Services	23.1	78.9	26.1	12.4	1368370
Total	**100**	**100**	**100**	**100**	**4153384**

* N.B. Public Administration and Defense Excluded
Source: Author's compilation on the bases of many CSO publications.

Table (7)
Income Sources for Rural and Urban Households (%)

	Urban Households	Rural Households	Aggregated Households
Wages	31.2	15.7	20.2
Land Rent	0.2	0.7	0.6
Capital	65.6	54.1	57.5
Transfers from Government	2.0	2.5	2.3
Remittances from Abroad	1.0	27.0	19.4
Total	**100**	**100**	**100**

Source: Social Accounting Matrix for Yemen, 1998

Estimation of Growth-Poverty Reduction Elasticities

The international record, i.e., country experiences, shows that economic growth is the most effective anti-poverty tool. Growth-oriented policies are considered as the most effective vehicle for expanding revenue base which, in turn, leads to reducing poverty. In their recent paper, van Eeghen and Soman (1996) argue that empirical results are consistent with international evidence for most countries in the world. They consider the MENA region as a clear evidence for such assumption. Experience in the MENA over the past decade, suggests that there is indeed a very strong empirical relationship between poverty alleviation and economic growth, which may be shown by a relatively high growth elasticity of poverty reduction. Results from the World Bank's poverty assessments in four countries in the region for the period 1985-1994 highlight the link between growth and poverty reduction despite the important contrast in growth achievements in these countries. While Morocco and Tunisia have sustained *per capita* GDP and witnessed poverty declined, Jordan suffered a sharp drop in *per capita* GDP and saw poverty increased (van Eeghen and Soman, 1996). The growth elasticity is negative and varies from -2.5 to -6.2 for the three countries (when estimated at a poverty line of US$1 per day at 1985 Parity Purchase Power (PPP). This means that for every 1% increase in real GDP growth, the number of poor people declines by 2.5 to 6.2% in the country. Conversely, this also means that a fall of 1% in real GDP growth increases the number of poor people by 2.5 to 6.2%. According to van Eeghen and Soman (1998), the relatively high growth elasticity could be explained by the fact that MENA is characterized by a low initial income inequality and by the choice of the poverty line as a $1 per person per day.

CGE models allow the identification and quantification, albeit at rather disaggregated levels, of some of the most important transmission channels relevant to poverty changes: relative factor and commodity price changes, and capital deepening caused due to domestic savings. Just using the growth figures estimated by a CGE model would be forfeiting most of the model's explanatory and numerical measurement power. Instead, such a model is primarily an instrument for counterfactual (i.e., what if?) analysis, rather than a growth forecasting tool. For these reasons, using estimates on real *per capita* consumption rather than *per capita* income growth allows the taking into account both the income distributional effect among the different household categories in the analysis and the changes in consumption patterns. The latter depends on changes in incomes and consumption prices vectors.

Thus, the CGE model provides results on changes in the real *per capita* consumption by household category. The use of estimates on growth elasticity of real *per capita* consumption for poverty reduction by household category allows for the estimation of some poverty measures related to any simulation provided and on the medium- to long-run.

Results of different household surveys are used to estimate the growth elasticity of real private consumption *per capita* for poverty reduction.

Despite the fact that: (a) very few shocks to an economy are distributionally neutral over sectors and income groups, and (b) an approach that combines the average real *per capita* consumption figures from a CGE with a poverty elasticity (here growth of real *per capita* consumption elasticity for poverty reduction) does not seem very promising in evaluating the full poverty impact of public policy reform inside each household category, this approach nevertheless, represents an intermediate tool to assess the change in poverty level between the representative household (RH) approach and the micro-simulation approach. Using only the RH approach does not help estimating poverty changes, and the analysis is limited to evaluating welfare change for the representative household. In contrast, the micro-simulation approach allows the evaluation of the effect of any economic reform on an individual household, which in turn, allows to estimate new poverty indicators related to any given reform (P0, P1, and P2).

In the case of Yemen and for the purpose of this study, the poverty line used in the estimation of the growth of real *per capita* consumption elasticity of poverty reduction, is the lower poverty line estimated by the World Bank at national and regional levels. The approach used for estimation of the growth of real consumption *per capita* for poverty reduction entails increasing *per capita* consumption by x% and estimating the new poverty rates both at the national and regional levels for the whole sample considered in the 1998 HBS. It is supposed that consumption distribution remains unchanged between the two situations: the initial or base year (1998) and the simulation period for each household category. Thus, for the given new level of poverty in Yemen, the rate of poverty reduction associated with 1% increase in real consumption by year and by person is estimated. The results obtained are presented in Table 8.

Table (8)
Growth Elasticity for Poverty Reduction in Yemen

	Growth Elasticity of Poverty Reduction
Yemen	-1.8
Urban Areas	-2.5
Rural Areas	-1.7

N.B. The poverty line used is the lower poverty line.

For Yemen, an increase of 1% in the average real private consumption *per capita* reduces the proportion of the poor by 1.8%. The effect of growth in real private consumption is more important for urban households than for rural. An increase of 1% of real consumption *per capita* reduces the number of the poor in urban areas by 2.5% while the reduction in the number of poor associated with 1% increase of real *per* *capita* consumption is only 1.7% in rural areas. The reason behind this may be found in the poverty gap index which is higher in rural areas than in urban areas.

Economic and Poverty Trends in the Baseline Scenario

In the CGE modeling framework, it is essential to establish a baseline scenario as counterfactual for comparing the outcome of a policy shock. In a dynamic analysis, this involves drawing on additional exogenous information to define what seems to be a plausible growth path for the Yemeni economy up to 2016. These include information on projected growth trends for macro variables, e.g. population, labor force and depreciation of the capital stock. This exercise should not be interpreted as an exercise in forecasting, but an attempt for defining a benchmark for comparing alternative policy scenarios to isolate their specific impact[8].

In constructing the baseline scenario, a figure is defined for the rate of growth in the economy. TFP is then endogenous. When simulating alternative policies, the previously estimated TFP becomes exogenous and GDP endogenous.

Growth Hypotheses. To construct a baseline scenario, the values of a number of variables are set exogenously. These include the rate of growth in GDP which is set over the time horizon of the model to match actual growth rates as well as to follow rates projected by the World Bank (World Bank, 2002). Actual average of annual GDP growth is 4.5% for the period between 1998 and 2001. Then, a 3% annual growth is projected for the period between 2001 and 2016. Similarly, population growth rates follow the government forecasts, where rural population is assumed to grow at an average annual rate of 1.9% while annual average growth rate for the urban population is expected to be 5.7% during the same period (the numbers account for the expected migration flows between rural and urban areas). For labor supply over the same time period, it is expected to continue to grow at high rates compared to other MENA countries.

In the rural areas, labor supply grows by 3.5% per year while urban labor force categories grow at an annual average growth rate of 3.4%. Annual growth rates for the labor market categories take into account the expected increase of women participation in the labor market and labor mobility from one sector of employment to another (from rural to urban areas) and from unskilled to skilled categories. In addition, the

[8] The fact that the value of exogenous variables are set on *a priori* basis within a realistic confidence interval, does not, however, have any major consequences. When the impact of alternative economic policies is assessed, it may be seen that these choices affect very little either amplitude or sign of the variations in the different aggregates relative to the baseline scenario (Chemingui and Dessus, 2001).

baseline growth path assumes that oil and gas extraction is expected to decline by an annual average rate of 2% during the period 1998-2013 to become constant from the year 2013 (a result of newly planned investments in oil and gas over the coming years). Total cultivated area declines by 2% yearly as result of high urbanization and scarce water resources. Workers remittances which represent an important source for household's income in Yemen remain unchanged during the simulation period.

Economy and Poverty in Yemen in the Absence of Reform in Public Spending. It is assumed here that the government leaves its policy of fiscal stabilization, given the high poverty rate in the country and the difficulties associated with any cut in direct and indirect transfers to households, mainly for the poorest. For this reason, the model imposes an increase in budget spending (excluding investment) in real terms by 4% between 1998 and 2001 and then by 3.7% between 2001 and 2010 and 3.2% since 2010. Public receipts are adjusted endogenously to achieve the predetermined net government position, by shifting households' income tax. This closure policy may be understood as a net transfer from households to government (or the reverse). This type of policy is considered by economists to be the most neutral way to assess economic policy reform. Other closures may be tested, e.g. adjusting indirect taxes for instance. However, this would bear the risk of introducing new distortions into the economy, thereby making more difficult the ability to conceptually isolate the impact of the public spending policy.

Tables 9 to 12 present economic and poverty trends in the baseline scenarios.

Table (9)
Macroeconomic Trend in the Baseline Scenario.

	1998 (YR billion)	2016 (%)
Real Gross Domestic Product	811.2	3.2
Total Production	1478.0	3.0
Private Consumption	592.5	2.7
Real Urban Available Income	216.3	5.0
Real Rural Available Income	528.4	1.4
Investment	338.9	0.6
Exports	228.0	2.1
Imports	405.2	1.3
Government Revenue	277.6	-1.0
GDP deflator	100	-0.9

N.B. Macroeconomic aggregates in the base year (1998) are expressed in billions of 1998 YR while for the simulation period, these aggregates are expressed in average yearly percentage changes compared to the base year.
Real available income levels are the available income levels in 1998 YR, divided by the consumer price index for each area.

Table (10)
Trend in Real Wages by Segment in the Baseline Scenario

	1998 (YR billion)	2016 (%)
Rural Unskilled Workers in the Public Sector	192.5	-5.8
Rural Skilled Workers in the Public Sector	192.6	-5.8
Rural Unskilled Workers in the Private Sector	16.7	-1.1
Rural Skilled Workers in the Private Sector	20.3	-2.8
Urban Unskilled workers in the public sector	192.7	-5.8
Urban Skilled Workers in the Public Sector	192.5	-5.8
Urban Unskilled Workers in the Private Sector	16.9	-1.3
Urban Skilled Workers in the Private Sector	20.3	-3.0

N.B. Real wages in the base year (1998) are expressed in billions of 1998 YR while for the simulation period these wages are expressed in average yearly percentage changes compared to the base year.

The rate of growth in TFP (which relates to physical capital and labor) is also determined endogenously in this initial scenario. Notably, it is dependent on the rate of growth in the economy and the initial stock of physical capital, which in turn, determines the rate at which the latter accumulates. Results show that investment rate (expressed as percentage of GDP) falls from 41.8% in 1998 to 26.3% in 2016. Finally, the assumption is made that there is a hardening in external constraints. In 2016, the deficit in the trade balance falls to 12.4% of GDP, compared with 21.8% in 1998.

Although an increasing trend is assumed towards achieving a constant annual growth rate of real public sector wages (after a 10% decline during the period 1998-2001), wages in real terms do not recover to the initial level and continue to report a decline over the simulation period (Table 10). Thus, workers in the public rural sector end up with their wages reporting an annual decline of 5.8% in real terms while the drops in real wages are less pronounced for the private sector in the rural areas. Real wages for unskilled workers in the rural private sector decline by 1.1% per year and real wages for skilled workers in the rural private sector decline by 2.8%. The expected increase in skilled labor force compared to unskilled in the coming years may explain such differentials in wages evolution in the private sector. The same tendency is observed for urban public workers where their real wages decline by 5.8% per year, on the average.

The decline in real wages in the private sector is more important in the urban than as in the rural sector (-1.3% for unskilled workers compared to -3.0% for skilled workers in the urban private sector). Given the conditions defined above for the baseline scenario and the simulated declines in the real wages as a result of the public wage policy, demand for labor will increase for all categories and unemployment is expected to decline consequently. The declines in unemployment are more important for the skilled workers than unskilled (-6.9% and 0% per year on the average in rural areas respectively and -1.9% and -0.3% per year, on the average, in urban areas respectively).

Table (11)
Trend in Unemployment Rates by Skill and Areas in the Baseline Scenario

	1998 (%)	2016 (%)
Rural Unskilled	16.4	0.0
Rural Skilled	6.4	-6.9
Urban Unskilled	12.01	-0.3
Urban Skilled	8.1	-1.9

Sources: Author's estimation using various CSO publications

Table (12)
Poverty Incidence Trend in the Baseline Scenario

	1998	2016
Poverty Incidence in %		
National Level	41.8	29.2
Urban Areas	30.8	14.3
Rural Areas	45.0	29.6
Number of Poor (in 1,000 persons)		
National Level	8055.7	1.2%
Urban Areas	1685.1	1.3%
Rural Areas	6210.5	–0.5%

N.B. * Poverty Incidences are expressed in percentage of total population in each year.
* Dates are rounded to one decimal.

As for the effect on poverty in the baseline scenario, as a result of growth, P0 is expected to decline. At the national level, the number of people living below the poverty line falls from 41.8% in 1998 to 29.2% in 2016. The decline in poverty is more important in urban areas than rural areas with an average yearly rate of 4.2% and 2.3% respectively or a fall from 30.8% of total population in urban areas in 1998 to 14.3% in 2016 and from 45% for rural populations in 1998 to 29.6% in 2016. Although the P0 declines during the simulation period, the absolute number of poor will increase by 1.2% per year at the national level. The increase of the number of poor is only in the urban areas with an annual average increase of 1.3% while the number of poor in rural areas declines by nearly 0.5% per year during the simulation period.

6. Public Spending Experiments

The assumptions for the public spending experiments are presented in Table 14. All the simulations involve an increase of public spending for priority areas while keeping the level of public spending in the other areas constants. Rather than assuming a reallocation of public spending into alternative priority areas following the work of Lofgren and Robinson (2004), increasing public spending is justified and more suitable for the case of Yemen. According to the World Bank (2002) and the PRSP, public investments in social sectors and infrastructure are considered low by international standards. Furthermore, expenditure shares on health and education services are low and gaps between rural and urban areas and among governorates are still very large.

Infrastructure is still below the desired standard and is characterized by geographical variances and bias towards the urban areas and against the most vulnerable groups. For these reasons, reallocating public spending into alternative priority areas may not be feasible politically, socially, and economically. It is not feasible politically since the reallocation of public spending necessarily consists of reducing current spending in one area and its reallocation to another area. This is politically sensitive because public spending is dominated by current spending (mostly wages). Thus, cutting wages is often not feasible politically and socially. In addition, and according to the PRSP, reduction of poverty in Yemen will be achieved through improvement of infrastructures and social services in the country which will be done through an additional public spending. Effectively, this type of spending increases a country's institutional, infrastructural and human capital. The private sector has less incentive to provide this type of capital, since its provision by one private firm tends to make the services of this capital available to all. The private firm cannot internalize all of the benefits of its investment in this type of capital, and consequently, this type of capital tends to be under-supplied.

Both better targeting of new government spending and international aids are identified as the two complementary instruments for poverty reduction. Thus, additional public spending has to be designed to generate faster growth rate of GDP which should reduce poverty. The empirical literature strongly suggests that more rapid GDP growth is associated with more rapid poverty reduction. Lofgren and Robinson (2004) present a detailed review of literature on the positive correlation between growth and poverty reduction.

In this context, the work of Barro (1997) may be shown for illustration. Barro's study focuses on the institutional factors found to be most conducive and most harmful for growth and rising standards of living in more than 100 countries around the world since 1960. He focuses on the statistical correlations between institutional influences and average rates of economic growth in various countries. His empirical hypothesis is the idea of "conditional convergence." If all national economies were basically the same except for the respective amounts of capital with which they were endowed, then the hypothesis suggests that the countries with smaller amounts of capital would experience higher annual per capita rates of real growth than countries with larger endowments of capital. The long-run tendency, therefore, is for poorer countries to catch up with richer countries in terms of GDP *per capita*.

According to Barro's study, government policies with respect to levels of consumption spending, protection of property rights, and distortions of domestic and international markets, are among the main factors affecting the level of economic growth. Thus, investment in human capital in the form of secondary and higher education are highly significant in their effects on potential rates of growth. The better and more highly trained the work force; the more productive they are in helping to enhance the rate of annual real output in a society. At the same time, the lower the rate of population increase relative to the rate of growth in the capital supply, the more capital may be invested per worker to increase the average output of each member of the work force. After looking at various types of government policies and their effects on economic growth in the surveyed countries, Barro concludes: "The growth rate tends to be higher if the government protects property rates, maintains free markets, and spends little on non-productive consumption."

In this study, two categories of financing of additional public spending are assessed. Both of them consist of increasing public spending in priority areas while keeping unchanged its level on the remaining areas. For the first category of public spending experiments, additional government spending on social sectors and infrastructures is generated through an adjustment of direct public transfers to household. In fact, according to the closure rules adopted in this study, the model generates a new coefficient of public transfers to households (net of direct taxes) compared to the situation prevailing in the baseline scenario to meet the additional spending level on selected areas. In the second category, and given the weak level of government resources, it is assumed that the additional level of government spending will be financed by direct international transfers in the form of foreign aid. Considered as a less developing countries, Yemen is benefiting from high international assistance in the form of aid which represents almost 23% of government expenditures in the year 1999 (World Bank, 2004).

Three alternative public spending scenarios are assessed for every financing schema adopted. These experiments are the following: (a) increasing public spending in agricultural infrastructure (SIMAGR); (b) increasing public spending on education services (SIMEDU); and (c) increasing public spending in health services (SIMHEA). The assumptions for these experiments are presented in Table 13.

Table(13)
Assumed Elasticities of Public Spending

Public Spending Category	Elasticity of public spending	Linkage channel
Agriculture	0.3700	TFP in agriculture
Education	0.0098	TFP in all sectors
Health	0.0418	TFP in all sectors

Sources: Elasticity estimates are from Barro (1997) and Mundlak *et al.* (1997)

The first experiment (SIMAGR) consists of evaluating the effect of a gradual increase in the public spending allocated to agriculture from 0.5% of GDP in 1998 to 1.5% in 2010 and after. It is aimed at improving the yields in agriculture such as public agricultural research and public infrastructures assumed to increase the long-run TFP level by 33% in agricultural sectors by 2016.

The second experiment (SIMEDU) focuses on increasing public spending on education by a gradual increase from 6.6% in 1998 to 9.6% in 2010 and after. This increase in public spending is envisioned to raise the long-run TFP level by 19.8% for all productive sectors by 2016.

Finally, the third experiment (SIMHEA) introduces an increase in public spending on health services from 1.6% of GDP in 1998 to 2.6% in 2010 and after. The expected increase in public spending on health sector will raise the long-run TFP level by 21.5% for all sectors by 2016.

For all the experiments described above, two schemas are used:

1. Additional public expenditures related to each experiment will be financed by an endogenous shift in the total public transfers to households (net of direct taxes), henceforth labeled as SIMAGR1, SIMEDU1 and SIM HEA1.

2. Additional public expenditures related to each experiment is financed and by foreign aid, henceforth labeled as SIMAGR2, SIMEDU2 and SIMHEA2.

Appendix Tables 4A to 8A present the results of the six experiments performed.

The simulation of a gradual increase in public spending on the agriculture sector suggests that the overall impact of this policy should be high but smaller than the expected impact of increasing public spending on education or health, as generally reported in the literature. For all the three experiments, the expected benefits should be higher when the additional public expenditures are financed by an additional foreign resources in the form of aid than by reducing direct public transfers (net of direct taxes) to households, which may be achieved through an increase of direct taxes or a reduction in direct transfers.

The first policy simulation (SIMAGR1) provides interesting results. GDP grew by 3.7% per year compared to 3.2% in the baseline scenario. Given the relatively inelastic demand for agricultural commodities, the productivity gains in agriculture tend to reduce the demand for labor in agricultural sectors, with surplus labor moving to other sectors. This explains why this reform mostly benefits urban households in terms of welfare — a gain of 5% relative to their disposable income in 2016 under the baseline scenario, compared to a gain of 2.3% for rural households.

Increasing public expenditures on education (SIMEDU1) provides a higher GDP gains at the economy-wide level with an annual increase by 4% compared to 3.2% in the baseline scenario and 3.7% in SIMAGR1 as result of increase in production growth in all economic sectors by an average yearly rate of 3.6% against only 3% in the baseline scenario and 3.3% in the SIMEDU1 scenario. The effect on household welfare is quite small with less than 1% for both rural and urban households compared to their disposable income in 2016 under the baseline scenario.

This may be explained by the fact that productivity gains in all sectors tend to reduce the demand of labor in all sectors in a first stage, which in turn, affect real wages negatively; and then in a second stage, increases the demand on labor as results of output expansion and cost reduction. The overall result is a more rapid decline in unemployment rates for all segments compared to the baseline scenario. While the macro-economic effects are more beneficial than in the previous scenario, the effect on unemployment rates and poverty levels are less promising. The reason behind such effect on poverty is the high cost of this policy in terms of the public budget expenditures, which have to be financed by a direct transfer from households. The net effects, while positive, are than less than in the previous scenario.

Given the relatively high value of the linkage elasticity between output and expenditures on health through the high improvement of TFP, the results of the last scenario related to a gradual increase in public spending (as a share of GDP) on health sector are more positive. The growth rate of GDP goes from 3.2% per year during the baseline to 4.3% per year in the present simulation. The effect on household welfare is impressive with more 11% increase for rural households and almost 17% for urban households compared to their disposable income in 2016 under the baseline scenario. This improvement of both macroeconomic situation and welfare level of all households may be explained by the higher return of public spending on health. In fact, and compared to the previous simulation related to the increase of public spending on education, this present policy leads to a greater improvement in productivity with fewer public resources (see Appendix Table 8A which provides the cost and the benefit for the three public spending experiments with domestic financing).

While all of the simulation experiments improve the macroeconomic situation of the country through a higher GDP and export growth rates, reduction in the poverty rate remains too low and the number of poor remains too high. This is due to the high rate of population growth. The poverty rate at the national level, which runs from 41.8% in 1998 to 29.2% in 2016 in the baseline scenario, higher declines are observed in the experiment related to increasing public spending on health sector as a result of the higher return rate of this category of investment (reflected by higher increase of TFP with fewer resources). For this policy of public spending, the poverty rate reaches the level of 20.2% in the case of additional foreign aid as schema of financing the additional public expenditures (SIMHEA2) to 21.6% in the option where the additional public expenditures are financed locally through a shift in direct government transfers to households (SIMHEA1).

Poverty reduction is much higher in the urban than rural areas. The poverty incidence in urban areas is projected to reach the rate of 8.3% and 9.4% in rural areas (according to the schema of financing additional public spending, SIMHEA1 or SIMHEA2) in 2016 in comparison to 14.3% during the baseline scenario. In contrast, the poverty rate in rural areas will pass from 29.6% in 2016 in the baseline scenario to 30.9% and 29.4% respectively according the sources of financing the additional public spending**.**

In a nutshell, Appendix Table 7A presents the results of the six experiments along with the baseline scenario showing the changes in the poverty incidence and the number of poor at both the national and regional levels in both rural and urban areas.

7. Conclusion

This paper has provided evidence suggesting that the structure of public spending is an important factor of economic growth and poverty reduction. Results show that greater benefits in terms of economic growth and poverty reduction may be expected with targeted public spending to both rural and urban areas. In this respect, increasing public spending in education and health could generate more benefit for the country than focusing only on the agriculture sector.

The very large estimated effects of additional targeted public spending may be surprising but as explained by Lopez (2004), these estimates are highly consistent with most of previous studies. Firstly, the literature reports extremely large rates of return to many forms of public goods including R&D, education, health care, some infrastructure and others. Furthermore studies that have performed analyses over time generally report that the rates of return show no tendency to decline over time. Moreover, recent surveys of the literature on the determinants of economic growth and the role of public spending find an amazing degree of consensus on the estimated rates of return.

In the case of Yemen, results of experiments show that more targeting public spending towards improving health and education services generates more economic growth thereby reducing poverty level. In any case, the road appears to be still long for Yemen to be able to achieve the MDG target in terms of poverty reduction. Re-allocating public expenditures from defense to these key sectors for example, appears to be the best option to reduce poverty, given the financial constraints facing Yemen. In the current context of terrorism problems, it will be very difficult to convince policy makers to reduce spending on defense and security. Targeting additional resources from international donors seems to be the only option available to increase public spending in the key sectors.

References

Al-Asaly, S.M. 2003. The political economy of economic growth policies: The case of Yemen Republic. Paper prepared for the First GDN Global Research Project on Explaining Growth in Developing Countries.

Ames, B., W. Brown, S. Devarajan and A. Izquierdo. 2001. Macroeconomic policy and poverty reduction. International Monetary Fund and The World Bank, Washington, D.C.

Barro, R.J. 1997. *Determinants of Economic Growth: A Cross-Country Empirical Study*. Cambridge, Mass.: The MIT Press.

Beghin, J., S. Dessus, D. Roland-Holst and D. van der Mensbrugghe. 1996. General Equilibrium modeling of trade and environments. OECD Development Centre Technical Paper No.116. Paris.

Burniaux, N. and J. Oliveira-Martins. 1992. Green: A global model for quantifying the costs of policies to curb CO2 emissions. *OECD Economic Studies* Vol.19: 21-32.

Central Statistical Organization of Yemen. 1999. *General Report on Household Budget Surveys for the Year 1998 in Yemen.* . Ministry of Planning and Development, Yemen.

Chemingui, M. and S. Dessus. 2001. The liberalisation of the Tunisian agriculture and the European Union: A prospective view. In *Towards Arab and Euro-Med Regional Integration.* Edited by S. Dessus, J. Devlin and R. Safadi. OECD Development Centre Seminars, Paris.

Coudouel, A and J. Hentschel. 2000. Poverty data and measurement. In *Poverty Reduction Strategy Sourcebook.* World Bank, Washington D.C. (available at www.worldbank.org/poverty/strategies

Dessus, S. and A. Suwa-Eisenman. 1999. Trade integration with Europe and labor reallocation in the Southern Mediterranean Countries: The case of Egypt. Working Paper Series, OECD Development Centre, Paris.

__________ and __________. 2000. *Regional Integration and Internal Reforms in the Mediterranean Area.* Development Centre Studies, OECD, Paris.

Easterly, W. and R. Levine. 2000. It's not factor accumulation: Stylized facts and growth models. World Bank, Washington D.C.

Gallaway, M., C. McDaniel and D. Rivera. 2000. Long-run industry level of US Armington elasticities. Working Paper No. 2000-09a, United States International Trade Commission, Washington D.C.

International Monetary Fund. 2001. Republic of Yemen: Selected issues. IMF Country Report No. 01/61. Washington D.C.

International Monetary Fund. 2005. The Effects of Removing Subsidies on Diesel on the Yemeni Economy, mimeo, Washington D.C.

_________. 2005. Republic of Yemen: 2004 Article IV consultation. IMF Country Report No. 05/111. Washington D.C.

Khan, Q. and S. Chase. 2003. Yemen and the Millennium Development Goal. Middle East and North Africa Working Paper Series No. 34, The World Bank, Washington, D.C.

Klenow, P. and A.Rodriguez-Clare. 1997. The neoclassical revival in growth economics: Has it gone too far? NBER Macroeconomics Annual 12. London.

Konan, D. and K. Maskus. 1997. A computable general equilibrium analysis of egyptian trade liberalisation scenarios. In *"Regional Partners in Global Markets: Limits and Possibilities of the Euro-Med Agreements".* Edited by A. Galal and B. Hoeckman. Centre for Economic Policy Research and the Egyptian Centre for Economic Studies. London and Cairo.

Lofgren, H. and S. Robinson. 2004. Public spending, growth, and poverty alleviation in Sub-Saharan Africa: A dynamic general equilibrium analysis. Paper prepared for the Seventh Annual Conference on Global Economic Analysis organized by The World Bank and the Center for Global Trade Analysis, Washington, D.C., June 17-19, 2004.

Lopez, R. 2004. Effect of the structure of rural public expenditures on agricultural growth and rural poverty in Latin America. Inter-American Development Bank, Working Paper, Washington, D.C.

Mundlak, Y., D.F. Larson and R. Butzer. 1997. The determinants of agricultural production: A cross country analysis. The World Bank, Mimeo.

Ravallion, M. 1994. Measuring social welfare with and without poverty lines. *American Economic Review* Vol. 84(2): 359-364.

Republic of Yemen. 2002. *Poverty Reduction Strategy Paper* (PRSP): 2003-2005. Sanaa, Yemen.

Rutherford, R., E. Rustrom and D. Tarr. 1997. Morocco's Free Trade Agreement with the EU: A quantitative assessment. *Economic Modeling* Vol. 14, No.9: 237-269.

van de Walle, D. 2002. Poverty and transfers in Yemen. Middle East and North Africa Working Paper Series No. 30, The World Bank, Washington, D.C.

van Eeghen and K. Soman. 1996. Poverty in the Middle East and North Africa. The World Bank, Washington D.C. Mimeo.

World Bank. 2000a. *Measuring Growth in Total Factor Productivity*. PREM Note No.42., Washington D.C.

__________. 2000b. *Yemen Economic Update*. Issue 1: June-September 2000. Washington, D.C.

__________. 2002. *Republic of Yemen — Poverty Update*. Two volumes (Volume I: Main Report and Volume II: Annexes), The World Bank, Report No. 24422-YEM, Washington D.C.

__________. 2004. *World Development Indicators*. The World Bank, Washington, D.C.

Appendix

Table 1A. Aggregate and Sectoral Growth in GDP

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Real GDP (Annual Growth Rate)	..	2	8.3	4.1	2.2	11.6	6	8	6.5	2.7	6.5	4.7	3.6
Real Oil GDP (Annual Growth Rate)	..	-5.7	-15.9	4.3	43.7	20	13	5	3	10	0	..	..
Real GDP *per capita* (Annual Growth Rate)	..	-9.7	4.9	0.7	-1.1	8.6	3.1	5	3.5	-0.1	3.6	1.6	0.5
Real GDP PPP *per capita* (Growth Rate)	..	-8.6	10.8	1.9	5.5	7.5	0.5	2.3	-2.8	3.7	5.7	0.5	0.9
GDP Agriculture (% of Total Real GDP)	24.2	21.3	23	21.4	22.6	20	16.9	16.3	20.3	16.7	14.1	15.3	15.2
GDP Agriculture (Annual Growth Rate)	..	-7.4	19.1	4.4	-3.4	9.6	2.6	8.1	14	1.2	4.6	5.9	3.6
GDP Industry (% of Total Real GDP)	26.8	24.5	22.7	21.8	24	32	41.5	43.2	32.5	42	47.3	42.2	40.4
GDP Industry (Annual Growth Rate)	..	-0.2	-3.9	4.5	13.1	21.2	10.5	7.6	2.7	4.8	-1.8	2.5	1.7
GDP Services (% of Total Real GDP)	49	54.2	54.3	56.8	53.4	48	41.6	40.5	47.2	41.4	38.6	42.5	44.4
GDP Services (Annual Growth Rate)	..	7.8	9.9	3.7	-0.2	7.7	51	8.1	5.4	2.3	12.4	5.3	4.5

Source: World Bank (2004), Al-Asaly (2003) and author's calculations

Table 2A. Macroeconomics Indicators

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Final Expenditures, Saving and Investment													
Final Consumption Expenditures (Share of GDP)	91.2	105.7	106.6	117.2	86.4	85.4	83.9	84.0	88.4	78.4	75.1	81.8	84.0
Final Consumption Expenditures (Annual Growth Rate)	..	21.6	6.1	14.5	-24.7	10.4	4.1	8.1	12.1	-8.9	2.0	14.1	6.3
General Government Final Consumption Expenditure (Share of GDP)	17.5	19.1	19.4	19.1	18.8	14.4	13.1	13.0	14.5	13.4	12.7	13.6	13.9
General Government Final Consumption Expenditure (Annual Growth Rate)	..	14.5	6.8	2.6	0.6	-14.7	-3.1	7.2	18.5	-4.8	0.7	12.3	6.1
Household Final Consumption Expenditure, Etc. (Share of GDP)	73.8	86.6	87.2	98.2	67.6	71.1	70.8	71.0	73.9	65.0	62.4	68.2	70.0
Household Final Consumption Expenditure, Etc. (Annual Growth Rate)	..	23.3	-2.7	15.3	-9.6	18.7	-7.5	5.3	10.9	-9.7	2.1	14.8	4.6
Gross National Saving (Share of GDP)	8.8	-5.7	-6.6	-17.2	13.6	14.6	16.1	16.0	11.6	21.6	24.9	18.2	16.0
Gross National Saving (Annual Growth Rate)		-177.8	47.3	224.0	-201.2	80.3	59.4	19.9	-30.7	152.5	51.4	-22.9	-4.0
Gross Fixed Capital Formation (Share of GDP)	11.9	13.9	19.9	17.5	19.0	20.6	21.3	21.4	31.2	22.8	16.5	16.4	15.8
Gross Fixed Capital Formation (Annual Growth Rate)	..	-4.3	92.3	-8.5	11.2	21.0	9.5	8.4	55.5	-24.9	-22.8	3.9	0.0
Inflation Rate (GDP Deflator, %)	..	17.1	17.4	19.2	25.8	50.7	35.9	11.8	-10.1	31.9	22.9	1.0	5.2
External Sector													
Exports (Share of GDP)	14.3	13.7	21.5	27.4	51.2	50.7	42.3	35.8	26.6	35.6	42.6	37.1	37.9
Exports (Annual Growth Rate)	..	-1.8	69.1	33.0	90.9	10.5	-11.7	-8.6	-20.9	37.8	27.3	-8.8	5.9
Imports (Share of GDP)	20.1	35.6	50.5	64.9	58.7	58.0	49.2	44.5	47.2	38.0	35.0	36.1	38.6
Imports (Annual Growth Rate)	..	80.7	53.7	33.8	-7.7	10.4	-10.2	-2.4	13.1	-17.2	-2.0	8.1	10.5
Current Account (Share of GDP)	15.3	-13.0	-18.8	-25.5	6.6	4.3	1.8	0.3	-5.0	7.4	14.2	7.0	5.4
Foreign Direct Investment, Net Inflows (% of GDP)	-2.7	5.6	12.5	18.4	0.4	-5.1	-1.0	-2.0	-3.5	-4.1	0.1	1.6	1.1
Trade (% of GDP)	34.4	49.3	71.9	92.3	109.9	108.8	91.4	80.2	73.8	73.7	77.6	73.2	76.5
External Balance on Goods and Services (Share of GDP)	-5.8	-21.8	-29.0	-37.5	-7.4	-7.3	-6.9	-8.7	-20.6	-2.4	7.6	0.9	-0.6

Source: World Bank (2004) and author's calculations

Table 3A. Yemeni Macro SAM, 1998 (YR million)

	Activities	Commodities	Factors	House-holds	Govern-ment	Indirect Taxes	Taxes on incomes and profits	Savings-Investment	Tariffs	Rest of World	Total
Activities		1247249.2									1475269.5
Commodities	734646.2			592491.0	45396.0			310946.7		228020.3	1683479.9
Factors	714407.6				96751.0						811158.6
Households			625559.4		18680.0					154869.9	799109.3
Government			117772			26215.7	54441.1		31036.3	48165.4	277630.5
Indirect Taxes Net of Subsidies	26215.7										26215.7
Taxes on Income and Profit				54441.1							54441.1
Savings-Investment				152177.2	116803.5					41966.0	310946.7
Tariffs		31036.3									31036.3
Rest of World		405194.4	67827.2								473021.6
Total	1475269.5	1683479.9	811158.6	799109.3	277630.5	26215.7	54441.1	310946.7	31036.3	473021.6	

Source: Author's estimation
N.B. Data are rounded to one decimal point.

Table 4A. Macroeconomic Results

Real Gross Domestic Product	BASE	SIMAGR 1	SIMAGR 2	SIMEDU 1	SIMEDU 2	SIMHEA 1	SIMHEA 2
	3.2	3.7	3.7	4.0	4.3	4.3	4.4
Total Production	3.0	3.3	3.3	3.6	3.9	3.9	4.0
Private Consumption	2.7	2.9	3.0	2.7	3.5	3.4	3.6
Real Urban Available Income	5.0	5.3	5.4	5.1	6.2	6.0	6.2
Real Rural Available Income	1.4	1.6	1.6	1.5	2.2	2.1	2.3
Investment	0.6	0.8	0.9	0.5	1.0	0.9	1.0
Exports	2.1	2.9	2.9	2.8	3.4	3.3	3.5
Imports	1.3	1.8	1.8	1.7	2.1	2.1	2.2
Government Revenue	-1.0	-0.6	-1.0	0.7	-1.3	-0.7	-1.3
GDP deflator	-0.9	-0.7	-0.7	-1.0	-0.9	-0.9	-0.9

N.B. Macroeconomic aggregates are expressed in annual percentage changes during the period 1998-2016 compared to 1998.

Table 5A. Changes in Real Wages by Segment and Simulation

	BASE	SIMAGR 1	SIMAGR 2	SIMEDU 1	SIMEDU 2	SIMHEA 1	SIMHEA 2
R.USK Workers in the Public Sector	-5.8	-5.8	-5.8	-6.0	-6.1	-6.1	-6.1
R.SKL Workers in the Public Sector	-5.8	-5.8	-5.8	-6.0	-6.1	-6.1	-6.1
R.USK Workers in the Private Sector	-1.1	0.7	0.6	-0.6	-0.3	-0.3	-0.2
R.SKL Workers in the Private Sector	-2.8	-2.6	-2.6	-2.2	-2.5	-2.4	-2.5
U.USK Workers in the public sector	-5.8	-5.8	-5.8	-6.0	-6.1	-6.1	-6.1
U.SKL Workers in the Public Sector	-5.8	-5.8	-5.8	-6.0	-6.1	-6.1	-6.1
U.USK Workers in the Private Sector	-1.3	-0.2	-0.2	-0.9	-0.7	-0.7	-0.6
U.SKL Workers in the Private Sector	-3.0	-2.9	-2.9	-2.6	-2.8	-2.7	-2.8

Notes: Real wages are expressed in percentage changes compared to the base year.
R: Rural
U: Urban
SKL: Skilled
USK: Unskilled

Table 6A. Trend in Unemployment Rates by Skill and Areas and Simulation

	BASE	SIMAGR 1	SIMAGR 2	SIMEDU 1	SIMEDU 2	SIMHEA 1	SIMHEA 2
Rural Unskilled	0.0	0.2	0.2	-0.4	-0.4	-0.5	-0.5
Rural Skilled	-6.9	-10.7	-9.2	-9.0	-13.7	-29.5	-14.5
Urban Unskilled	-0.3	-0.8	-0.7	-0.6	-0.7	-0.7	-0.8
Urban Skilled	-1.9	-2.5	-2.3	-3.2	-2.6	-2.9	-2.7

Table 7A. Poverty Incidence and Number of Poor in 2016 by Simulation

	BASE 1998	BASE 2016	SIMAGR 1	SIMAGR 2	SIMEDU 1	SIMEDU 2	SIMHEA 1	SIMHEA 2
Poverty Incidence (P0) National Level Urban Areas Rural Areas		29.2 14.3 29.6	26.2 12.8 36.4	25.3 12.0 35.5	27.3 14.8 37.0	20.7 8.6 30.0	21.6 9.4 30.9	20.2 8.3 29.4
Changes in number of Poor National Level Urban Areas Rural Areas		1.2 1.3 - 0.5	0.7 0.7 0.7	0.5 0.3 0.6	0.9 1.5 0.8	- 0.6 - 1.5 - 0.4	- 0.4 - 1.0 - 0.2	- 0.7 - 1.7 - 0.5

N.B. * Poverty Incidences are expressed in percentage of total population at the end of the simulation period (2016).
* Number of poor is expressed in annual percentage change compared to the base year.
Dates are rounded to one decimal

Table 8A. Cost/Benefits for each Public Spending Experiments: Domestic Financing

	SIMAGR1	SIMEDU1	SIMHEA1
Cost of the policy (Additional government expenditures required * Total in YR billions * Average per year during the simulation period in YR billions	893.261 49.626	2314.676 128.593	1096.138 60.897
Changes in GDP in 2016 compared to the baseline scenario	+0.5 percentage point	+0.8 percentage point	+1.1 percentage point
Poverty Incidence Changes • National Level • Urban Areas • Rural Areas	-3 percentage point -1.5 percentage point +6.8 percentage point	-1.9 percentage point +0.5 percentage point +7.4 percentage point	-7.6 percentage point -4.9 percentage point +1.3 percentage point
Number of Poor • National Level • Urban Areas • Rural Areas	-0.5 percentage point -0.6 percentage point +1.2 percentage point	-0.3 percentage point +0.2 percentage point +1.3 percentage point	-1.6 percentage point -2.3 percentage point +0.3 percentage point

Chapter Ten

Public Policy and Poverty in the Arab Region: Major Findings and Lessons Learned

Ali Abdel Gadir Ali, Leah Horowitz and Shenggen Fan

The persistence of poverty in the developing world has drawn the attention of policy makers, donors, and international organizations alike over the last decade. The Millennium Development Goals, adopted at the UN Millennium Summit by most of the World's governments, set ambitious goals to be achieved by 2015. The first goal of halving the percentage of poor placed poverty reduction at the center of the global agenda. Many developing country governments have also adopted their own poverty reduction strategies or similar concept papers to outline strategic plans and to earmark financial resources for achieving significant poverty reduction goals.

As national governments and their development partners develop plans for reducing poverty, they require a nuanced understanding of the specific mechanisms through which public policy interventions can contribute to poverty reduction. Indeed, the role of the state and of public policy has been debated for a long time. The general consensus is that public policy designed by the state should maximize economic efficiency by correcting market failures while also ensuring more equity and reducing poverty. Governments can use a diverse set of interventions to achieve these objectives, including trade, price, tax, monetary and spending polices. Among these, public spending is one of the most effective instruments that governments can use to achieve development goals such as economic growth and poverty reduction.

Government spending affects final development objectives through different channels. For example, government investments designed to build human and physical capital –education, infrastructure, technology, and research, for example -- can have a long-term impact on economic growth, and therefore on per capita income and poverty. This type of investment can also contribute to poverty reduction more immediately by increasing demand for intermediate inputs, labor, and other factors of production. Social spending on health, social security, and cash transfers or subsidies often have an immediate impact on poverty and equity through direct income (or in kind) transfers, while contributing less to growth generation. Yet public resources are limited and each expenditure has an opportunity cost. Using empirical evidence to prioritize expenditures that best achieve growth and equity objectives is therefore critical.

Development economists have generated an impressive body of knowledge about the impact of public spending on growth and poverty reduction in many regions. Such studies provide policymakers with the evidence necessary to make difficult choices. But, to date, few studies have examined the effects of government spending policies in Arab countries. The Arab region is economically diverse, and, while international estimates show low poverty rates for the region as a whole, large sub-populations live in poverty or suffer economic vulnerability. Accordingly, this book sought to examine the channels through which public expenditures in Arab countries affect development indicators in both the short- and long-run, and to identify how priorities can be set to maximize the social development impact of limited public resources.

The remainder of this chapter reviews the major findings of the study. After considering the regional-level trends in poverty and public policy in the Arab countries presented in the three overview papers, we highlight the key findings of the five country case studies. We conclude with a discussion of cross-cutting themes and future research directions.

Poverty and Public Policy in the Arab Region

Poverty and inequality are significant public policy problems in the Arab region. Using country-specific poverty lines, Ali estimated the overall head-count ratio for the Arab region at 26.7%, an order of magnitude higher than the international estimates of Chen and Ravallion (2004). This figure more accurately captures the poverty trends observed on the ground over the last decade. The region is also characterized by high income inequality, ranking second to Latin America in the early 1980s, and third in the period from 1986-90. Macroeconomic shocks, such as structural adjustment, trade liberalization, commodity price fluctuations (oil), and/or inflation, appear to negatively impact microeconomic welfare more significantly in this region than others. Since poorer households are less able to insure themselves against such shocks, they are affected disproportionately, which may account for some of the inequality observed.

To combat such problems effectively, policymakers must understand the varying impacts of different policy interventions on poverty outcomes. Solid empirical analysis is necessary for such a task since the final impact of any given public policy on poverty cannot be known a priori; a policy intended to increase the mean income of the population may also change income distribution in either direction. Researchers have experimented with a number of methodological tools to measure the returns to public investment including benefit incidence, labor intensity, regression, and Computable General Equilibrium (CGE) modeling. The authors of Chapters 3 and 4 assessed the impacts of specific public policies on poverty, income distribution, and growth at a regional level using two of these methods: the cross-country regression and CGE modeling.

Laabas and Limam estimated a simultaneous equation model with three endogenous variables, namely growth, inequality, and poverty, for a sample of 77 countries. The results of this study contested the conventional development prescription that the only viable anti-poverty measures are those promoting growth. Rather, the authors found a high elasticity of poverty with respect to income distribution in their sample, so policies aimed at improving income distribution more effectively reduced poverty than policies meant to increase mean consumption and growth. Growth-promoting policies need to be accompanied by equity-enhancing policies in order to effectively reduce poverty. In addition, government expenditure, transfers, and monetary policies that curb inflation reduced poverty. Policies that support basic necessity production, like cereals, also had a large impact on poverty and income distribution – larger, in fact, than transfers. On the other hand, openness, while promoting growth, was found to have a negative impact on poverty and income distribution. Given the conflicting impact of public policies on growth, poverty, and income distribution, policymakers must choose the right mix of policies with care. However, cross-country regression has its limitation in addressing general equilibrium effects of various public spending and in modeling the opportunity costs of raising public resources.

Thus, Computable General Equilibrium (CGE) models provide a powerful tool to help policymakers better understand the tradeoffs between macroeconomic and microeconomic development hinted but not addressed by Laabas and Limam. CGE models are analytical tools that simulate economy-wide dynamics -- they link macroeconomic structure with microeconomic behavior. They have been widely used to simulate both exogenous and policy shocks on the socioeconomic system and to design public policies to mitigate negative impacts.

In Chapter 4, Babiker provided a road map for how poverty analysis could be conducted using a Computable General Equilibrium framework for a typical Arab country. The components of such a framework include: a database known as a Social Accounting Matrix (SAM), a standard CGE model with a method to capture dynamic effects, a methodology for modeling public policies and measuring poverty, and a set of scenarios describing the future policy environment. The key to poverty analysis using CGE models is the availability of a detailed disaggregation of the household sector and the factors account in the SAM. The author reviewed the available data and poverty-related CGE modeling in the Arab region, and concluded that CGE applications to public policy analysis are relatively recent (starting in the early 1990s), with an almost exclusive focus on trade. Often, the lack of appropriate data permitting the construction of SAMs is a major obstacle hindering broader application of CGE models for the assessment of public policy interventions in Arab countries. Nevertheless, a number of countries have made progress updating or constructing SAMs for their economies, or have conducted relatively recent household surveys that may be used for CGE analysis of poverty.

All methodological applications will have context-specific strengths and weaknesses when applied at the country-level. To draw these out further, the next section examines the major findings of the multi-level, multi-method analyses of public policy and poverty conducted within five Arab countries.

Major Findings from Country Case Studies

Case studies were presented for Egypt, Morocco, Sudan, Tunisia, and Yemen. The case countries were selected to reflect some of the diversity of the region: they represent different stages of development and differing types of economies, poverty rates, and reliance on the rural and agricultural sectors. At the same time, the five countries make up half of the Diversified Economies or Primary Export Economies in the region. Poverty is expected to pose a development problem in all of the Arab countries with these types of economies.

Egypt

Fan, Al-Riffai, El-Said, Yu, and Kamaly presented the case study on Egypt in Chapter 5. Following a structural adjustment program in the early 1990s, Egypt enjoyed rapid economic growth, with GDP increasing by 4.6% per annum between 1994 and 2004. Nevertheless, poverty remains a significant problem in Egypt today. The national poverty rate was 16.7% in 2000, but poverty was much worse in upper Egypt and rural areas, where many depend on agriculture for their livelihood. Moreover, Egypt still lags behind many middle-income countries in key social indicators. Fortunately, the Egyptian government views public spending as an important instrument for achieving economic growth and equity goals; it has increased investments in transportation and communications infrastructure, education, health, and agriculture since 1980. Historically, a substantial proportion of government spending has also been in the form of expensive universal subsidy programs, which have proved politically difficult to reform. As Egypt pursues macroeconomic adjustments in relation to its limited – even declining – public resources, it is critical to analyze the relative contributions of various expenditures to growth and poverty reduction in order to improve allocative efficiency.

The authors used both econometric analyses and CGE modeling at the household, sector/regional, and macro level to assess the effects of various types of government spending on growth and poverty reduction and the trade-offs between these two goals. They relied on data from the 1997 Egypt Integrated Household Survey, as well as data from different governorates for the period 1980-2000 and the 1997 SAM for Egypt. The chapter confirmed results from earlier studies finding that universal subsidies are inefficient. Universal subsidies usually achieve their intended goals at a much higher cost than a targeted approach. Targeted social safety nets reduce the fiscal burden and free funds for uses that promote growth and alleviate poverty. Saved government resources can be reallocated toward more productive investments in human capital, infrastructure, and agricultural technology. They are also more equitable, which is of significant importance in the case of Egypt because the existing subsidy program has long been biased toward the higher quintiles. Among all types of targeted programs, direct income transfers, as well as transfers targeted to the aged, women, and children deserve special attention.

Among productive investments, investing in human capital and infrastructure, particularly in rural Egypt, offers the highest return in terms of both economic growth and poverty reduction. Regionally, investment in Upper Egypt would lead to larger poverty reductions because poor people are concentrated there. Investing in agriculture is potentially pro-poor and can contribute to long-term national food security. However, because current trade policy isolates the domestic market and the domestic demand for food is inelastic, increased agricultural production linked to productivity improvements drives down the domestic prices of agricultural goods. As agricultural terms of trade deteriorate under an autarky economy, most of the benefits from agriculture investment are reaped by urban consumers, and the majority of the rural population, as net producers, may suffer. Investing in Egyptian agriculture and rural areas is a must to lift the rural poor out of poverty, but securing market access for increased agricultural exports is a pre-condition for this to happen.

Morocco

Abdelkhalek and Rockmore presented the case study on Morocco in Chapter 6. Morocco's structural adjustment program and free trade agreements with the U.S. and EU led to significant improvements in macroeconomic indicators since the early 1980s. Yet despite the health of the economy, it has grown only slowly – not enough to reduce unemployment, which nears 20% in urban areas. Poverty also increased between 1990 and 2000. In that year a considerable 17.8% of the population fell below the poverty line, with a wide rural-urban spread (28.2% vs. 9.6%). Low nominal growth was the leading cause of this increase in poverty. In addition, Moroccan society is characterized by a high degree of inequality in both consumer expenditure and access to infrastructure and other public resources. Part of the accumulated deficits in basic infrastructure can be explained by the structure of government revenue flows. The investment component of the Moroccan budget has generally fluctuated during periods of economic decline, since other budgetary expenses, namely public sector wages and debt servicing, are more fixed. Urban bias in public expenditure has also contributed. At the same time, the government has expanded "priority" social expenditure over the past decade.

The authors used economic and statistical optimization approaches to examine the impact of public policies on the evolution of both household and regional poverty in Morocco. They relied mainly on the 1998/99 National Survey of Household Living Standards (ENNVM). Both socio-demographic and public policy variables affect household well-being in Morocco. In urban areas, a male head of household, a low dependency ratio, employment outside of the home, education, electricity, telephone ownership, and access to water all decrease the likelihood of poverty. In rural areas, policies increasing access to land, infrastructure, and services may decrease poverty, as access to drinking water, owning a telephone, and the area of owned land all increase the rural standard of living. Due to data gaps and unreliability, the results of the regional analysis were only suggestive. However, they showed that poverty eradication requires that a reduction in inequality be paired with economic growth. When growth occurs alone, poverty rates actually increased. At the same time, the reduction of inequality at the regional level is more difficult to achieve than the reduction of poverty. With this objective in mind it is useful to note that increased industrial production decreases inequality while population density and per capita government expenditures that disproportionately favor the non-poor increase inequality.

Sudan

Chapter 6, authored by Mahran, presented the case study on Sudan. Sudan is emerging out of a long conflict, the reality of which has taken a severe toll on poverty and public investment trends. While real GDP has registered an impressive growth rate of 10.2% between 1990 and 2002, poverty rates are abysmal. Over 90 percent of Sudanese people live in poverty, in both urban and rural areas – one of the highest poverty rates in the world. Adverse weather, weak world agricultural prices, and chronic instability contribute to the extreme poverty. More than half of the workforce is employed in agriculture, which contributed 35% of GDP, but most farms remain rain-fed and susceptible to drought. Moreover, public policy before 1992 exploited the agriculture sector to fund industrial development. In addition, the escalation of the civil war in the south has led to a reduction in foreign aid and a significant increase in the resources devoted to war, at the expense of productive investments. These developments have frustrated previous concerted efforts made to move the economy onto a sustained growth path. The relative economic stability that Sudan has witnessed in recent years has come largely from the advent of oil in the late 1990s.

In light of this endemic poverty, Mahran used a two stage regression approach to identify the most promising public policy and policy-related tools for accelerated poverty reduction in Sudan. In the first stage, province-level data compiled from the 1996 Manpower and Labor Force Survey was used to examine the determinants of poverty (i.e. average income and distribution); in the second stage national-level data compiled from the Bank of Sudan Annual Reports was used to examine the impact of public policy on poverty determinants (i.e. real per capita income). Based on his analysis, the author concluded that policymakers should give more attention to opening the economy for investment, with an emphasis on industry. The emerging oil sector as well as agro-based industry could play instrumental roles in poverty alleviation efforts, if supported with adequate and reliable infrastructure. In addition, like Morocco, Sudan's poverty indices are more responsive to inequality than economic growth. For this reason, public policies geared toward poverty reduction should focus more on improving income distribution. Past income inequality was caused in large part by skyrocketing inflation related to scarcity and production rigidities, so anti-inflationary fiscal policy as well as the reallocation of resources toward productive activities seem to be important to combating inflation. Finally, a number of institutions that help in poverty alleviation could be consolidated.

Tunisia

Bibi and Chatti considered the case of Tunisia in Chapter 7. Since its independence from French rule in 1956, Tunisia has enjoyed a very successful development trajectory with strong progress in human development. Tunisia's leaders generated broad prosperity by investing in basic education and health services, as well as an effective social security system based on direct transfers to the needy and consumer food subsidies. Since 1995, Tunisia has gradually removed barriers to trade with the EU; Using trade and economic growth to widen people's choices was a primary objective. Today, extreme poverty is no longer a very serious problem in Tunisia, which boasts a poverty rate of about 4.7%.[1] However, economic vulnerability remains an important concern. Nearly 40% of the rural population and 15% of the urban population fall within 200% of the lower poverty line. Agricultural production fluctuations, due to variability in rainfall, account for a major share of rural vulnerability and GDP growth volatility, but with the increased diversification of the economy, this effect has been declining.

The authors conducted a multi-level analysis at the household, regional, and economy-wide scales to capture the likely effects of various types of public expenditure on growth, inequality, and poverty. They drew data from the official publications of the *Institut National de la Statistique*, a

[1] Based on 2000 data.

1990 household survey, and governorate data from the period 1980-2000.

The results of this study highlighted the trade-offs that exist between policies that lessen poverty in the short-run and those that operate over the long-term. Investments in infrastructure and human capital amplify the positive impacts of growth on the poor, and should thus have a high priority in terms of economic growth. But would the removal of food subsidies to enhance public spending on these be wise? Policies that increase the purchasing power of the poor appear to be more effective in reducing poverty in the short-run than infrastructure, human capital investment, or trade liberalization. Yet, in the long-run, the latter investments accelerate income growth over all segments of the population. Thus, it seems that safety net policies are needed in the short-run to smooth the negative impact of the policy changes that enhance economic growth in the long-run. Conditional cash transfers may be the most effective of such safety net policies. Proxy means tests are also shown to be more effective than targeting by commodities. In this regard, this study conforms to the results from Egypt finding that targeting subsidies greatly improves the allocation of scarce resources.

Yemen

Chemingui presented the final case study, on Yemen, in Chapter 8. Yemen is among the poorest countries in the world, with a GDP per capita of US$460. Nearly half of the population lives in poverty. While it has enjoyed reasonably strong economic growth since implementing a structural adjustment program under the IMF in 1995, high rates of population growth have eroded any progress at a per capita level. Following a minor discovery of oil in the south, the share of oil and gas in the economy has increased from 13% to 34% of GDP between 1995 and 2000, while agriculture dropped from 24% to 15% during the same period. Nonetheless, three-quarters of the population is still employed in agriculture or herding. The Yemeni government has shown a recent interest in social sector spending – total public spending in social sectors increased from 41% to 50% of total spending between 1991 and 2001. However, oil and gas revenues account for almost 90% of government revenues, which creates a boom-bust cycle in public finances. The government's ability to finance investments and essential services fluctuates greatly. The government phased out its universal food subsidy in 1999, replacing it with a targeted cash transfer program.

Using data from Yemen's Social Accounting Matrix for 1998, Chemingui built a dynamic-recursive CGE model for Yemen, solved for the period 1998-2016. He compared alternate policy scenarios to assess the impact on economic growth and poverty reduction of increased public spending in the priority areas of agriculture, education, and health. The results of this study highlight the complex channels through which government expenditure conditions an economy for growth and poverty alleviation.

Human capital investments in health and education services are shown to generate more economic growth than investment in agriculture under normal simulation assumptions, a finding which differs from previous studies on returns to public investment. However, if one assumes that health and education spending does not improve productivity in the oil sector because it is a more capital- than labor-intensive sector, then spending on agriculture infrastructure generates the highest return in terms of economic growth, and thus poverty reduction. These results also demonstrate that expenditure priorities are highly country specific, since the differences in this study compared to those conducted by Lofgren or Fan might be explained by the importance of the oil sector in the Yemeni economy.

Lessons Learned

This section draws out some of the cross-cutting themes observed in the work summarized above.

1. *There is no one-size-fits-all solution*

The sample of case study countries varies widely on such variables as poverty rates, public spending, political stability, openness to trade, and agricultural workforce, partially because they were selected to capture this variation, but more so because the Arab region as a whole is home to a great diversity of economic and political systems. With such diversity, it is ill-advised to seek generalizable development strategies. It has been argued here that public spending is one of the most important tools that governments have at their disposal to promote development and reduce poverty in their countries, almost universally. But the most effective ways to spend public resources will necessarily vary from country to country. The country-level case studies in this book provided important insight into the specific contexts that shape the channels through which public spending facilitates economic growth and poverty reduction. Continuing this type of work, while building the capacity of local researchers and policy advisors to use such tools as CGE modeling will be invaluable to national governments as they pursue poverty reduction goals and strategies.

2. *Agricultural growth is crucial to lift the rural poor out of poverty*

Poverty is largely a rural phenomenon in Arab countries. In all five of the case study countries, rural poverty rates were markedly higher than those found in urban areas. Because the poor are concentrated in rural areas, where the majority of people depend on agriculture either directly or indirectly for their livelihoods, agricultural spending is one of the most important government instruments for promoting economic growth and alleviating poverty in the region. Targeting government expenditure in rural areas can also make up for long-standing urban and industrial expenditure bias that diminished rural people's access to basic infrastructure and government services in countries like Morocco and Sudan. Agricultural growth may also contribute to poverty reduction in urban areas by lowering food prices for urban residents.

Yet, even within agriculture, there is a wide array of interventions and expenditure categories that must be prioritized. Past studies have found productive investment in the agricultural sector to have a much greater poverty alleviation effect than non-productive investments, such as fertilizer or electricity subsidies. This point is particularly true for agricultural research and development. Agriculture in many Arab countries remains rain-fed and prone to fluctuations from drought, so irrigation may be another priority. Countries in the region should follow Egypt's example of investing heavily in agricultural research centers, as well as in the provision of irrigation and drainage.

At the same time, policy makers must develop agricultural policies that take into account specific national contexts. The case of Egypt is again instructive in this respect. Because of the structure of domestic demand, agriculture spending aimed at increasing agricultural productivity in that country would actually be detrimental to the rural poor unless measures were first taken to increase their access to new markets. Proper sequencing is essential.

3. *Broader types of investment in human and physical capital are also needed*

Many countries do need to increase their spending in the agriculture sector, but not in isolation. Arab countries seek broad based growth and this requires investing in human and physical capital such as infrastructure, education, and health. Well-developed and reliable infrastructure is necessary to fully exploit the forward and backward linkages between agriculture and other sectors of the economy so some rural expenditure should be targeted in this area.

Low educational attainment and/or illiteracy of the household head were predictive factors of household-level poverty in every case. Human capital investments, in education, but also in health, improve individuals' abilities to climb out of poverty. They also improve the labor productivity of society in a more aggregate sense, which can generate more rapid economic growth. Moreover, as agriculture declines as a share of economic activity in every country, investing in health and education may actually bring greater returns in terms of poverty reduction over time than investing in agriculture, since the gains to these investments are spread over all sectors of the economy. Yemen may be one example of such a trend. It is important to note that government expenditures on basic education in developing countries have been found to be more pro-poor than investment in tertiary educational institutions, such as universities, which generally favor the better-off.

4. *Targeted transfers are efficient ways to aid the extreme poor or vulnerable*

While the countries on the whole boast fairly low poverty rates for a developing region, a number of sub-regions or sub-populations in Arab countries are unable to access the growth process, and persist in extreme poverty. Targeting government policies and expenditures more closely to the needs of these populations is both more effective and less costly than universal subsidies.

Consumer subsidies, especially for food and fuel, have been a popular policy tool in Arab countries over the past several decades. However, a large percentage of this type of spending benefits the well-off at the expense of the poor. Despite the underlying social objectives of such programs, on balance, they often cannot be considered pro-poor spending policy. On the other hand, either subsidies or direct cash transfers that are targeted through means tests, proxy means tests, geographical or gender considerations, or in other ways can achieve the intended goals at a lower cost. Saved government resources can be reallocated toward more productive investments in human capital, infrastructure, and agricultural technology.

Also, many Arab countries, such as Morocco and Tunisia, are in the process of opening their markets to international trade. While trade liberalization may have long-term growth benefits, increased openness will undoubtedly increase the vulnerability of some populations in Arab countries. Targeted transfers can smooth the short-run negative impact of policy changes that enhance economic growth in the long-run and ensure that Arab societies share broadly the prosperity from growth.

5. *Diminishing persistent inequality is a difficult but important component of poverty alleviation*

Inequality in income distribution and consumption expenditure is a persistent characteristic of most Arab countries and a large factor in the poverty problem in many of them. High elasticities of poverty with respect to income distribution in many countries suggest that growth-promoting policies need to be accompanied by equity-enhancing policies in order to effectively reduce poverty. This may be a difficult task to accomplish. In the Moroccan case, it was actually easier to reduce poverty than income inequality at the regional level. But taking measures to decrease inequality can be seen as a win-win solution for policymakers. While decreasing inequality is an important objective in itself, it is also good for growth because it allows poor people to participate in the growth process and to demand more of the economy's goods and services. Policies that have been shown to increase equity include anti-inflationary fiscal policy, investment in human and physical assets for the poor, policies that enable the poor to participate effectively in the labor markets, and social safety nets (transfers) for the extremely poor and vulnerable.

Knowledge Gaps and Future Research Directions

The existing literature on public spending and poverty reduction is rich, and this book adds a much needed perspective on the topic for the Arab region. However, much remains unknown. The following discussion points out a few potential research areas that would enrich the study of public policy and poverty reduction in Arab countries, and in the developing world more broadly.

(1) Arab countries must prioritize the systematic compilation of public investment data. Various international agencies such as the World Bank, FAO, and IMF have made efforts to help developing countries establish national statistical systems to collect, monitor, and present development indicators related to agriculture production and inputs, income, employment, wages, and poverty. But these efforts seldom include rural infrastructure, technology, education, and related government investment. There is also a lack of gender-disaggregated data. Without such information, it is difficult to comprehensively assess the impacts of government intervention on growth and poverty reduction. In addition, wherever possible, countries should invest in the development of current Social Accounting Matrices (SAMs) to enable economy-wide analyses that accurately estimate the overall impact of public investment on poverty. Obviously, data collection in situations of political instability and war such as in Sudan involves a more complex set of issues.

(2) Analysis of the political and institutional contexts in which public investment is allocated and disbursed is essential to understanding the final impacts of public policy on poverty. While policymakers may believe the evidence presented to them by researchers on the best uses of public resources, political realities may dictate a different outcome. In particular, research on how to overcome historical urban biases in investment as well as how to reform public institutions by improving incentives, accountability, and management would be valuable.

More generally, studying a region's development in isolation from its larger political context does not necessarily yield fruitful results. High poverty rates are not the reason that the Arab region appears daily on the front page of major western newspapers. As the United Nations report on progress towards the MDGs noted, "war and conflict in the region continue to destroy resources and the social fabric of society while diverting Government budgets toward military expenditure (UNDP, 2005)." Acknowledging the geopolitical security concerns that many governments in the region are grappling with would bring an important perspective to the study of social welfare.

(3) Research needs to be done on the political economy of devolution and decentralization of power in infrastructure provision and problems of common property rights. In addition, the theories implicit in new institutional economics suggest that pricing policies and subsidies in infrastructure expenditure need further research. The potential of trans-boundary, regional cooperation in the provision of infrastructure for transport, energy, and water management would be a fruitful area for future investigation.

(4) High unemployment coupled with rapid labor force growth, especially among the young, educated, and women, is widely considered one of the most pressing challenges facing countries in the years to come. Conducting public expenditure analyses that explicitly consider employment as a primary outcome variable would be highly valuable in this context.

(5) Finally, gender-sensitive analysis may yield important insights into the study of poverty reduction in the Arab region. Many of the Arab countries are Muslim societies where the empowerment and rights of women vary to a great degree. Evidence suggests that gender discrimination leads to less rapid economic growth and poverty reduction than that found in more equitable societies.[2] Public policy may be key to enhancing women's social standing, access to resources, and power in important economic sectors such as agriculture, but understanding the nuances of this will require sensitive, country-specific investigation.

[2] See King and Mason (2001), and UNDP (2006) for discussion.

Literature Cited

Chen, Shaoshua and Martin Ravallion. (2004) How Have the World's Poorest Fared since the Early 1980s? *The World Bank Research Observer* 19(2):141-169.

King, Elizabeth and Andrew Mason. (2001) *Engendering Development through Gender Equality in Rights, Resources, and Voice.* World Bank Policy Research Report No. 21776. Washington D.C.: World Bank Development Research Group

United Nations. (2005) *The Millennium Development Goals in the Arab Region 2005.* Available on the web at: http://www.rbas.undp.org/mdg_arab.shtml

United Nations Development Programme. (2006) *Arab Human Development Report: Towards the Rise of Women in the Arab World.* New York: United Nations Development Programme.