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Including Women in the Policy Responses to High Oil Prices

A Case Study of South Africa

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Contents

Tables

Figures

ABSTRACT

The recent surge in oil prices has created concern about its impacts on poor people in South Africa. The strong economic performance recorded over the period 1995-05 has not contributed to a substantial reduction in poverty in this country, particularly among women that tend to be overrepresented among poor households. Government management of an oil shock is important in reducing its adverse impacts in oil-importing countries. Thus, this study examines alternative policy responses to the recent high oil prices through a gender lens in South Africa. A multisector general equilibrium framework is developed to account for the energy specificities of the economy and its relationship with nonenergy sectors. In addition, male and female supplies of labor and the households' demand for energy and nonenergy commodities are explored through a careful modeling of the household economy along with the market economy. The simulation scenarios combine increases in world prices of crude oil, petroleum products, and coal with various fiscal policy responses. Under the floating prices scenario, gross domestic product (GDP) falls compared to the baseline value driven by the inflationary effect of high energy prices and the exchange rate depreciation. Labor earnings also fall, while the gap between male and female earnings widens. The low participation of women compared to men in nonoil energy and export-oriented industries increases their vulnerability to the oil price shock. The gender employment gap also increases under the fixed petroleum price scenarios regardless of the tax-financing option. Further, fiscal policy responses are explored through the broadening of price supports to all commodities and all industries financed by an additional tax on household revenue. A government subsidy to businesses under the oil price shock shows the highest multiplier effect—higher GDP and labor earning effects—but the gap in male and female employment does not change significantly compared with that in the floating and set price scenarios. The government subsidy to businesses is decomposed by type of industry to further explore its gender employment impact. Simulation results indicate that the gender employment gap improves when the subsidy is allocated to high female-employing industries. On the other hand, providing a subsidy to industries that easily substitute capital–energy technology with low-skilled work gives the best GDP outcome. Therefore, this study shows that fiscal policy can help ensure equitable growth when an economy faces a serious challenge, such as a surge in world oil prices. This indicates that supporting industries that easily substitute the capital–energy factor and female-dominated, low-skilled work is the most efficient and gender-equitable fiscal response to high oil prices in South Africa. Given the small differences in GDP and employment results between the fiscal response scenarios with and without a focus on gender equity, the cost of investing in gender equality appears to be small.

Keywords: crude oil, petroleum, price shock, gender, fiscal policy, general equilibrium, household economy, domestic work, time allocation

ABBREVIATIONS AND ACRONYMS

BFP	basic fuels prices
CAB	current account balance
CES	constant elasticity of substitution
CGE	computable general equilibrium
COICOP	Classification of Individual Consumption by Purpose
FDI	foreign direct investment
FSIM	financial services indirectly measured
GDP	gross domestic product
ICATUS	International Classification of Activities for Time Use Statistics
IES	income and expenditure survey
LES	linear expenditure system
LPG	liquefied petroleum gas
NA	national account
OECD	Organization for Economic Co-operation and Development
SNA	System of National Accounts
TFC	total final consumption
TPES	total primary energy supply
TUS	Time Use Survey

1. INTRODUCTION

The recent surge in oil prices has created widespread concern about its impacts on economic growth and on poor people in developing countries. Analysts have pointed out that higher oil prices are inevitable, and it is unlikely that prices will be reduced in the long term without sufficient sources of oil or alternative energy sources.

The international prices of crude oil have been increasing since 2003 and have been highly volatile in recent years. Prices hit an all-time record in mid-2008, becoming nearly three times more expensive than the price prevailing two years before. Moreover, the prices of major oil products–gasoline, heating oil, liquefied petroleum gas (LPG), and jet fuel–have recorded significant price increases with even more volatility than crude oil prices. It is unlikely that economies highly dependent on oil would withstand sudden and important increases in oil prices.

Indeed, oil price is an important determinant of economic performance. The impact of high oil prices depends on whether the country is a net importer or net exporter of oil. An increase in oil prices leads to a transfer of income from net importing countries to net exporting countries. In net importing countries, it lowers the exchange rate, raises inflation and unemployment, and results in lesser real output. The magnitude of the impact depends on the vulnerability of the economy to high oil prices and the ability of the economy to adjust to the shock in the short, medium, and long runs. It also depends on the government's management of the shock.

Because oil is such a basic component of manufacturing, flotation of oil prices will directly affect the whole economy, employment and income distribution and ultimately consumption. The pass-through of high oil prices to inflation will impact on oil-dependent businesses because their costs will increase substantially. Higher oil prices also increase the cost of oil products consumed by households and, therefore, reduce their purchasing power.

On the other hand, government subsidies to oil prices distort the real market signal, which no longer reflects real costs. Subsidizing oil products sends the wrong message to consumers who are in fact encouraged to use more of these products. Even if it might be beneficial to competitiveness and the whole economy, subsidizing oil prices raises the risk of increasing the trade deficit with increased oil imports. It may cause higher prices for domestic goods thereby lowering consumption. Consequently, higher inflation will reduce short-term investments and restrict predicted growth in the domestic economy.

Government management of an oil shock can help reduce its adverse impacts in oil-importing countries. But inadequate policies can also worsen its recessionary income and welfare effects. Therefore, it is recognized that quantitative assessment of the impact of high oil prices on economic growth and welfare can largely contribute to design of a coherent government policy response.

This study explores various government responses aimed at minimizing the adverse growth and welfare impacts of soaring oil prices. The analysis is applied to the South African economy, an oil-importing country that experienced the recent oil price shock.

South Africa produces and uses a substantial amount of energy by international standards. The country is endowed with large reserves of coal, and coal is the dominant source of energy. Coal accounts for 72 percent of the country's total primary energy supply. South Africa has very limited oil reserves and thus imports crude oil for refining. Almost 95 percent of all crude oil used in the country is imported, and oil imports were the single largest import category even before the start of the oil crisis. Crude oil accounts for 22 percent of the total primary energy supply.

Wakeford (2006) argues that the diversification of the South African economy from minerals, particularly gold, to manufacturing and services may mean that the economy cannot buffer itself from oil crises as much as it did in the past.[1] The author argues that the weakening of the rand, social ills such as poverty, and the dependence of the economy on oil imports contributes to the country's increasing

[1]The 1973–74 oil shock resulted in an increase of the price of gold, which provided a temporary buffer for South Africa. This increase in gold prices initially raised the overall terms of trade, although the rising import bill later led to a deterioration of the terms of trade by 1975 (Wakeford 2006).

vulnerability to oil crises. Moreover, analysts are unanimous in that the government management of the oil price shock will have significant repercussions on the economy and welfare.

The strong economic performance recorded over the period 1995-2005 has not contributed to a substantial reduction in poverty in the country.[2] The Gini coefficient remained at a consistently high level and within-race inequality increased.[3] More than half of the population was below the poverty line in 2000 (Cockburn et al. 2007). Further, two-thirds of female-headed households were below the poverty line, compared with less than half of the male-headed households in 2000, and women tended to be overrepresented among poor households, according to the study by Cockburn et al. (2007). Unemployment increased as a result of insufficient economic growth, and the growing cost of labor relative to capital. Unemployment rates remained higher among women than men, particularly in urban areas (Cockburn et al. 2007). Women earned less than men in formal sector employment with a 65 to 95 percent wage gap (Valodia 1996). Further, women's participation in the labor force was 38 percent in 2000, although they represented more than half of the population.[4] Cockburn et al. (2007) point out that discrimination against women in education and training during the apartheid period contributed to the gender segregation in the South African labor market.[5]

Thus, this study aims to help reduce gender inequalities in South Africa. It examines government responses to surging oil prices with an emphasis on the distributional impact between men and women.

The remainder of the paper is arranged in five sections. The next section presents an energy profile of the South African economy and the government's policy response to the recent oil price shock. Energy supply and demand are analyzed under a gender perspective in Section 3. The method and data used in the analysis are discussed in Section 4. The simulation scenarios and results are presented in Section 5. The paper concludes with the main lessons learned from the analysis and the policy recommendations.

[2]The economic performance of post-apartheid South Africa has been relatively strong, averaging 3.3 percent in real GDP growth and 1.4 percent in per capita terms for the period 1995–2005. This growth trend was an improvement over the previous decade (1985–94) with respective average rates of 0.8 and –1.3 percent.

[3]The gap between poor and rich Africans and between poor and rich Whites has been increasing, according to Bhorat et al. (2001).

[4]The female labor force as a percentage of the total labor force moved from 37 percent in 1990 to 38 percent in 2000, according to the statistics published by the World Bank in 2002.

[5]The post-apartheid primary and secondary education enrollment and literacy ratios have significantly improved for women, according to the World Bank's 2004 report on world development.

2. SOUTH AFRICAN ENERGY PROFILE AND POLICY

South Africa's economy is highly energy intensive; that is, the country uses a large quantity of energy per unit of gross domestic product (GDP). Crude oil and oil products are important sources of energy and represented nearly 30 percent of the country's total final consumption (TFC) of energy in 2004 (Table 2.1). Coal and electricity are other important sources of energy and represented 28 and 26 percent, respectively, of the TFC of energy in 2004. As a consequence, the substitution among energy products is an important element of the analysis of high oil prices in South Africa.

Electricity is essentially produced from coal and, more importantly, 36 percent of the demand for liquid fuels is met by South African synthetic fuels plants transforming coal and natural gas into petroleum products.[6] The synthesis of fuels is an important aspect of this analysis.

The transport sector was by far the major user of liquid fuels in 2004 (using 76 percent of the TFC of energy). Thus, it is expected that the recent increase in fuel prices hardly hits the transport sector.

Table 2.1—Total primary energy supply (TPES) and total final consumption (TFC) of energy in South Africa, 2004 (%)

			Final consumption by user				
			Energy use by sector			Non-energy	All
Energy products	TPES	TFC	Industry	Transport	Other sectors	use	use
Coal	72.0	27.9	56.7	0.0	23.8	19.5	100.0
Oil	14.1	29.8	4.4	76.2	13.2	6.2	100.0
Electricity	-0.2	26.0	56.9	3.1	39.9	0.0	100.0
Gas	4.1	1.7	99.4	0.0	0.6	0.0	100.0
Other energy products*	10.0	14.6	17.3	0.0	82.7	0.0	100.0
All	100.0	100.0	36.1	23.5	33.1	7.3	100.0

Source: International Energy Agency (2011).

Note: * Other energy products include: nuclear, hydro, geothermal, solar, and biofuels and water.

The retail prices of major petroleum products do not simply follow the free market forces in South Africa. They are rather set by the government to ensure that energy is available to the poor at affordable prices. However, despite the government control over the pricing system, petroleum prices are closely linked to the world oil and financial market movements.

The prices of petroleum products are driven by external and internal factors. They are linked to the world market through the Basic Fuels Price (BFP) System. The BFP is an import parity pricing system. It is calculated by the cost of fuel that would have been incurred if fuel had been imported from the most effective refineries in the world.[7] The other external factor impacting directly on fuel prices is the exchange rate. External factors are mainly responsible for the monthly movements in domestic prices of petroleum products.[8] The internal factors include government taxes and levies, oil companies' margins, service differential, transport costs, and pump rounding factors. In general, these factors are adjusted on an annual basis and included monthly in the relevant price changes.

The pump price of petrol and diesel are mainly made up of the basic fuel price (about 50 and 60 percent, respectively) and taxes (about 30 percent). Given that paraffin is heavily used by poor households, it is less taxed than other fuels, about 5 percent. Thus, the share of BFP is relatively higher (75 percent) for this product. The remaining items comprise wholesale and retail margins, transport costs, and delivery costs. Therefore, the government already plays an important role in the determination of the prices of fuel and can seek to be more involved in the face of increasing oil prices.

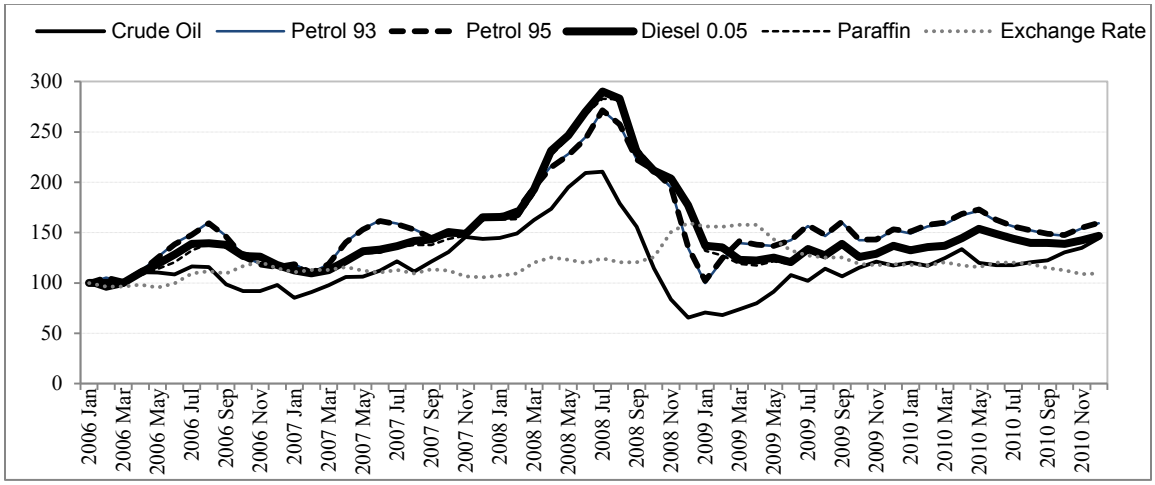
[6]South Africa is the only country that makes fuels from the synthesis of coal.

[7]The BFP system was instituted in April 2003 to replace the old "in bond landed cost".

[8] The retail price of petrol is changed every first Wednesday of the month to take into account movements in international prices and the exchange rate.

Comparison of the 10-year trend of the BFP for major petroleum products and the international prices of crude oil suggests that high oil prices have been passed through to increases in consumers' purchasing prices in South Africa (Figure 2.1 and Table 2.2).

Figure 2.1—Percentage changes in basic fuel prices in South Africa



Source: Department of Energy 2011.
Note: Price index, January 2006=100; Crude Oil, Dated Brent, fob U.K., US Dollars per Barrel.

Table 2.2—Selected macroeconomic variables

	2004	2005	2006	2007	2008	2009
Change in consumer prices (%)	1.4	3.4	4.7	7.1	11.5	7.1
Current Account Balance (share of GDP in %)	-3.0	-3.5	-5.3	-7.0	-7.1	-4.1
Debt (share of GDP in %)	20.5	18.7	21.9	26.3	26.1	28.0
Foreign Direct Investment net flows (US$ million)	-552	5,717	-6,590	2,729	12,140	4,112
Aid flows (US$ million)	629	690	715	807	1,125	1,075
GDP growth rate (%)	4.6	5.3	5.6	5.6	3.6	-1.7

Sources: International Monetary Fund (2011); African Economic Outlook (2011).

The pass-through of high oil prices to increases in consumer prices has heterogeneous effects among sectors and households. The low responsiveness of demand to prices is translated into a higher import bill and ultimately a depreciation of the country's current account balance. The latter increases the inflationary pressure and exacerbates the heterogeneous impact of high oil prices among industries.

An industry's sensitivity to high oil prices can be measured through its oil input cost per unit of value added, also called oil intensity. Oil intensity is computed for the industries recorded in the 2000 South African National Account (NA) tables. To simplify the analysis, the focus is first made on the 10 most intensive oil-input industries among the 95 industries reported in the 2000 NA tables. This group accounts for 11 percent of the total value added and 50 percent of the total oil input expenses (Table 2.3). When the share of oil in the total energy[9] bill is used as an indicator of energy substitution possibility, it appears that most industries of this group have a very limited flexibility to substitute other energies for oil. The average share of oil and oil products cost in the total energy cost is 77 percent. The transport sector is among the intensive oil-input industries with a high share of oil in energy cost. Thus, large-scale fuel substitution is less likely to occur in the transport sector in the short run.

[9]Considering the principal sources of energy in South Africa: coal, petroleum, and electricity.

Table 2.3—Energy profile for high oil input industries (%)

Industry	Share			Oil intensity	Ratio of oil to energy cost
	Value added	Oil cost	All energy cost		
Oil petroleum	1.0	26.7	16.1	149.6	95.6
Fertilizers	0.2	4.2	2.5	107.6	97.2
Primary plastic	0.4	4.0	2.4	56.7	93.8
Synthetic petroleum	0.4	2.0	6.4	26.7	18.4
Basic chemical	0.4	1.7	1.1	26.4	90.0
Paints	0.1	0.6	0.5	23.8	77.7
Pumps	0.1	0.2	0.1	21.8	80.2
Rubber tires	0.1	0.5	0.6	20.4	49.7
Transport services	6.2	21.4	13.9	19.5	88.4
Office machinery	0.0	0.0	0.0	17.7	67.5
All high oil input use	8.9	61.4	43.6	38.7	81.0
Other industries	91.1	38.6	56.4	2.4	39.3
All industries	100.0	100.0	100.0	5.6	57.5

Source: Author's calculations from the 2000 Final Supply and Use Tables, from Statistics South Africa (2003).
Note: Oil intensity is the oil input cost per unit of value added.

Table 2.4 focuses on the 10 non-intensive oil-input industries, which contribute 17 percent of the country's value added and account for 2 percent of the total oil input expenses. For this group of industries, the average oil intensity is very low, as is the share of oil in total energy. The electricity sector is among the least oil input-intensive sectors in South Africa; it is highly coal intensive, relying on coal for more than 70 percent of the energy input expenses.

Table 2.4—Energy profile for low oil input industries (%)

Industry	Share			Oil Intensity	Ratio of Oil to Energy Cost
	Value added	Oil cost	All energy cost		
Other food products	0.3	0.0	0.0	0.1	35.3
Insulated wire and cable	0.1	0.0	0.0	0.1	53.7
Published and printed products	0.7	0.0	0.1	0.4	28.9
Containers of paper	0.3	0.0	0.1	0.5	22.5
Insurance services*	10.1	0.9	1.2	0.5	41.6
Wearing apparel	0.4	0.0	0.1	0.6	34.2
Other paper products	0.2	0.0	0.0	0.6	58.2
Electricity	2.4	0.3	7.7	0.6	2.1
Accommodation	2.0	0.2	0.9	0.7	15.9
Sugar products	0.2	0.0	0.1	0.7	17.2
All low oil input use	16.7	1.5	10.1	0.5	8.7
Other industries	83.3	98.5	89.9	6.7	63.0
All industries	100.0	100.0	100.0	5.6	57.5

Source: Author's calculations from the 2000 Final Supply and Use Tables from Statistics South Africa (2003).
Note: Oil intensity is the oil input cost per unit of value added. * Including the Financial Services Indirectly Measured.

Any significant differences among quintile groups in the shares of energy in total expenditure appear from the analysis of the income and expenditure survey for the year 2000 (Table 2.5). In contrast, the share of petroleum products declines as the total consumption expenditure increases, then increases substantially for the richest quintile. Therefore, petroleum products as a whole are used most intensively by either high or low income households.

Table 2.5—Percentage shares of energy in total household expenses

		Petroleum Products				
Quintile	All energy	All	Paraffin	Gas	Other domestic fuel	Transport fuel
Quintile 1	8.2	3.9	3.8	0.1	0.0	0.0
Quintile 2	7.9	3.1	2.9	0.2	0.0	0.1
Quintile 3	7.5	2.5	1.9	0.2	0.0	0.5
Quintile 4	7.7	2.6	0.8	0.2	0.0	1.5
Quintile 5	8.8	4.8	0.0	0.1	0.1	4.5
All	8.5	4.2	0.5	0.1	0.1	3.5

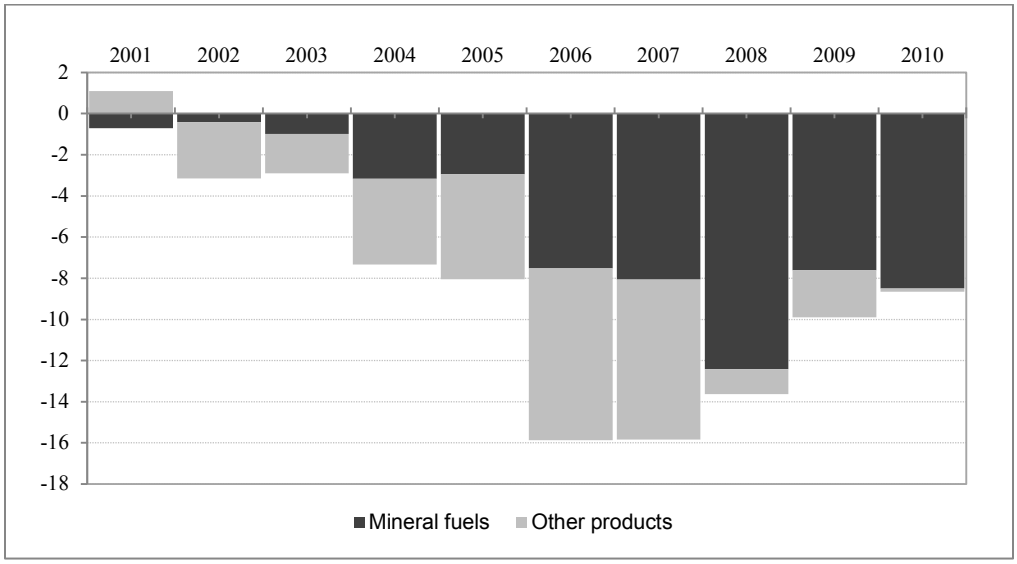
Source: Author's calculations from the Income and Expenditure Survey, from Statistics South Africa (2000).

When looking at domestic and transport fuels separately, a significant difference is noted in the expenditure pattern of the lower and the higher quintile expenditure groups. The lowest expenditure groups rely primarily on paraffin as a source of liquid fuel and gas. In contrast, the highest expenditure groups use more intensive transport fuels.

This pattern of fuel expenditures shows that significant distributional impacts between household income categories will not be observed with the small differences in the changes in fuel prices observed over the last decade (Figure 2.1).

The current account deficit of the South African economy has been growing sharply since 2003, fueled by a rising trade balance deficit (Table 2.2 and Figure 2.2). The increase in the current account deficit means that the value of imported products has recorded a more important increase than the value of exported products, in particular for crude oil and petroleum products (Figure 2.2).

Figure 2.2—Trade balance of South Africa (US$ billions)



Source: International Trade Centre 2011.

On the other hand, South Africa has succeeded in managing and limiting the consequences of its increasing current account deficit through increases in international aid, foreign investments, and external borrowing (as shown in Table 2.2). This has helped mitigate the currency depreciation, while GDP growth has remained relatively strong (Table 2.2).

Consequently, the study starts by assessing the impact of a surge in oil prices as observed in 2007–08 on the South African economy, assuming a tide of external funding, i.e. the net receipts from international aid, foreign investments, and external borrowing remain the same over the period of analysis (short term). In other words, it seeks to isolate the impact of rising oil prices from other shocks that occurred during the same period. Further, the government response to the oil price shock is examined with the aim of reducing its adverse growth impacts.

The economic impact is not the only issue raised by high oil prices; its distributional impact is likely to be heterogeneous among individuals. Therefore, the social consequences of high oil prices are also of concern. Thus, the study focuses on the distributional impact of high oil prices between men and women as it aims to help reducing gender inequalities in South Africa.

3. GENDER AND ENERGY IN SOUTH AFRICA

The relationship between gender and energy is discussed from energy supply and demand perspectives.[10] The supply side focuses on male and female employment in the energy sector. On the demand side, the energy input intensity of fuel-demanding industries is matched with gender employment to give an overview of the direct impact of high oil prices on gender labor earnings. This is completed by an analysis of the openness to external trade, as it is likely that high oil prices have significant exchange rate and trade-related (indirect) effects. Finally, the section discusses time spent by men and women in providing nonmodern fuels (wood, dung, and crop waste) to their households. Nonmodern fuels are close substitutes for oil products, and any change in the household's demand for these products could impact male and female time allocation.

Table 3.1 shows that women do not earn as much income as men from the energy sector. For every R100 earned by male workers, female counterparts earn R3 and R4 in petroleum and coal industries, respectively, and R13 in the electricity industry. These figures are far less important than the economywide average of 37 percent of the ratio of female-to-male wages (Table 3.1). Although women are less exposed than men to oil petroleum, the industry most vulnerable to the increase in crude oil prices, they tend to be less represented in alternative energy sources—synthetic petroleum, coal, and electricity. As a substitute for oil petroleum, the latter products are better positioned to benefit from high oil prices. The contribution of these products to the country's GDP is also four times that of the oil petroleum industry.

Table 3.1—Gender employment earnings in the energy sector (%)

Energy source	Share of GDP	Ratio of female to male wages
Synthetic petroleum	0.4	3.2
Oil petroleum	1.0	3.2
Coal	1.3	4.0
Electricity	2.4	12.7
Nonenergy	94.9	37.7
All industries	100.0	36.7

Source: Author's calculations from the 2000 Gender-Focused Social Accounting Matrix for South Africa (Fofana, 2010).

Industries' oil-input intensities, discussed in the previous section, are matched with gender sectoral employment earnings. Once again, women are less represented in high oil-input use industries, compared to men, while they are overrepresented in the low oil input-intensive industries (Table 3.2). This reinforces the previous statement that women are less exposed to fuel-supplying industries as well as to high fuel-demanding industries.

[10] Further discussion on gender and energy in South Africa is provided in Feenstra (2002).

Table 3.2—Oil input intensity and gender employment earnings by industries (%)

High oil input use industries				Low oil input use industries			
Industry	**Value added share**	**Oil intensity**	**Female to male wages**	**Industry**	**Value added share**	**Oil intensity**	**Female to male wages**
Jewelry	0.1	149.6	3.2	Other food products	0.3	0.1	30.2
Leather products	0.0	107.6	11.6	Insulated wire and cable	0.1	0.1	13.4
Other transport products	0.1	56.7	11.6	Published and printed	0.7	0.4	47.2
Basic chemical	0.4	26.7	3.2	Containers of paper	0.3	0.5	42.6
General machinery	0.2	26.4	11.6	Insurance services	10.1	0.5	39.5
Other manufacturing	0.1	23.8	31.2	Wearing apparel	0.4	0.6	230.6
Iron and steel products	1.2	21.8	20.6	Other paper products	0.2	0.6	42.6
Fish products	0.1	20.4	5.6	Electricity	2.4	0.6	12.7
Optical instruments	0.1	19.5	15.4	Accommodation	2.0	0.7	90.2
Other mining products	3.4	17.7	1.2	Sugar products	0.2	0.7	30.2
All export oriented	5.7	38.7	14.2	All low oil input	16.7	0.5	43.3
Other industries	94.3	2.4	38.6	Other industries	83.3	6.7	35.8
All industries	100.0	5.6	36.7	All industries	100.0	5.6	36.7

Source: Author's calculations from the 2000 Gender-Focused Social Accounting Matrix for South Africa (Fofana, 2010).

High oil prices lead to depreciation of the exchange rates in net-importing countries because of high import values. The induced trade-related effect, although indirect, can be an important driver of the distributional impact of high oil prices among industries and ultimately individuals. Table 3.3 clusters the 95 industries presented in the 2000 National Accounts tables in 10 groups, according to their degree of openness to external trade. The top group are the more open industries, while the bottom group are less open. The more open industries (groups 1 and 2) appear to employ fewer females. On the other hand, inward industries are highly female-oriented. Although, the low involvement of women in high oil-input use industries shelters them from the adverse effects of high oil prices, the positive trade effect induced by the exchange rate depreciation will certainly be more beneficial to men than women.

Table 3.3—Gender exposure to external trade (%)

	Value added share	**Trade openness**	**Female-to-male wages**
Decile 1	1.1	790.9	10.9
Decile 2	2.1	424.7	23.1
Decile 3	1.7	278.6	31.5
Decile 4	2.9	206.0	28.9
Decile 5	5.2	168.1	30.1
Decile 6	3.2	138.3	18.7
Decile 7	4.0	79.4	26.6
Decile 8	13.0	44.1	36.4
Decile 9	23.9	14.7	31.7
Decile 10	42.9	1.1	45.7
All industries	100.0	54.6	36.7

Source: Author's calculations from the 2000 Gender-Focused Social Accounting Matrix for South Africa (Fofana, 2010).

While the direct effect of high oil prices appears to be less harmful to women, the indirect trade-related effect induced by the depreciation of the exchange rate is less favorable to women than to men. Therefore, *assessing* the distributional impact of high oil prices between men and women requires an appropriate technique enabling us to account for both the direct and the indirect effects of the shock.

High oil prices affect the cost of energy and the purchasing power of households. Although, households' primary strategy to deal with high fuel cost is to reduce their consumption of fuel, the scope of the change in fuel consumption is limited in the short term.[11] Therefore, the fall in household expenses is likely to be at the expense of nonenergy products, in particular nonfood products (with higher price-elasticity of demand).

High prices of oil and oil products also increase the competition with nonmodern fuel consumption (wood, dung, and crop waste). These products, although available to households at low cost, are time-consuming, as shown in Table 3.4. Individuals spent on average 22 minutes per day fetching wood and other fuel products. The impact of the household switching away from modern fuels appears to be less burdensome to women than to men. Still, compared to the time women spend in productive activities (Table 3.4), high oil prices may increase their workload more than men's.

Table 3.4—Average time spent in fetching fuel (minutes per day)

	South Africa	Urban	Rural
Men	30	32	26
Women	15	18	11
All	22	24	18

Source: Author's calculations from the South African 2000 Time Use Survey, Statistics South Africa (2001).

Thus, the focus on the distributional impact on men versus women is aimed at reduce gender inequalities in the market economy, as well as in the nonmarket sphere of the economy, particularly the time allocation.

Indeed, women work longer hours than men do—an average of 41 hours per week for women against 35 hours per week for men (Table 3.5). Women perform more unpaid domestic and social activities, while men are more active in the labor market.

Table 3.5—Men's and women's allocation of time in South Africa (hours per week)

Activity	Men	Women	All
SNA economic	25	15	19
SNA noneconomic	10	26	19
NonSNA	133	127	130
All	168	168	168

Source: Author's calculations from the South African 2000 Time Use Survey, Statistics South Africa (2001).
Note: SNA stands for System of National Accounts.

[11] The price-elasticity of the demand for energy is likely to be low.

4. METHOD AND DATA

Economists have used a variety of methods to analyse the extent and magnitude of oil price-induced shocks, the adjustment policies, and the effects of such policies on economic growth and income distribution in developing countries.[12] A recent study by Fofana, Chitiga, and Mabugu (2007) uses three levels of analysis to track the channels by which South Africa is directly impacted by a sustained increase in the oil price (US$20 a barrel). Studies by McDonald and van Schoor (2005) and Essama-Nssah et al. (2007) explore the effects on the South African economy of a rapid rise in the relative international price of oil, using a multisector general equilibrium approach. Comparing results from these analyses, Chitiga, Fofana, and Mabugu (2010) indicate that the direct impact of the shock appears to account for a smaller part of the total impact. Thus, they call for the use of a framework that accounts for both direct and indirect effects in assessing the impact of high oil prices.

The assessment of the impact of the oil price shock in South Africa requires an appropriate methodology enabling capture of the structure of the energy sector, with emphasis on the synthetic fuel industry, the energy cost, the energy substitution effect, the relationship between the energy and the transportation sector, and the exchange rate effect. Multisector general equilibrium models, also called computable general equilibrium (CGE) models, are an appropriate framework that can integrate these features in a consistent way. They provide a unique opportunity to account for both direct and indirect effects of shocks.

The analysis of high oil prices is undertaken beyond the market activities through the integration of activities performed by individuals within their households and communities. These activities are exclusively performed by households and are linked to the market through the supply of labor (time) and the demand for commodities. Time used in household activities can be productive if it is spent to provide services to the family (domestic activities) or to the community (social activities). The rest of the time is considered nonproductive and used for personal activities or leisure.[13] The terms market economy and household economy are used hereafter to separate the two spheres of the economy.

The modeling of the household economy along with the market economy provides further details on the demand for energy and nonenergy products, on the one hand, and for male and female time allocation across various activities (market, domestic, social, and personal) on the other.

Modeling the Market Economy

A large number of CGE models have been applied to various issues in the South African economy.[14] McDonald and van Schoor (2005) and Essama-Nssah et al. (2007) use a CGE model to assess the impacts of oil price shocks in South Africa. These studies assume low substitution elasticity among various types of energy in the production technology. They fail to isolate the synthetic fuel industry, which is intensive in coal input, from the oil petroleum industries, which use crude oil as a main input. Although, these studies provide interesting insights into the macro and distributive impacts of the recent oil price increases on the South African economy, they investigate neither the policy response issue nor the distributional impact between men and women.

The core of the constructed model is based on the neoclassical general equilibrium theory. Producers maximize their profit under a given technology and independent prices. Industry-specific producers are modelled as representative producers that are assumed to have a nested constant elasticity of substitution production technology.

[12] Among others, Mitra (1994) explores different adjustment scenarios in oil-importing developing countries to cope with the 1973/74 and 1978/79 oil price shocks.

[13] Nonproductive activities lay outside the 1993 System of National Accounts boundaries because they fail the *third person test*, that is, they cannot be performed by a third person.

[14] Among others are Thurlow and van Seventer (2002); McDonald and Punt (2005); and Mabugu and Chitiga (2009).

The relationship between the rest of the world and the domestic economy is determined by the substitutability between imported and domestic goods on the consumption side and by the substitutability between the domestic and international markets on the production side. The relative prices of foreign goods–defined by international fixed prices (small country hypothesis), the exchange rate, and government interventions (taxes, subsidies, and tariffs)–determine the allocation of supply and demand between domestic and international markets.

Consumers maximize their utility under limited budgets and given market prices. Households are modeled as representative agents that are assumed to have a Stone-Geary type of utility function.

Perfect competition prevails in the sense that producers and consumers take as given the relative prices that simultaneously clear all markets, that is, equalizing the quantity produced to the quantity demanded for each commodity. Households' behavior is rational, which implies that in the presence of complete markets, there is a separation between their production and their consumption decisions (separability assumption). Further details on the model are provided by Chitiga, Fofana, and Mabugu (2010).

The Energy Specificities

The model developed here differs from the standard CGE models in the energy supply and demand specifications, on the one hand, and the price setting method in the domestic oil market, on the other. The specifications of the supply and demand for energy build upon the framework provided by the energy and environmental CGE modeling.[15]

An industry technology is presented as a nested constant elasticity of substitution (CES) function. The gross output consists of a Leontief function of the composite value added-energy and the nonenergy input consumption. Leontief technology also determines the demand for nonenergy commodities in the total nonenergy input consumption. A CES function aggregates unskilled labor and the bundle of capital–energy and skilled labor in the value-added–energy composite with a relatively high elasticity of substitution.[16] The bundle of capital–energy and skilled labor is also a CES aggregation of capital–energy and skilled labor. However, the latter has a low elasticity of substitution.[17] Capital and energy imperfectly substitute for each other in the composite capital–energy with a low elasticity (quasi-complementary).

The model has four types of energy products (crude oil, petroleum products, coal, and electricity) and the same number of energy industries (refined fuel, synthetic fuel, coal, and electricity).[18] Petroleum products from the synthesis of coal are perfect substitutes for the refined oil products; that is, consumers do not differentiate among products from one or the other industry.

Energy inputs are imperfect substitutes for each other. Composite fuels and electricity are combined in a CES function with a relatively low elasticity of substitution, meaning that it is not easy for an industry to adopt a better energy efficiency technology, according to the short-run perspective of the study.[19] Composite fuel is a CES-aggregate of coal and oil fuels, also with a relatively low elasticity of substitution. Finally, crude oil and refined oil products are assumed to be complements in the oil bundle. The demand for each energy commodity is shared between imports and domestic-produced goods, depending on their relative prices and assuming a high degree of substitutability between them.

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[15]Hudson and Jorgenson (1975) developed the first CGE model for energy policy analysis related to the oil price increases in 1973 and 1979. It was followed by the well-known ETA-MACRO model of Manne (1977). In the 1990s, a number of single-country models for environmental policy and resource management analysis were developed (for example, Hazilla and Kopp 1990; Bergman 1990). One of the most famous CGE models of energy and environmental issues is the GeneRal Equilibrium EnNvironmental (GREEN) model developed at the Organization of Economic Cooperation and Development (OECD) Development Centre (van der Mensbrugghe 1994).

[16]The substitution elasticity is fixed at 0.7.

[17]The value of the elasticity (0.35) is half of that of the substitution between unskilled labor and the bundle of capital–energy and skilled labor.

[18] The electricity product and industry also include gas and renewable energies.

[19]An elasticity value of 0.35 is chosen for the substitution among various energy products.

Household consumption follows the 1993 System of National Accounts (SNA) Classification of Individual Consumption by Purpose (COICOP). A single commodity (for example, petroleum) enters into one or several groups of consumption by purpose (for example, household fuel and transport). Representative urban and rural households maximize unitary utility functions over the group of consumption by purpose, subject to a revenue constraint. First, a Cobb-Douglas function combines commodities into the categories of consumption by purpose; then, a linear expenditure system (LES) function combines households' expenditure on various groups of consumption by purpose into household total consumption.

Although the oil market follows the market-clearing rule, to implement the oil price support policy the government guarantees a selling price to oil consumers. In a market-clearing context, there is zero excess supply so that the equilibrium price adjusts supply and demand. Therefore, the government provides a price policy support to oil consumers, but it is still willing to let the market adjust to the market-clearing price. Thus, the price paid by oil consumers is exogenous, whereas the level of government subsidy is endogenously determined, depending on the fluctuation of the international oil prices. The government will then have to arrange some method of financing the implied extra expenses.

The Gender Dimension

There is a general consensus among analysts that the labor market in South Africa is segmented. Each segment corresponds to a specific skill level and behaves differently in terms of earnings, job opportunity, unemployment, and wage flexibility.[20] Therefore, location-specific (urban and rural) workers are divided into high-skilled, medium-skilled, and low-skilled categories. While education and experience are important determinants of earnings, other factors such as discrimination by race and gender and barriers to mobility (geographic location) are associated with larger differentials than usually found in studies for other countries (Fallon and Lucas 1998).[21]

High, medium, and low skilled workers in urban and rural areas are separated by sex (male and female) and the labor markets are segmented accordingly.

The labor markets are assumed to be fully segmented. Workers are immobile between urban and rural areas, according to the short-term perspective of the analysis and the absence of explicit treatment of migration between the two areas. The three skill categories do not compete for jobs. As a result, high-skilled, medium-skilled and low-skilled male and female workers in both urban and rural areas participate in different labor markets. Each category of labor is assumed to be perfectly mobile across industries.

Male and female workers are imperfect substitutes in the industry's production technology. The demand for male and female market time is determined by industries, while the supply decision is made by households, accordingly.

Wage rates are fixed and do not adjust to inflation, according to the short-run perspective of the analysis.[22] Male and female wage rates are indexed to the average domestic prices. As a consequence, substitution between male and female market time does not occur at the industry level, as the relative price of the two factors remains constant. However, as men and women tend to work in different industries, the total demand for male and female market time is affected by the distributional impact of the shock across industries. Ultimately, it is male and female unemployment rates that adjust to the demand and supply shocks. The supply response to the shock is discussed next.

[20] The country faces at the same time a shortage of skilled workers and a high unemployment rate among unskilled workers.

[21] The model does not explicitly treat the rural–urban migration issue though. The analysis considers that racial discrimination is minor and individuals with identical education and work experience have the same opportunity to be hired regardless of the population group they belong to.

[22] Further discussions on the relationship between trade balance, exchange rate, inflation, and wage in South Africa are provided by Edwards and Willcox (2003).

Modeling the Household Economy

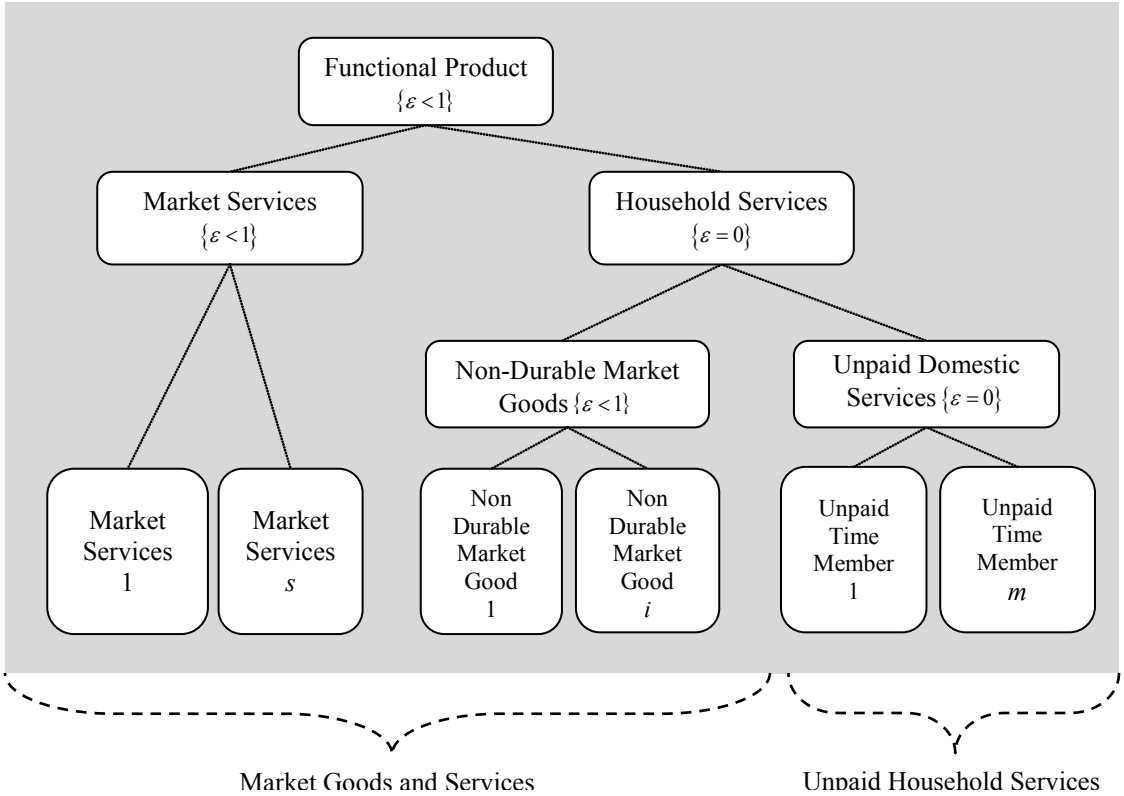
The standard static labor supply model assumes that the consumption of market products and leisure time separately are the only sources of well-being. Although this analysis partially follows this approach, it also considers that market commodities are combined with unpaid domestic time to provide composite goods to the household.

Time allocation theory as developed originally by Becker (1965) is explored throughout the basic *good concept*, named the *functional product* hereafter. The latter, referring to the functional nomenclature of the 1993 SNA of the United Nations, is further discussed in the next section.

The main difference with Becker's work is that the analysis does not directly integrate the consumption or personal time into the functional products. This analysis rather follows the functional nomenclature of the 1993 SNA in which market goods and services contribute to realization of various functions at the household level: food, housing, clothing, health, education, recreation, culture and sport, transport, and so forth. The method considers the total cost of consumption in accounting for both market and nonmarket resources. In general, nonmarket activities are not measured by the statistics and are not suited for an industry approach analysis. Consequently, the functional approach makes it possible to integrate them into the traditional economic analysis.

Thus, a unitary household maximizes its welfare throughout the consumption of functional products and leisure time subject to a full income constraint. The functional product consumed by the household is a multilevel nested aggregation of household unpaid services and market products as depicted in Figure 5.1.

Figure 5.1—Structure of functional products



Source: Author's creation.

The household consumes 14 categories of functional products, 10 market exclusive products, 1 household exclusive product, and 3 products combining market commodities and household services. Market products are purchased from the market, while unpaid household services are freely offered by individuals to their respective households. Household services are assumed not to be exchanged (sold and purchased) through a market.

Households are both production and consumption units. The production decision is made in three steps. First, unpaid male and female times are combined in a fixed proportion into the household's unpaid domestic services. A division of tasks between men and women is assumed; in other words, there is little room for substituting female domestic time with male. Second, the unpaid services offered by household members are combined with nondurable market goods also in a fixed proportionality. In other words, to offer a meal, the household uses its own domestic services (time) to process the foodstuffs bought from the markets. The time used under this task is proportional to the quantity of foodstuffs processed. The same assumption is applied to household maintenance and management activities that required nondurable goods from the market (textile, chemicals, and so forth). Third, household-provided services are in competition with market services, including services provided by durable goods. Thus, these services are imperfect substitutes in the functional products consumed by the household. Higher consumption of market services and durable goods reduces the supplies of close substitutes offered by the household and, as a consequence, reduces the time spent by men and women in domestic activities.

Travel is also a functional product. Travel time is a linear combination of activity time. Time spent in traveling varies with the activity and the location (urban and rural) and less with individual characteristics (age, sex, skill, and so forth). Travel time is then adjusted according to the substitution possibility between individual's unpaid time, market nondurable goods (petroleum products), and market services (transport services) driven by the changes in relative prices. The total cost of travel comes as a deduction to the full income before the latter is allocated to the other consumption bundles.

Nonmarket time is valuated at its opportunity cost; that is, the expected market wages forgone by men and women for involvement in nonmarket activities. As functional products combine market and household products, their costs are strongly related to the market prices and the input intensity of various goods and services.

The demand for market commodities and the supply of male and female market time are derived from a unitary–household welfare maximization problem over *z*, functional products (C), and *k*, individuals' leisure time (ℓ).

$$U = u\left(C_z, \ell_k\right).$$

The household faces constraints with regard to the absence of markets for the functional products, the budget, and the time available for market and nonmarket activities, and the production technology.

There is no market for household's produced products (*S*); thus, these products are totally consumed by the household.

$$C_z = S_z.$$

The production technology includes market goods and services *i* (C^M), along with *k* unpaid individuals' domestic and social time (L^Z).

$$\mathrm{S_z} = \mathrm{s}\left(\mathrm{C_i^M}, \mathrm{L_k^Z}\right).$$

Household disposal income is used for purchasing market goods and services (C^M) or is saved (β); w and L^S are the individual k expected wage rate and supply of labor, respectively; R is the household's nonlabor income, and P is the market price of product i.

$$\sum_i P_i \cdot C_i^M + \beta = \sum_k w_k \cdot L_k^S + R$$

The maximum time available to an individual (24 hours per day) is allocated to market activities (L^S), unpaid domestic and social activities (L^Z), and personal activities or leisure time (ℓ). The latter includes the minimum time required to satisfy the basic human needs (such as sleeping and eating).

$$\overline{T}_k = L_k^S + L_k^Z + \ell_k .$$

The optimum demand for market goods and services (C^{M^*}) and supply of labor (L^{S^*}) from the household are given by the solution to the above welfare maximization problem.

$$C_i^{M^*} = u\left(p_i, w_k\right),$$

$$L_k^{S^*} = \overline{T}_k - u\left(p_i, w_k\right) - g\left(p_i, w_k\right) .$$

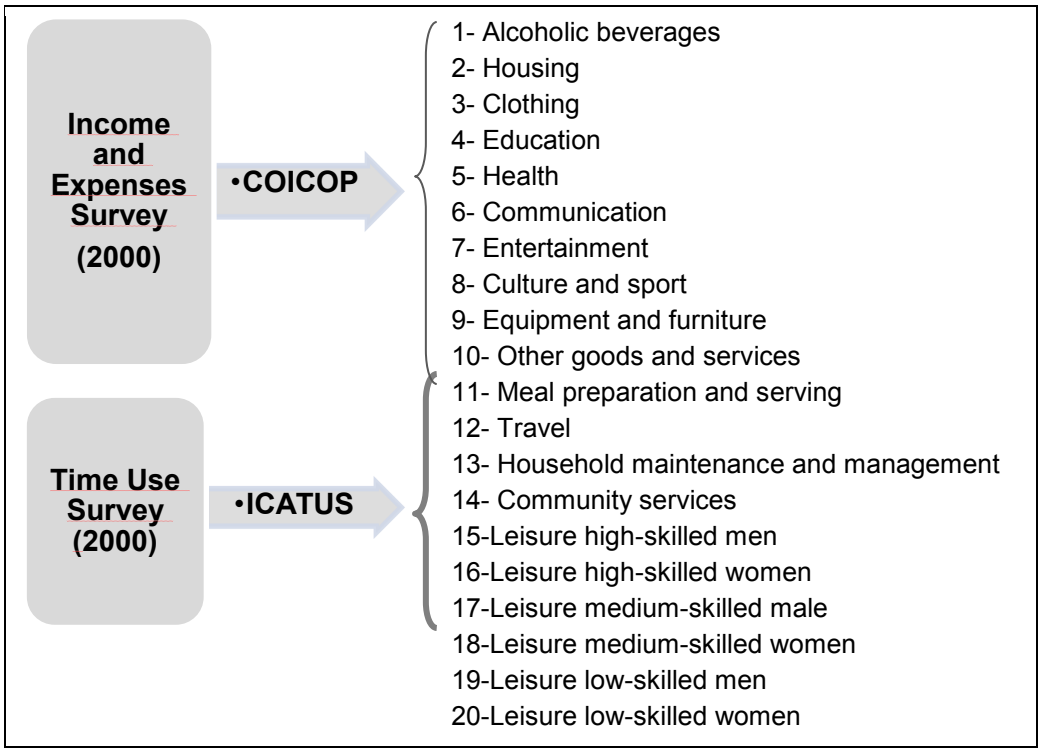
Data

The energy specificity is integrated to the standard social accounting matrix (SAM) in three steps. First, the supply of "crude oil" is separated from "other mining and quarrying." As there was no domestic production of "crude oil" in year 2000, the total supply is essentially satisfied by imports. Second, the petroleum industry is decomposed into synthetic fuel industry using coal as input, and refined oil industry relying mainly on crude oil as input. Third, households' final consumption presented by product-category in the standard SAM is rearranged by purpose throughout additional accounts.

The study uses a framework integrating both economic and noneconomic activities by exploiting the following two classifications of the United Nations: the Classification of Individual Consumption by Purpose (COICOP) and the International Classification of Activities for Time Use Statistics (ICATUS).

A mapping is established between the COICOP and the ICATUS classifications in order to present the overall picture of activities contributing to the satisfaction of the various consumption functions. The detailed description of the ICATUS activities made it possible to reconcile the use of time and the consumption of goods and services by purpose (COICOP). The tentative association of a time-use to every consumption results in 14 categories of consumption decomposed into 10 market exclusive consumptions (alcoholic beverages, housing, clothing, education, health, communication, entertainment, culture and sport, equipment and furniture, other goods and services), 1 time-use exclusive consumption (community services), and 3 combined market and time-use consumptions (meal preparation and serving, household maintenance and management, and travel) as depicted in Figure 5.2.

Figure 5.2—List of functional products



Source: Compiled by the author based on the Income and Expenditure Survey (Statistics South Africa, 2000) and the Time Use Survey (Statistics South Africa, 2001).

Finally, leisure or personal time is collected for all individuals by household categories (urban and rural) and grouped into the six categories of workers considered in the analysis (high, medium, and low-skilled male workers and high, medium, and low-skilled female workers).

6. SIMULATIONS AND RESULTS

The study simulates a doubling of the prices of crude oil and petroleum products imported and exported by South Africa. The resulting economic and social implications are assessed through changes in GDP and in male and female unemployment rates. Further, the analysis highlights the effects of soaring fuel prices on male and female time allocation to various market and nonmarket (domestic, social, and personal) activities.

The doubling of the world prices of imported crude oil reflects the changes that occurred in the major oil markets during the period 2007–08 (see Figure 2.1). The major petroleum products—gasoline, heating oil, LPG, and jet fuel—also recorded significant increases in prices. As a result, the average prices of the petroleum products imported by South Africa increase by the same magnitude (Figure 2.1). Thus, the simulated scenarios also include a doubling of the world prices of imported and exported petroleum products.

The increases in world fuel prices are simulated under various policy response scenarios. First, the pass-through of the increases in fuel prices to the end users is analyzed. Second, the increases in oil prices are nullified through government subsidies to domestic petroleum prices, using various financing methods. Third, alternative price support responses are explored and a gender equitable fiscal response is proposed.

Passing High Oil Prices on to Consumers

The simulation of high oil prices takes place in a context of fiscal policy stability; that is, the rise in oil prices is fully passed on to consumers. High import prices of fuels or basic fuel prices (BFP) are transferred to the domestic market. However, the increases in the domestic prices are less important because the constant domestic costs (taxes and levies and margins) add up to the BFP in fixed monetary basis.

By introducing a compensatory tax, levied at a uniform rate on households' gross income, government revenue is assumed to be neutral.

GDP and Unemployment Effects

The doubling of the import prices of fuels leads to a less than proportional reduction of the import quantities because of a low price elasticity of fuel demand (Table 6.1). The value of exported fuels also increases in response to the increase in the export prices of fuels but not sufficiently to compensate for the rising oil bill. As a consequence, the current account balance widens and the exchange rate depreciates and contributes to the inflationary effect of high oil prices.

Table 6.1—Effect on fuel imports and exports (%)

		Share	Change
Imports	Crude oil	11.3	-12.0
	Petroleum	1.1	-43.0
	Nonfuel	87.4	-4.4
	All products	100.0	-5.7
Exports	Petroleum	3.7	14.2
	Nonfuel	92.5	1.0
	All products	100.0	1.4

Source: Author's calculations from the simulation results.

The inflationary effect reduces the spending on locally produced and imported commodities. Thus, the total volume of imports falls by 5.7 percent (Table 6.1). The exchange rate depreciation improves the price competitiveness of the economy and boosts exports by 1.4 percent. Falling import volumes, combined with increasing export volumes, contribute to improvement of the trade balance (net exports).

On the other hand, the inflationary effect reduces households' purchasing power and the demand for locally produced commodities. Thus, production falls and, combined with higher input cost and low profitability, leads to lower employment. Unemployment increases by 5.5 percentage points, contributing to a decline in household revenue (Table 6.2). The negative income effect, combined with higher consumption prices, contributes to a significant reduction in final consumption (4.0 percent) and ultimately to a 2.1 percent fall in GDP, compared to the baseline (Table 6.2).

Table 6.2—Changes in GDP and unemployment rates (%)

Unemployment rate*	5.5
Real GDP	-2.1
Final consumption	-4.0
Exports	1.4
Imports	-5.7

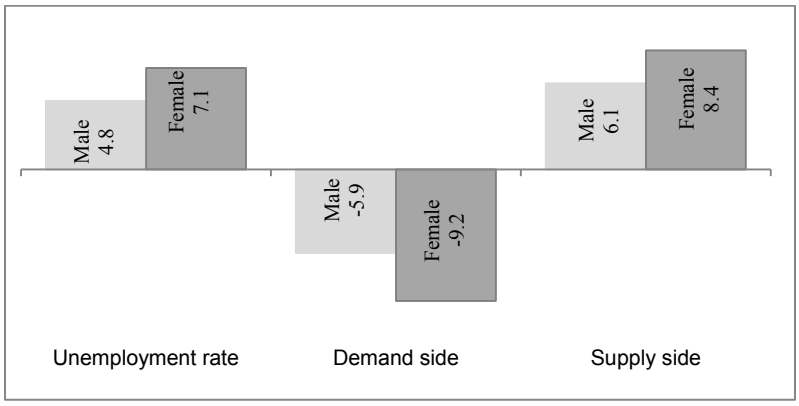
Source: Author's calculations from the simulation results.
Note: *Percentage point.

Because of the short run perspective of the analysis, salaries and wages do not adjust to the inflation caused by high oil prices; that is, salaries and wages are fixed.[23] Thus, the distributional impact between men and women is assessed through the changes in their unemployment rates, which account for both the demand and supply of labor.

Figure 6.1 shows that employment opportunities decline under soaring oil prices. On the other hand, individuals supply more labor to compensate for welfare losses. The combination of lower demand and higher supply of labor increases the unemployment rates. The increase is greater for women than men because women's employment opportunities fall more (-9.2 against -5.9 percent) and their supply of labor increases more (8.4 against 6.1 percent). As a result, the unemployment rate increases more among women (7.1 percentage points) as compared to men's (4.8 percentage points). The greater decline in labor demand among women than men is driven by the disparity in gender employment across industries and the heterogeneity of the impact of high oil prices in the economy. Although households supply more labor to the market as their real incomes fall, the difference between men and women is driven by their levels of involvement in various household activities and the nonuniform cost effect of high oil prices among these activities. These demand and supply implications are further discussed in the next section.

[23] See Edwards and Willcox (2003) for further discussion regarding the relationship between inflation and wages in South Africa.

Figure 6.1—Gender unemployment effect of oil price increases (%)



Source: Author's calculations from the simulation results.

Sectoral and Employment Effects

The distributional impact among industries is driven by high energy-input costs and the decline in domestic demand (negative effects), on one hand, and the improvement of the price-competitiveness of the economy (positive effect), on the other.

High fuel prices largely benefit the synthetic fuel industry by increasing output (Table 6.3). As synthetic fuels are perfect substitutes for refined fuels, they benefit from the increase of the sale price relative to the price of their main input, coal. The coal industry also benefits from high oil prices driven by the increase in the demand for coal. Coal also benefits from its high exposure to the external market and the improvement of the competitiveness of the economy. The mining industry is the other winner from improvement of the price-competitiveness of the economy because of its high export propensity.

Table 6.3—Sectoral effects of high oil prices (%)

	Propensity				Share in total consumption			Labor earnings	
	Export	Import	Oil intensity	Flexibility to oil substitution	Final cons.	Interm. cons.	Change in output	Male	Female
Synthetic fuel	29.3	48.5	12.7	81.6	56.3	38.2	16.8	0.2	0.0
Coal	42.7	1.9	3.5	50.5	63.0	1.1	3.9	1.1	0.1
Mining	85.8	5.7	2.6	78.2	20.8	0.0	1.1	6.7	0.5
Heavy manufacturing	21.2	27.3	2.4	64.2	45.2	8.7	0.0	12.4	4.9
Other services	2.4	2.0	2.5	42.8	45.5	40.0	-1.4	57.9	78.6
Food manufacturing	11.3	8.2	1.0	59.4	22.1	103.3	-2.1	3.0	1.8
Electricity	3.0	0.0	1.1	97.9	65.6	35.7	-2.4	1.9	0.6
Agriculture	12.1	6.2	23.4	13.7	71.1	28.3	-2.4	2.3	1.7
Transport	13.8	6.3	10.1	11.6	53.9	32.0	-2.5	6.1	2.6
Light manufacturing	20.6	21.4	5.3	31.7	56.5	29.1	-2.5	8.1	9.1
Refined oil	29.3	48.5	71.2	4.4	56.3	38.2	-16.6	0.4	0.0
ALL	14.0	11.7	5.6	42.5	46.3	32.4	-1.3	100.0	100.0

Source: South African social accounting matrix for 2000 and author's calculations from the simulation results.

Notes: Oil intensity = Oil cost per unit of value added; Flexibility to oil substitution = 1-Share of oil in energy consumption in value in percentage.

Electricity, which uses coal as a major input, is among the least oil-intensive product. Although an alternative to oil and coal, electricity does not benefit much from the oil price shock because its flexibility for substituting various energy sources is low.[24]

The refined fuel industry, light manufacturing industries, transport services, agriculture, and food industries are all severely affected by the rise in oil prices (Table 6.3). Food and light nonfood manufactured products are less traded and heavily represented in domestic consumption (Table 6.3); thus, they are affected by the decline of domestic demand. High fuel cost and little flexibility to substitute oil for other energy sources also explains the contraction of the light nonfood manufacturing industries. Transport and agriculture are intensive oil-input industries, and their products are heavily used as input in other industries. They suffer from high oil prices as well as from the contraction of the economy. Finally, crude oil is the largest single input used in the refined fuel industry. A doubling of crude oil prices increases the production cost and leads to a significant contraction of the industry.

The analysis shows important distributional effects of high energy prices among sectors in terms of output and, consequently, factor rewards. This information is matched with male and female employment across industries to better understand the increase in the gender gap under the pass-through of high oil prices scenario.

Table 6.3 also depicts the distribution of male and female labor earnings across industries and sectors. Matching male and female labor earnings with the distributional effects of high fuel prices across industries, men generate nearly four times more income than women (20.4 against 5.5 percent) from the noncontracting output industries. The proportion is less than 1.5 times (20.5 against 16.5 percent) in the highly contracting industries (more than 2 percent of output loss). As mining, including coal and heavy manufacturing, provides more employment and income to men than women, their expansion is likely to be less beneficial to female employment compared to male employment.

Effects on Home Activities and Labor Supply

The production of home goods is intensive in nonmarket time. Therefore, the decline in the expected real wages results in a greater reduction of the production cost of home goods as compared to market goods. The decline in the opportunity cost of time also reduces the total cost of traveling despite a significant increase in the cost of transport services.

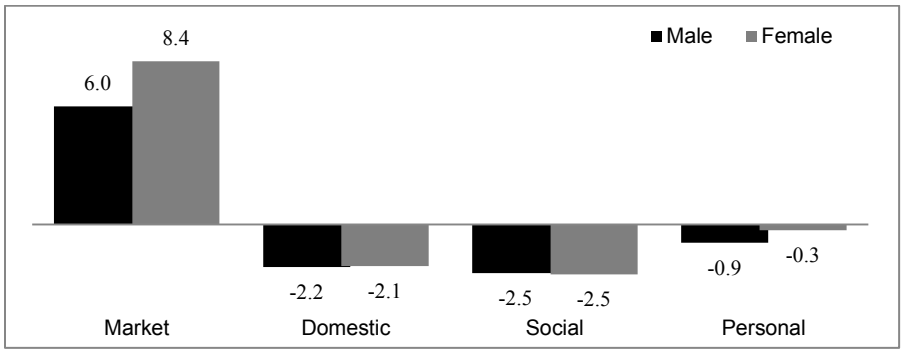
On the other hand, the fall in expected wage rates reduces households' revenue and consumption expenses. Consequently, fewer market inputs are used in the household economy and less time is required. To give a simple illustration of the situation, consider that a household cooks three meals a day, and there is a proportional relationship between the quantity of food cooked and the time required for cooking a meal. When a decline in household income and, consequently, food expenditures results in two meals taken by the household, instead of three, less time is spent in the meals' preparation and serving.

The significant increase in transportation costs due to high oil prices results in more time spent in traveling, while spending on transport services declines. In other words, people use cheaper but more time-expensive transportation methods.

However, the additional time spent for traveling is less important than the time released from the reduction in domestic activities. Further, households cannot afford to spend more time in social and personal activities as their revenue falls (Figure 6.2). The time spent by men and women in personal activities falls, but even less time is recorded in social and domestic activities. For these activities, the cost of substituting market inputs is high, along with the decline in household revenue.

[24] This is guided by the short-run perspective of the analysis.

Figure 6.2—Male and female allocation of time (%)



Source: Author's calculations from the simulation results.

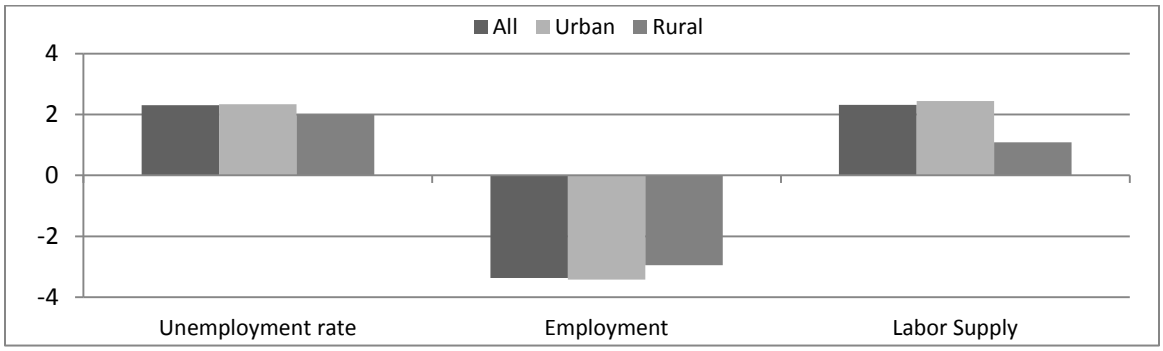
Time spent by men and women in domestic activities falls in the same proportion because of the low substitution assumption. Women's heavy involvement in domestic activities leads to a greater reduction of their domestic time spent, compared to men. This time is entirely allocated to market activities to compensate for the loss of revenue encountered by their households and consequently results in a small decline in female personal time, compared to their male counterparts. On the other hand, men have to compensate for the revenue lost from their personal time. Finally, because of a greater decline in the time spent in domestic and social activities, the increase of market time is more important for women than men.

High fuel prices help to reduce disparities in male and female allocation of time. Women spend more time in the market economy; therefore, less time goes into the household economy without reducing their personal or leisure time. However, the increasing participation of women in the labor force (supply side) and the - greater reduction of their employment opportunities (demand side) lead to higher unemployment of women than men do (both male and female real wage rates being fixed).

Effects on Urban and Rural Unemployment Rates

The female-to-male unemployment gap increases in all areas but more significantly in urban than in rural areas (Figure 6.3). The gender employment gap increases relatively more in urban than in rural areas. But the regional difference is largely driven by the greater supply of female labor in urban than in rural areas, compared to their male counterparts.

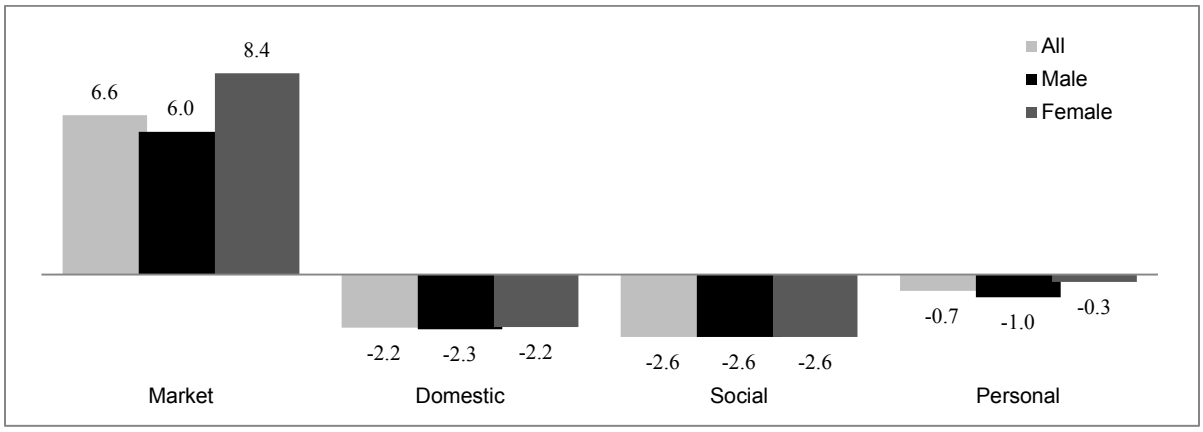
Figure 6.3—Female-to-male employment gap by location (percentage point)



Source: Author's calculations from the simulation results.
Note: The figure shows differences in the percentage changes in female-to-male unemployment rates, nationwide employment, and labor supply.

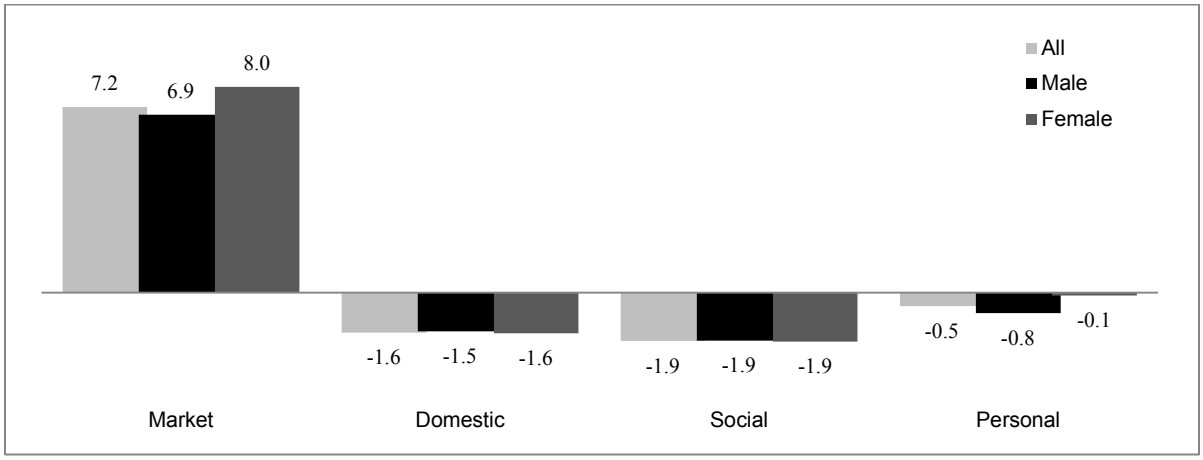
There is a small difference between urban and rural areas in the effects of the oil prices increase on male and female personal time (Figures 6.4 and 6.5). On the other hand, in urban areas, the differences in domestic and social times are more important, freeing more time for females and increasing their market employment more than their male counterparts. As the urban household economy uses more market inputs, including oil products, than its rural counterpart, the cost of producing home goods is more expensive in urban than rural areas. Thus, the substitution effect in domestic activities is more important in urban than rural areas.

Figure 6.4—Change in gender allocation of time in urban areas (%)



Source: Author's calculations from the simulation results.

Figure 6.5—Change in gender allocation of time in rural areas (%)



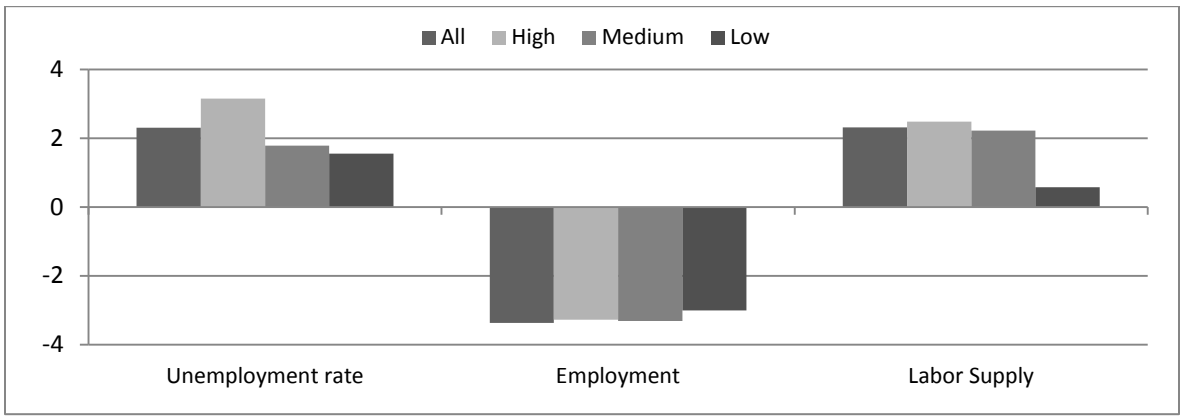
Source: Author's calculation's from the simulation results.

Effects on the Skill Categories

The gap between female and male unemployment rates increases with the skill level, particularly for high-skilled workers (Figure 6.6). The changes in male and female unemployment rates are also driven by the supply effect, as the employment effect is quite similar among all skill categories. On the supply side, high- and medium-skilled female workers supply more labor to the market than their male counterparts under the oil price shock. The gap between men and women is less significant for low-skilled workers, meaning that the supply of low-skilled male labor is also important. Given their initially high unemployment, low-skilled men are relatively more involved in domestic and social activities than

medium- and high-skilled men. Thus, the former see their time allocation to domestic and social activities decrease significantly in favor of market activities.

Figure 6.6—Female-to-male employment gap by skill categories (%)

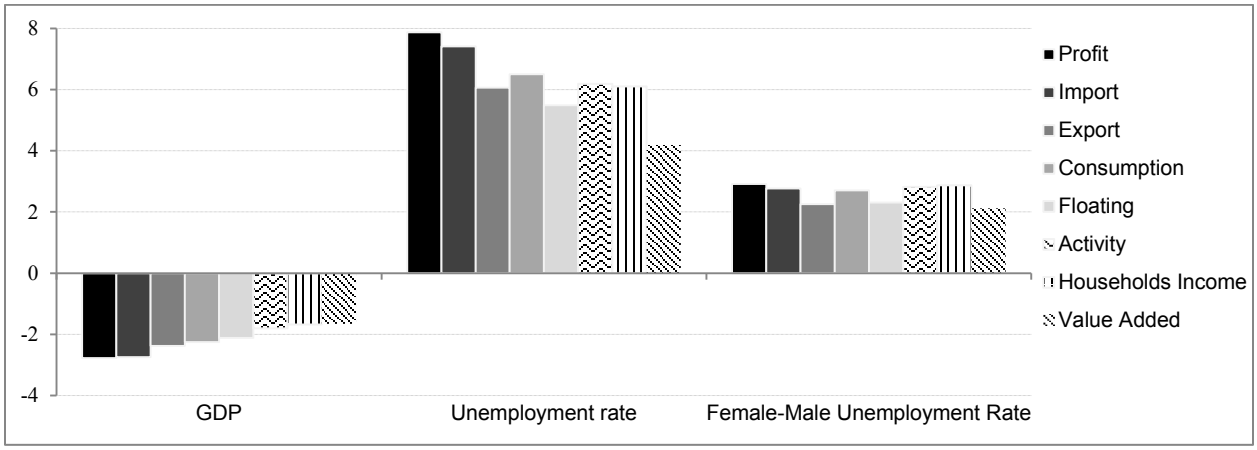


Source: Author's calculation's from the simulation results.

Subsidizing Fuel Prices

These scenarios keep unchanged the purchasing prices of petroleum products through a subsidy mechanism provided by the government. To fully cover the increases of the government expenses[25] in subsidizing the petroleum prices, the study successively explores various financing methods based on additional taxation of households' gross income, activities, profits, sales, value added,[26] imports, and exports. The impact of high oil prices under the fixed purchasing prices of petroleum products is assessed on GDP and gender unemployment rates (Figure 6.7).

Figure 6.7—Comparison of the set price simulation results (%)



Source: Author's calculations from the simulation results.

[25]The additional spending of the government is estimated between 9.1 and 11.0 percent of its initial budget.
[26] Deductible value added tax.

GDP falls under the scenarios where prices are set. Compared to the floating prices scenario, GDP contracts less under additional taxation of households' gross income, activities, and value added. GDP contracts more under other financing methods (taxation on profits, imports, exports, and sales).

Compared to the floating prices scenario, imported fuels increase relatively under the set prices scenario at the expense of other imported commodities, as the total import volume decreases. Thus, the oil bill increases, causing a greater inflationary effect, and declines under final consumption and GDP.

On the other hand, the economy becomes more competitive because of the exchange rate depreciation and lower cost of fuels that result from more exports in the set price scenarios. The competitiveness of the economy is lower under business financing, compared to household financing scenarios. Less costly inputs for industries financing through taxing revenues generated by individuals or households have more multiplier effects.

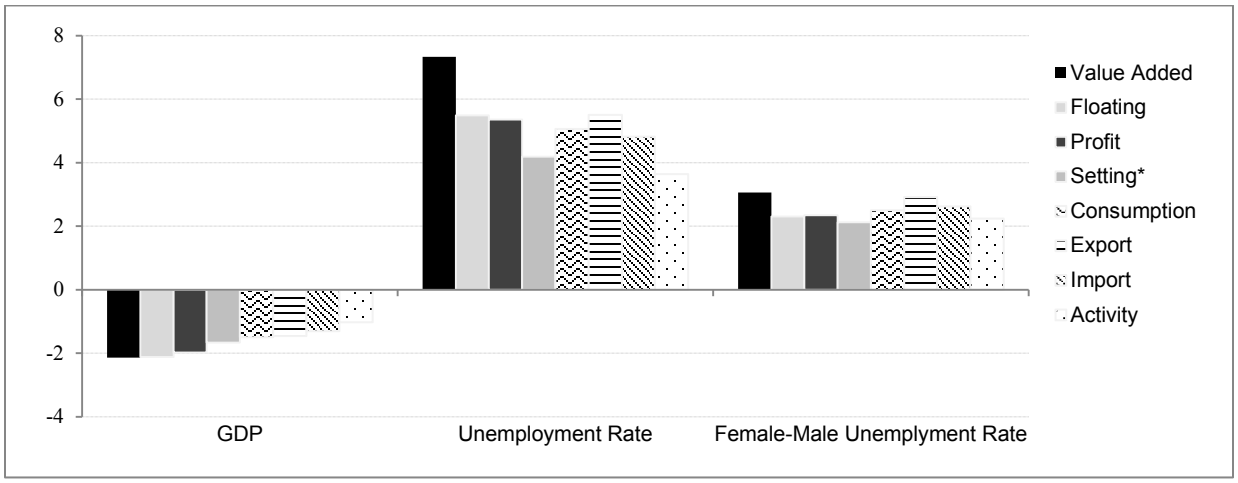
In general, the price support scenarios result in high unemployment rates with an increasing gap between male and female rates, compared to the floating price scenario. By supporting petroleum prices, economywide price-competitiveness increases, which benefits export-oriented industries more. Since the latter employ more men than women, the gender gap increases more under the set price scenario than under the floating price scenario.

Although value-added and household income taxation has similar effects on GDP, a significant difference appears in the gender unemployment effect. The gender gap improves in the value-added financing method because of the greater involvement of women in less traded industries. Indeed, the value-added tax is more biased against imported products than the income tax because of lower (effective) tax rates on less import-competitive industries (the services sector, for example). These industries are more female than male employment-intensive.

Alternative Price Supporting Policies

Further fiscal policy responses are tested by broadening the price support policy to all commodities and all activities. The tax on household revenue finances the price support policies. For comparability purposes, the amount allocated to each price setting policy response is kept at 10 percent of the government budget and results are presented in Figure 6.8.

Figure 6.8—Comparison of price support simulation results (%)



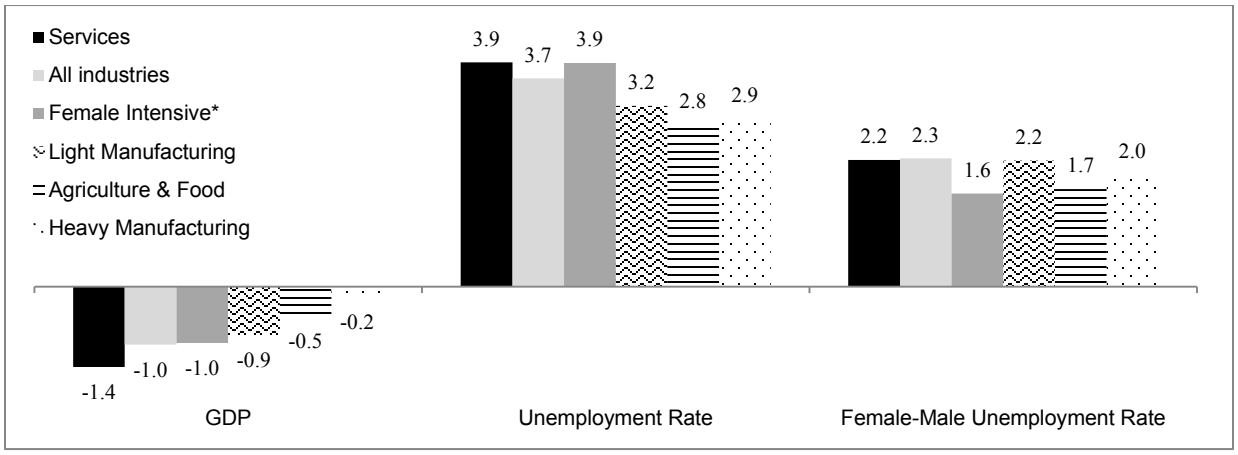
Source: Author's calculations from the simulation results.
Notes: *Setting oil prices financed by taxation on households' income.

The impact of reducing the value-added tax is canceled out by the increase in the household income tax, and the GDP result is close to that obtained in the floating price scenario. However, the unemployment and gender gap effects are more important. As discussed earlier, the differences in results are explained by the lower (effective) value-added tax rates of less import-competitive industries that appear to be more employment-intensive in general and female-employing in particular.

In contrast, the reduction of the production cost shows the highest multiplier effect. Lower input cost increases the competitiveness of the economy, boosts exports while reducing imports in favor of local production, and ultimately increases production, employment, and income distribution. This fiscal response helps minimize the economic impact of high oil prices as well as its employment implications.

The production subsidy is decomposed by sector to further explore the economic and gender implications (Figure 6.9). The subsidy is provided successively to agriculture and manufactured food industries, light manufacturing industries, heavy manufacturing industries, and finally services. Under these scenarios, the reduction in GDP ranges between -1.4 and -0.2 percent and the gender unemployment gap between 2.2 and 1.7 percentage points. Reducing the production cost of heavy manufacturing industries gives the best GDP outcome because of its greater exposure to the external market. The policy is less efficient in private services, as they employ fewer low-skilled workers and therefore have less ability to substitute for their costly capital-energy technology. On the other hand, agriculture and manufactured food are more flexible and able to make substitutions for cheaper low-skilled work and the costly capital–energy factor. Finally, declines in consumption are less driven by higher employment earnings that reduce the impact of the oil price shock on GDP. However, the improvement in employment is still less favorable to female workers, compared to their male counterparts.

Figure 6.9—Comparison of activity–cost support simulation results (%)



Source: Author's calculation from the simulation results.
Notes: *Female Labor Intensive industries.

The main lessons learned from the previous simulations are twofold. First, the impact of high energy prices on GDP and employment improves under the government support to industries that can easily substitute the capital–energy factor for low-skilled work. Second, the change in the unemployment gap between men and women is minimized when government policy targets industries that employ a large number of females (Figure 6.9).

The last two simulations are guided by these results. In the first scenario, the subsidy is provided to industries that intensively combine female dominated low-skilled work and the capital–energy factor (Table 6.4).

Table 6.4—Industries intensive in oil and low-skilled work dominated by females

Industry	Low-skilled female wages to value added	Oil to value added
Knitting mill products	60.6	4.2
Wearing apparel	47.3	0.6
Optical instruments	38.4	5.1
Carpets	31.6	9.6
Accumulators	31.5	4.5
Other textile products	30.8	1.5
Made-up textile products	30.4	2.2
Textile products	28.8	1.8
Electric motors	26.0	10.4
Plastic products	25.0	3.8
Footwear	22.4	1.2
General machinery	21.2	2.8
Other manufacturing	18.4	7.8
Jewelry	18.4	3.7
Fruit and vegetables products	15.1	2.5
Oils and fats products	15.0	5.7
Fish products	15.0	3.6
Meat products	15.0	12.4
Bakery products	12.5	8.8
Other business services	11.3	2.6
Recorded media products	11.1	10.1
Other industries	8.2	5.8
All industries	8.8	5.6

Source: 2000 Gender-Focused Social Accounting Matrix for South Africa (Fofana, 2010).

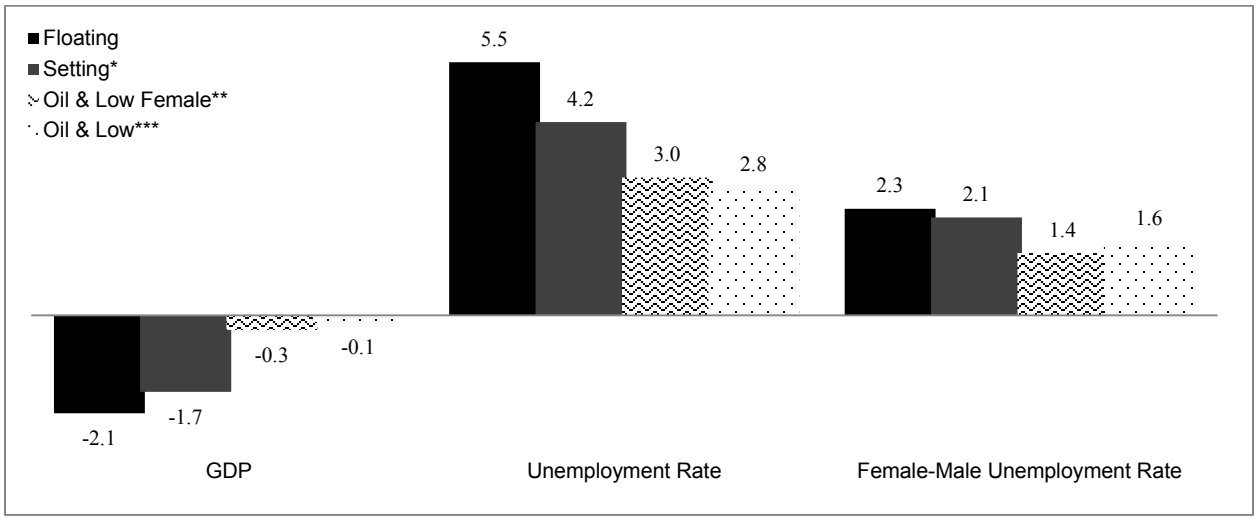
The results indicate a 0.3 percent decline in GDP and a 3.0 percentage point increase in unemployment rates under the oil price shock. The results improve substantially over the results obtained under the floating and set price scenarios (a decrease of GDP by 2.1 and 1.7 percent and an increase of the unemployment rate by 5.5 and 4.2 percentage points, respectively).

Female employment evolves better under this scenario; the difference in the changes in female and male unemployment rates is as low as 1.4 percentage points, compared to 2.3 and 2.1 percentage points under the floating and set price scenarios, respectively.

Given that not all industries intensive in capital–energy are also intensive in female employment, there is a trade-off between reaching a high GDP level and reducing the unemployment gap between women and men under the oil price shock. Thus, the study explores the cost of investing in gender equity by addressing the question: How much GDP is forgone for considering gender equity? The last simulation focuses on industries intensive in energy and low-skilled work, regardless of the gender consideration

The fall in GDP is smaller under the gender-neutral policy response (-0.1 percent), while the gender gap in unemployment is relatively higher (1.6 percent), compared to the gender-equity policy scenario (Figure 6.10). Given the small differences in GDP and gender employment results between the two scenarios, it appears that investing in gender equity while responding to the impact of soaring oil prices in South Africa has a small economic cost.

Figure 6.10—Comparison of female-bias and gender-neutral fiscal responses (%)



Source: Author's calculations from the simulation results.

Note: * Setting oil prices financed by taxation on households' income; ** female-dominant low-skilled work; *** low skilled work.

7. CONCLUSION

In this study policy responses to the impact of high oil prices are examined through a gender lens in South Africa. The analysis is motivated by gender inequalities in economic opportunities and concern about the recent increase in inequality in the country.

A multisector general equilibrium framework is used to integrate the energy features of the economy and its interrelationship with the nonenergy sectors. Following the pioneer work of Becker (1965), the modeling of the household economy is explored to better specify male and female supplies of labor and the household's demand for energy and nonenergy commodities.

The simulation scenarios double the world prices of crude oil and petroleum products. The magnitude of the increase reflects the price shock that occurred in the oil market over the period 2007–08. The increases in the world prices of energy are combined with various fiscal policy responses. The discussion of the results focuses on the GDP and gender unemployment effects.

GDP falls under the floating price scenario, essentially driven by the decline in final consumption. The inflationary effect, triggered by high oil prices and the exchange rate depreciation, increases input costs and reduces production and earnings. Further, the inflationary effect increases consumption prices and the cost of the consumption basket's contribution to the decline in demand and therefore production. Imports also fall and exports increase with the exchange rate depreciation, improving the trade balance. However, the effect of the positive net exports is not enough to reverse the decline in final consumption and the contraction of GDP.

Employment declines with higher input costs and less profit, as well as less demand and production. Female workers are more affected by high oil prices than male workers, as they are less likely to be employed in alternative energy industries and in export-oriented industries. The fall in employment is combined with a high supply of labor to the market, contributing to increased male and female unemployment. The decline in domestic activities due to a reduction in income and a relatively higher cost of market inputs used in domestic activities contribute to a significant reduction in the time allocated to domestic activities. The greater involvement of women in domestic activities largely reduces the time they spend on domestic versus nondomestic activities, in particular market activities.

High energy prices help to reduce disparities in male and female allocation of time. Women spend more time in the market economy and, therefore, less time in the household economy, without reducing their personal or leisure time. However, despite their increasing participation in the labor force, women more than men face a reduction of employment opportunities created by high oil prices. Consequently, women face higher unemployment than men do.

The gender unemployment gap increases more under the petroleum price support policy, except in the value-added tax scenario. Comparing the results to those of the floating price scenario, the contraction of GDP is less pronounced under the household financing approaches. The improvement of GDP is driven by low production cost, higher external competitiveness, and more exported output.

Further, fiscal policy responses are tested by broadening the price support policy to all commodities and all activities financed by additional household income taxation. For the purpose of comparison, the amount allocated to each set price policy response is kept at 10 percent of the government budget. The reduction of the production cost shows the highest multiplier effect. The reduction of input costs contributes to an increase in the competitiveness of the economy, boosting exports while reducing imports in favor of local production. Ultimately, it results in higher production, employment, and income distribution. The contraction of GDP is less than in the set price and the floating price scenarios. Employment measures are also better but the gender gap does not change significantly.

The input cost support policy is decomposed at the industry level to further explore the economic and gender impacts. High oil price impacts are analyzed under a production subsidy provided successively to agriculture and manufactured food industries, to light manufacturing industries, to heavy manufacturing industries, and to private services. The production subsidy is less efficient in private services because they employ fewer low-skilled workers and therefore have less ability to substitute these

workers for the costly capital–energy factor. Other industries, in particular agriculture and manufactured food, are more flexible, substituting cheaper low-skilled work for the costly capital–energy factor. Under this policy response, final consumption falls, because it is less driven by higher employment earnings and therefore able to reduce the impact of higher energy price on GDP. However, the positive economywide effect is still less favorable to women than to men in terms of employment. Female employment evolves better than male employment only when the production subsidy targets female-intensive industries at the expense of less GDP growth.

The main lessons learned from the previous simulations are twofold. First, the impact of high fuel prices on GDP and employment improves under the government support to businesses that can easily substitute capital–energy factors with low-skilled work. Second, the gender employment gap induced by high fuel prices is minimized only if the policy targets industries with high female employment.

Thus, a policy that subsidizes industries that intensively combine female-dominated low-skilled work and the capital–energy factor should provide interesting results. Indeed, unemployment increases less under this scenario, compared to the floating and the set price scenarios. Female employment and GDP improve significantly under this scenario.

Given that not all capital–energy-intensive industries are also intensive in female employment, there is a trade-off between reaching a high GDP level and reducing the unemployment gap between women and men under the oil price shock. The fall in GDP is smaller under the gender-neutral policy response, while the gender gap in unemployment is relatively higher than in the gender-equity policy scenario. However, the differences in GDP and gender employment results between the two scenarios are relatively small.

Thus, the analysis shows that fiscal policy can contribute to ensuring equitable growth when an economy faces a surge in world oil prices. Providing support to businesses that easily substitute the capital–energy factor and female-dominated low-skilled work is the most gender-equitable fiscal response to soaring oil prices. The economic cost of investing in gender equality appears to be low, given the small difference in results between the gender-equity and gender-neutral scenarios.

REFERENCES

African Economic Outlook. 2011. South Africa: Macroeconomic indicators. [Data file]. Retrieved from www.africaneconomicoutlook.org .

Becker, G. S. 1965. "A Theory of the Allocation of Time." *Economic Journal* 75 (299): 493–517.

Bergman, L. 1990. "Energy and Environmental Constraints on Growth: A CGE Modeling Approach". *Journal of Policy Modeling*, 12(4):671-691.

Bhorat, H., M. Leibbrandt, M. Maziya, S. van der Berg, and I. Woolard. 2001. Fighting Poverty: Labour Markets and Inequality in South Africa. Cape Town: UCT Press.

Chitiga, M., Fofana, I, and Mabugu, R. 2010. "Analysing Alternative Policy Response to High Oil Prices, Using an Energy Integrated CGE Microsimulation Approach for South Africa". Working Paper No 196. Cape Town, South Africa: Economic Research South Africa.

Cockburn, J., Fofana, I., Decaluwé, B., Chitiga, M., and Mabugu, R. 2007. "A Gender-focused Macro-Micro Analysis of the Poverty Impacts of Trade Liberalization in South Africa." in Peter J. Lambert (ed.) Equity (Research on Economic Inequality, Volume 15), Emerald Group Publishing Limited, pp.269-305.

Department of Energy. 2011. Fuel prices. [Data file]. Retrieved from www.energy.gov.za.

Edwards, L., and Willcox, O. (n.d.). "Exchange Rate Depreciation and the Trade Balance in South Africa." Unpublished manuscript. Retrieved from www.commerce.uct.ac.za/economics/staff/ledwards/docs/BOPreport5.doc.

Essama-Nssah, B., Go, D., Kearney, M., Korman, V., Robinson, S., and Thierfelder, K. 2007. "Economywide and Distributional Impacts of an Oil Price Shock on the South African Economy." Policy Research Working Paper 4354 Washington D.C.: World Bank.

Fallon, P., and Lucas, R. 1998. "South African Labor Markets: Adjustment and Inequalities." Discussion paper, No. 12. Washington D.C.: World Bank.

Feenstra, M. 2002. "Towards a Gender-Aware Energy Policy: A Case Study of South Africa and Uganda." (Master Thesis, University of Twente, Enschede, Netherlands). Retrieved from http://essay.utwente.nl/58197.

Fofana, I. 2010. "Chocs et Politiques Macroéconomiques, Allocation Intraménage du temps et Réduction de la Pauvreté en Afrique. Doctoral dissertation, Université de Paris 1.

Fofana, I., M. Chitiga, and R. Mabugu. 2007. "Oil Prices and the South African Economy: A Macro-Meso-Micro Analysis." *Energy Policy* 37 (no.12): 5509–5518.

Hazilla, M., Kopp, R., J. 1990. "Social Cost of Environmental Quality Regulations: A General Equilibrium Analysis". *Journal of Political Economy*, vol. 98(4), pp. 853-73.

Hudson, E., A., and Jorgenson, D. 1975. "US Energy Policy and Economic Growth, 1975-2000." *The Bell Journal of Economics and Management Science*, 5: 461-514.

International Energy Agency. 2011. Energy Statistics [Data file]. Retrieved from www.iea.org/Textbase/stats.

International Monetary Fund. 2011. Regional economic outlook, Sub-Saharan Africa: Recovery and New Risks. World economic and financial surveys, 0258-7440. Washington, DC: International Monetary Fund. Retrieved from www.imf.org/external/pubs/ft/reo/2011/afr/eng/sreo0411.pdf.

International Trade Centre. 2011. COMTRADE Statistics. [Data file] Retrieved from www.intracen.org/country/South-Africa.

Mabugu, R., and M. R. Chitiga. 2009. "Liberalising Trade in South Africa: A Survey of Computable General Equilibrium Studies." Mimeo. Pretoria, South Africa: Financial and Fiscal Commission. South African Journal of Economics, Volume 77, Issue 3.

Manne, A., S. 1977. *ETA-MACRO: A Model of Energy Economy Interactions*. Paolo Alto Electric Power Research Institute Research Report, 1014.

McDonald, S., and C. Punt. 2005. “General Equilibrium Modelling in South Africa: What the Future Holds.” *Agrekon* 44(1): 60–97.

McDonald, S., and M. van Schoor. 2005. A Computable General Equilibrium (CGE) Analysis of the Impact of an Oil Price Increase in South Africa. Working Paper 2005:1. Elsenburg, South Africa: The Provincial Decision-making Enabling (PROVIDER) Project.

Mitra, P. K. 1994. Adjustment in Oil-Exporting Developing Countries. New York, NY: Cambridge University Press.

Statistics South Africa. 2003. “Final Supply and Use Tables 2000 (Report no. 04-04-01).” Pretoria: Government Printers.

Statistics South Africa. 2001. “Time Use Survey” [Data file]. Pretoria: Statistics South Africa.

Statistics South Africa. 2000. “Income and Expenditure Survey” [Data file]. Pretoria: Statistics South Africa.

Thurlow, J., and D. E. N. van Seventer. 2002. “A Standard Computable General Equilibrium Model for South Africa.” Trade and Marketing Division Discussion Paper No. 100. International Food Policy Research Institute, Washington D.C.

Valodia, I. 1996. “Work.” In *The Women’s Budget*, edited by D. Budlender. Cape Town, South Africa: Idasa.

van der Mensbrugghe, D. 1994. GREEN: The Reference Manual. Working Papers 143: Paris, France: OECD Economics Department.

Wakeford, J. 2006. “The Impact of Oil Price Shocks on the South African Macroeconomy: History and Prospects.” Paper presented at the Development Policy Research Unit/ Trade & Industrial Policy Strategies conference, 2006 Johannesburg, South Africa.

World Bank. 2002. Gender Stats – Database for Gender Statistics. Retrieved from http://devdata.worldbank.org/genderstats.

_____. 2004. World Development. Retrieved from http://devdata.worldbank.org.

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