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A PROPOSAL FOR MEASURING THE BENEFITS OF POLICY-ORIENTED SOCIAL SCIENCE RESEARCH

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Discussion Papers contain preliminary material and research results, and are circulated prior to a full peer review in order to stimulate discussion and critical comment. It is expected that most Discussion Papers will eventually be published in some other form, and that their content may also be revised.

Little is known about the impact of social science research in general, and food policy research, in particular. In order to expand the scope of available academic research and to develop quantitative methods for estimating the impact of IFPRI's work, several papers were commissioned from social scientists. Furthermore, IFPRI held an essay contest to solicit research from a broader range of scientists. The resulting papers were discussed at a two-day symposium organized by IFPRI in 1997. This Discussion Paper is a revised version of a paper prepared for and discussed at the symposium. Other papers will be published in this Discussion Paper series over the next months.

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ABSTRACT

This paper addresses the problem of how to measure the benefits of policy-oriented social science research. It argues that social science research promotes economic efficiency in three different ways—it fosters efficiency in the public sector both directly and through effects on the general public, and it increases the efficiency of the private sector. The paper also proposes a practical empirical methodology for measuring the benefits of policy-oriented social science research. The proposed methodology includes a three-stage analysis of a cross-section of countries. The relationship between research and policy is estimated first. Then an estimate is made of the relationship between policy and economic growth. Finally, these estimates are used to deduce the relationship between research and economic growth.

1. INTRODUCTION

This paper addresses the following question: What are the benefits of policy-oriented social science research? Our stock of knowledge about this is limited. This state of affairs is both unfortunate and potentially rewarding. It is unfortunate because there is little to guide us toward sensible answers. It is potentially rewarding because the scope for meaningful contributions is that much greater. The question is itself relevant to policy. Resolving it in a satisfactory way can provide valuable assistance to those who allocate scarce public research resources among their many competing possible uses.

In the abstract, it is not difficult to guess about the possible benefits of policy-oriented social science research. It has long been recognized, perhaps since the beginning of mankind, that the success and welfare of a society depend largely on the quality of government and government policies. The worldwide trend toward meaner and leaner governments notwithstanding, few people would argue against the notion that government matters and, in fact, matters a great deal.

It is, of course, not enough to assert that policy-oriented social science research has benefits. Everybody would love absolutely no traffic congestion, but this does not mean that governments set aside public funds to achieve this goal. Government-supported social science research, like all other government endeavors, must pass the litmus test of cost-benefit analysis, especially in these days of shrinking national budgets. In this connection, accurate quantitative estimates of the rate of return to investments in this area are needed. Only after such estimates are made can the relevant authorities make educated guesses about how much to allocate to such investments.

Broadly speaking, this paper has two distinct parts. The first deals with conceptual issues. It includes discussions of the economist's approach to calculating the value of knowledge, the effect of social science research on public-sector efficiency, the effect of such research on government accountability, the ways in which research can help promote private-sector efficiency, and some other key conceptual issues in the empirical analysis of the benefits of social science research. The second part is a proposal for a practical methodology for such an empirical analysis. The discussion below is structured in what is intended to be a logical, coherent manner. This essay may rely too much on economic analysis. However, I believe the gains from this, primarily a greater concreteness, more than compensate for the inevitable loss of generality that this entails.

2. MEASURING THE VALUE OF NEW KNOWLEDGE

Knowledge is the output of all research. More precisely, research is about producing new, additional knowledge. Hence, gauging the value of research amounts to gauging the value of new knowledge. This is hardly a new exercise in the social sciences. For example, economists regularly attempt to measure the returns to education (as in Blaug 1992; and Psacharopoulos 1994). The main empirical methodology used has been to compare the salary of, say, high-school graduates with that of, say, college graduates and attribute the difference to college education. The value of knowledge high-school graduates acquire by attending college is the higher lifetime incomes that await them upon their graduation. The cost of acquiring knowledge in college is the sum of all opportunities forgone by going, including the opportunity to work. Such estimates of both costs and benefits allow at least an attempt to estimate the rate of return for a 17-year old who spends four years acquiring new knowledge.

This methodology is more restrictive than it might appear since it treats the increase in income rather than utility as the benefit of education. The point here is not to argue about the validity or accuracy of this approach to measurement. Common sense alone should make evident the many possible errors of commission as well as omission—it is not clear how an impressive knowledge of 19th-century French literature can translate into anything valuable at the workplace. Rather, the main point is that a well-established methodology to quantify the benefits of new knowledge in economics exists, a methodology that will be applied later.

Knowledge is not directly quantifiable. How can a monetary value or any other number, for that matter, be placed on the knowledge that someone has, whether it is the name of the capital of Botswana or an obscure principle of physics? The crux of the methodology described above is that it equates the value of new knowledge with the value of purely economic benefits associated with that knowledge. For a college student, the sole value of the knowledge gained in college is larger paychecks. This observation is not trivial at all once the complex nature of knowledge is recognized. The non-triviality will become clearer later, but for now note that an exclusive focus on economic benefits and costs turns a multidimensional problem into a one-dimensional one. The loss of accuracy due to this simplification can be excused because of the question addressed in this essay—it asks for a methodology that is plausible rather than a methodology that is perfect.

An implicit assumption of this purely economic approach is that the market is dominant. More precisely, the price of new knowledge is simply what the market will bear. Supply and demand in the markets for graduates of college and high-school are what determine how much each of those groups earn and the gap between them. Again,

this assumption is not trivial because it suggests a specific method for quantifying the value of knowledge.

It can easily be seen that this kind of empirical approach can be used to measure the returns to science and technology research (for example, Grabowski and Vernon 1994). This is particularly true for applied research and development, which seeks to produce commercially viable products or technologies. Even basic research in pure sciences often ultimately leads to such products or technologies. Broadly speaking, the commercial success of the final product or technology determines the benefits of science and technology research. Of course, many measurement problems remain. For example, is a research program that results in 10 mildly useful patents more useful than another program that results in a single superstar patent? But the point is that, in principle, the value of scientific and technological research can be measured because this type of research produces tangible results that are tested in the marketplace and hence can be translated into dollar amounts. In general, the same cannot be said for policy-oriented social science research, which often produces much less tangible results.

The more significant difference between the two types of research lies in whether their results are tangible, not whether they are produced for private markets. After all, a substantial part of science and technology research is done in the public sector, especially the defense industry, and there are private-sector consulting firms that engage in policy-oriented social science research. Furthermore, the demand for induced institutional change must also be considered (Ruttan 1979).

However, even without the market mechanism, the benefits of research in the natural sciences would be easier to quantify than the benefits of research in the social sciences since the former tend to be more tangible. The returns to research in agriculture or manufacturing can be estimated in terms of increased physical productivity. Much of the empirical literature on agricultural and industrial research does just this (Pardey and Craig 1989; Griliches 1986). In contrast, the main output of policy-oriented social science research—an improvement in the quality of government policies—is nowhere nearly as tangible and much more difficult to measure.

3. PUBLIC-SECTOR EFFICIENCY AND SOCIAL SCIENCE RESEARCH

The difficulty of measuring the benefits of policy-oriented social science research was mentioned in the preceding section. It is time to examine the nature of those benefits in greater detail. The starting point will be the general assumption that the government benevolently seeks to maximize social welfare. In doing so, the government designs and implements a wide array of policies to fulfill a wide array of objectives, such as ensuring that affordable medical care is available for the elderly, minimizing the incidence of crime on the streets, or preventing the outbreak of contagious diseases.

In theory, the quality of a government can be measured by estimating the increase in social welfare due to government policies; *ceteris paribus*, a government whose policies make a large contribution to social welfare must be better than another that makes only a small one. In practice, public-sector efficiency is a slippery concept, not the least because there is nothing like a consensus on what constitutes an appropriate social welfare function or indeed on whether such functions are theoretically valid to begin with (Ng 1979; Sen 1977).

Before moving on, it is important to remind ourselves that government is not an exogenous entity that designs and implements policies in isolation from the society which it serves. Rather, it is an organic forum where policies are determined through the dynamic interaction of members of society such as voters or politicians. Thus, as will be seen in greater detail in the next section, policy-oriented social science research will affect all those players as well as the government *per se*.

Be that as it may, even in the most repressive dictatorship or the most representative democracy, policymakers and bureaucrats do enjoy a good deal of independence and discretion. Therefore, in this section, the discussion of the government and the benefits of new useful policy-relevant knowledge is really about the improvement in the ability of those players to promote social welfare.

Politicians often exercise significant influence over policymakers and are often policymakers themselves. This has led to a widespread view that policymakers try to maximize political support rather than social welfare (for example, Buchanan and Lee 1982). But it is intuitively likely that political support is related to social welfare. Niskanen (1968, 1971) makes the well-known argument that self-interested bureaucracies grow inefficiently big. Objections against the social welfare maximization theory dilute but do not invalidate it, as will become clear in the next section.

The absence of a profit motive in the public sector militates against an efficient allocation of resources. The worldwide trend toward privatization of state firms suggests that many governments themselves implicitly acknowledge their own incompetence

(Bailey and Pack 1995). Notwithstanding the popular tendency to regard “efficient government” as an oxymoron, considerations of efficiency do affect government in a broad sense—all governments have finite resources.

This law of scarcity is becoming ever more binding. In rich countries, electorates and financial markets have begun to impose a tough discipline on governments long used to spending more than they earned. In poor countries, of course, this constraint was always uncomfortably tight. A government's optimization problem therefore becomes one of allocating limited resources to maximize social welfare.

So why is policy-oriented social science research socially beneficial when, unlike research in the natural sciences, it fails to yield anything that can be seen and touched? The answer is that such research produces policy-relevant knowledge that can raise the productivity of policymakers and thus enable them to bring about either a larger increase in social welfare with given resources or an identical increase in social welfare with fewer resources. In either case, society as a whole gains from the more efficient allocation of resources by government, made possible by social science research or more precisely, the additional knowledge it creates. These kinds of benefits are as real as a useful new product or technology once it is realized that they mean either more goods and services or the release of scarce resources for alternative uses.

A methodology known as cost-benefit analysis (CBA), an important tool of welfare economics, epitomizes social science research that is geared toward increasing the efficiency of the public sector (for example, Layard and Glaister 1994). Although CBA has been used to evaluate public projects such as dam construction, it can be used to evaluate other policies as well. Basically, CBA takes the sum of all possible losses and gains to a society resulting from a public program to see whether the gains outweigh the losses. Only programs with positive net social benefits are judged to be worthwhile. When resources are limited, CBA recommends the selection of programs with the highest net benefits.

The contribution that CBA, a type of social science research, can make toward greater efficiency in government is clear. CBA eliminates programs that would have subtracted from rather than added to social welfare from consideration by policymakers and makes it possible for them to allocate scarce resources to achieve the largest possible increase in social welfare. CBA's value added is greatest when policymakers have little information or knowledge about the program in question. They would then be most likely to select poor alternatives, resulting in the misallocation of resources. CBA can be used to evaluate policy performance as well as to recommend policies. The use of CBA for ex-post evaluation can also improve the government's efficiency by identifying policies that are no longer sufficiently worthwhile.

Although the benefits of other types of policy-oriented social science research are more difficult to pinpoint than those of CBA, social science research in general can make the allocation of resources within the public sector more efficient. The point of policy-oriented social science research is to create new, additional policy-relevant knowledge, knowledge that can help policymakers promote social welfare. Even when social science research does not yield precise, quantitative knowledge it may produce useful qualitative knowledge that can provide direction to policymakers. Let us suppose that researchers find transfer payments to the poor to be ineffective in the fight against poverty. This kind of qualitative information is far from worthless—at the minimum, it tells those in charge of antipoverty policies to give serious consideration to other policy instruments.

4. GOVERNMENT ACCOUNTABILITY, PUBLIC-SECTOR EFFICIENCY, AND SOCIAL SCIENCE RESEARCH

If policy-relevant social science research can promote efficiency in the public sector directly by expanding the stock of knowledge at the disposal of policymakers, it can also do so indirectly by informing the general public. Policymaking does not take place in a vacuum but in the political context in which policymakers find themselves. That is, government objectives, goals, and actions reflect the demands of the citizenry, albeit to varying degrees. All governments are at least partially accountable to the governed.

In democracies, elections provide the mechanism for ensuring accountability. Even in nondemocratic political systems, there are alternative mechanisms, often more violent, that limit the government's freedom. A key criterion of accountability is the efficiency of resource allocation within the public sector. Since the public cares about how public funds are used, public opinion can be an effective champion of governments and government policies that promote the efficient use of public resources.

There are, of course, considerations that limit the effectiveness of popular sentiment as a mechanism for disciplining the government to encourage efficiency-friendly policies. For one, even in democracies, where the responsiveness of the government to the demands of the people is supposedly strongest, voters vote not for policies but for politicians who represent at best a bundle of policies. In nondemocratic systems, the connection between the political process and the efficiency of the public sector is tenuous, if it exists at all. Governments in those systems often rely on nepotism, cronyism, and other resource allocation mechanisms that have nothing even remotely to do with efficiency.

Another fundamental objection has to do with the actions and incentives of the citizens themselves. Public opinion might be a poor champion of efficiency in the public sector simply because the public might not want an efficient government! In particular, citizens organize themselves politically to go actively after goodies rather than wait passively for the government to hand them out (Olson 1965; Tullock 1981; Grossman and Helpman 1994). This line of thought, of course, has its basis on the traditions of public choice. The world of lobbying and vested interests is a world in which the business of making the pie larger takes a back seat to the more lucrative business of dividing it up. The only efficiency that concerns the citizens is the efficiency with which they can get their hands on the public till.

All these arguments that cast doubt on the potential for public opinion to discipline the government into making more efficient use of public-sector resources are valid. But they give only a limited, one-sided picture (for example, Wittman 1995). As

the public revolt against big government in many Western countries and the global popularity of privatization shows, the general public will not put up with a government's ineptitude forever.

Given the quantitative significance of the public sector in most economies, it is almost conceivable that persistent misallocation of public resources can coexist with a socially acceptable rate of economic growth. In the long run, whether through the ballot box or by taking to the streets, the general public will replace inefficient policies and the politicians who embody them with more efficient alternatives. This is so even in repressive political systems, as the demise of communism clearly illustrates.

Unfortunately, the long run may be intolerably long in terms of the suffering inflicted on the governed. The persistent poverty and underdevelopment of Sub-Saharan Africa is a case in point (Sachs and Warner 1996; World Bank 1994). This is where policy-oriented social science research enters the picture. The better informed the general public is about the misallocation of public resources, the more likely they are to seek recourse to remedies that cut short the lives of policies responsible for the misallocation. Knowledge is power, and social science research empowers the citizenry.

The relevant comparison is between worlds with and without social science research. In terms of how it uses public resources, the government is likely to be more accountable to the public in the former. By producing knowledge about government actions, policy-oriented research can nudge the government toward policies that add to rather than subtract from social welfare. For example, it is likely that the studies of economists on the ominous intergenerational consequences of large budget deficits (Auerbach, Gokhale, and Kotlikoff 1994) have had considerable influence in shaping public opinion as well as public policy.

5. PRIVATE-SECTOR EFFICIENCY, OVERALL ECONOMIC WELFARE, AND SOCIAL SCIENCE RESEARCH

Government policies not only affect the efficiency with which the government makes use of public resources, they also have a significant impact on the allocation of resources within the private sector. This is particularly true for economic policies such as monetary policy, fiscal policy, trade policy, or industrial policy. Their effects on the composition and overall performance of the private sector should be self-evident. For example, high protectionist barriers against imports will increase the allocation of resources to protected industries, and an increase in the tax rate against savings will lower the savings rate.

Less obvious but sometimes equally as significant are the effects that noneconomic policies have on the efficiency of the private sector. For example, ineffective law enforcement and the consequent breakdown of law and order sometimes impose costs on doing business that are prohibitively high, as appears to be the case in Russia (Zagorski 1995). The efficiency of both the public and private sectors and general economic welfare more broadly depends critically on the quality of policies and policymakers (Olson 1996).

Whatever one's opinion about the importance of sound government policies in economic growth and notwithstanding the widely popular notion that the best government is the smallest possible, government and government policies do influence how well the economy does (Easterly 1995; Bruno 1994; Alesina 1994). Above all, economic policymaking in a capitalist society is about laying down and enforcing the rules of the game in the private sector. It's not just that those rules matter in the performance of the private sector; they matter enormously.

As with the public sector, the benefit to the private sector of policy-oriented social science research and the policy-relevant knowledge it creates is the more efficient allocation of resources. More precisely, this kind of research provides policymakers with knowledge about the consequences of their actions, both ex-ante and ex-post, on the efficiency of the private sector. Better-informed policymakers are more likely to pursue efficiency-friendly policies than ill-informed ones. Furthermore, social science research can also indirectly promote a concern for private-sector efficiency among policymakers by enlightening the public about the effects of policies on the efficiency of the private sector and overall economic performance.

Not only can social science research significantly help to rectify failures of government, it can do the same for failures of the market. Markets do not always make the most efficient allocation of resources. Sometimes they do not even exist. The most commonly cited sources of market failure include externalities, public goods, and natural

monopolies. For example, compared to what is optimal for a society, there are likely to be too few roads and too much pollution. The role of social science research here is to give policymakers and the general public answers about how many miles of roads the government should build and how much clean air it should protect.

Social science research informs us about both the costs and the benefits of government intervention. The government's corrective efforts are not exempt from the litmus test of cost-benefit analysis. Government interventions designed to correct market failures do not make much sense if they bring about government failures with even higher social costs. By creating and distributing policy-relevant knowledge, social science not only informs policymaker and public about what needs to be regulated and rectified, it also helps to regulate the regulators and rectify the rectifiers.

Another possible role for the government in improving overall economic efficiency is in overcoming distortions created by monopolistic market structures. The textbook deadweight losses associated with such structures are well known. Recent contributions from public choice theory suggest that those losses might seriously underestimate the total social losses associated with monopoly because they ignore the diversion of scarce resources to the socially wasteful activity of gaining and preserving monopoly power (Tullock 1967). The argument that government policy is itself a significant source of monopoly power (Demsetz 1989) is related to this line of reasoning. Import tariffs provide a classic example.

An important consideration in this context is the counterexample of a firm that achieves monopoly power by producing cheaper, better products rather than through socially undesirable means—some monopolies may be, on the whole, beneficial to society (Demsetz 1973). As usual, the social value added by policy-oriented social science research comes in the form of greater knowledge about the social costs and benefits of both monopoly and competition policy. In particular, such knowledge can foster a competition policy that protects competition rather than competitors.

In the long run, dynamic efficiency matters more for economic performance than static efficiency; Schumpeterian competition, where new products, services, and industries uproot and replace existing ones, takes precedence over the competitive market structure of many price-taking firms (Schumpeter 1950). The invention of automobiles sooner or later dwarfs the issue of whether the market for horses is “competitive” in a static sense, although there are reasons to believe that static market structure affects innovation and dynamic efficiency (Scherer 1984).

In general, what ultimately propels economies and societies forward is innovation, or the creation of new knowledge. Policymakers can and do play a vital role in creating

knowledge by providing the appropriate environment to make this critical business flourish. More precisely, policymakers must pursue policies that produce an environment in which creators of useful new knowledge can collect rewards for their efforts sufficient to induce them to put in their efforts in the first place.

The relevant policies here are those that concern the protection of intellectual property rights through patents and copyrights. Since these rights create monopolistic markets and static efficiency losses, the policymakers' task is to strike the right balance between dynamic benefits and static costs. The protection of intellectual property rights illustrates the importance of the role of government, mentioned earlier, in laying down and enforcing the rules of the game in the private sector. It also shows the corresponding scope of the potential gains from policy-oriented social science research in this area (Gould and Gruben 1996). This kind of research can help policymakers set and enforce the socially optimal level of protection and incentives for knowledge-producing activities.

6. CONCEPTUAL ISSUES IN EMPIRICAL ANALYSIS

Broadly speaking, there are three empirical approaches or methodologies for measuring the effects of research investments on output, profits, or costs. These are the parametric, nonparametric, and index-number approaches. The parametric approach can be divided further into primal or dual methods or supply equations. Regardless of the choice of methodology, one must address a number of specification and measurement issues in order to make the chosen methodology operational. The econometric measurement of the effects of research will not be summarized here (Alston, Norton, and Pardey 1995).

Instead, let us briefly discuss a few major conceptual issues associated with this type of measurement. As noted before, the output of policy-oriented social science research is policy-relevant knowledge and better policies. But knowledge is not empirically observable and hence cannot be included in an empirical analysis. On the other hand, the quality of policies can be measured and used for empirical purposes. In any case, the benefits from knowledge and better policies depend on the extent to which they help promote a social objective.

In this paper, that social objective will be defined as economic efficiency, although in reality there are many other objectives that the government and the general public pursue, most notably distributive equity. Therefore, in the broadest terms, the central purpose of this paper is to suggest a practical approach to measuring the effect of policy-oriented social science research on economic efficiency. That is, conceptually, the inputs are investments in research, and the final outputs are improvements in economic efficiency, although the intermediate outputs are knowledge and sounder policies.

Knowledge is durable and the social benefits from knowledge produced by social scientists may well last for a long time. For example, the distortions and deadweight losses associated with protectionist policies are old hat to economists. Yet this knowledge remains highly influential among policymakers, politicians, and the general public. The countless research efforts made that illustrate the inefficiencies of protectionism still generate social benefits to the extent that they have helped to forge a social consensus for openness and liberalization.

At the same time, some useful policy-relevant knowledge is only adopted after a considerable time has passed. Just as there are often gestation lags in the transformation of new scientific knowledge into commercially viable products and technologies, so political, bureaucratic, and other constraints can hold up the adoption of good ideas for policy. And, just as the gestation lag varies from invention to invention, the adoption lag will vary from idea to idea. Moreover, as noted earlier, policy-oriented social science

research affects economic efficiency only indirectly by enlarging the stock of policy-relevant knowledge.

More generally, the specification of the lag probably presents the most serious problem in measuring the benefits from knowledge-generating research. The stock of useful policy-relevant knowledge in any period can be determined by adding current increases in such knowledge to the stock of such knowledge in the preceding period and then subtracting the amount of knowledge that has depreciated or become less useful.

Unfortunately, there is no agreement on precisely how to do this. In the first place, the relationship between past investments in research and current increases in useful knowledge is complicated and uncertain (for example, Alston, Norton, and Pardey 1995). Economists have assumed different research lag structures. In doing so, they have implicitly made different assumptions about the depreciation of knowledge. For example, Huffman and Evenson (1989, 1992) use finite lags and implicitly assume that depreciation is 100 percent, while Fulginiti and Perrin (1992) use infinite lags and implicitly assume no depreciation at all.

Then there is the problem of embodied knowledge. As stated earlier, the greater the ignorance of the policymakers and the general public, the greater will be the potential contribution of social science research to a society's well being. However, such ignorance is not independent of that research. Policymakers and the public, especially the former, can and do absorb and embody the knowledge produced by social science research. Empirically, distinguishing between embodied and disembodied knowledge is an intractable task, analytically equivalent to distinguishing between embodied and disembodied technology. The beneficial effects of policy-oriented research on public-sector efficiency may be underestimated when other variables are included that to some degree embody such research.

7. A PROPOSAL FOR MEASURING THE BENEFITS OF POLICY-ORIENTED SOCIAL SCIENCE RESEARCH

The central part of this paper is a proposal for a practical approach to estimating the value of policy-oriented social science research. Only the broad directions for such an approach are outlined here. Note that the focus is on measuring the benefits of a particular type of research rather than the benefits of research in general. Therefore, because this problem concerns all research and not just social science research, the aforementioned problem of research lag specification will not be addressed in detail. What is and is not practical for empirical purposes depends largely on the availability of data, so this consideration will be the point of departure.

Data limitations do not favor an empirical approach based on an analysis of individual policies, which are extremely difficult to define clearly and precisely. The problem of classifying social science research by policy affiliation is almost as serious. Likewise, an empirical methodology based on individual public-sector projects, such as the construction of an airport or a dam, is not practical. Unlike policies, however, projects are generally well-defined. But data on project-specific social science research are hard to come by for the simple reason that policy-oriented social science research deals with policies rather than projects. All of this implies that highly aggregated data must be used.

It is also doubtful whether studies of local government efficiency and local social science research can be used as a basis for empirical work. The primary benefit of using such studies is that they eliminate the problem of allowing for structural differences between countries, which are likely to exceed structural differences between different parts of a country. The Achilles' heel of this approach is that it neglects the stylized fact that in most countries most social scientists study issues that have nationwide implications. In addition, central governments that implement national rather than local policies account for a large share of the public sector. This suggests that an empirical analysis must rely on national data rather than data that are more disaggregated geographically.

At the same time, the problem of research lag specification favors the use of cross-section data rather than time-series data. The problem is serious enough to be the dominant factor in deciding between the two types of data, at least until a widely accepted resolution emerges. Insofar as a stock of R&D-generated knowledge is used in the cross-section analysis, the issue will not go away altogether. But at least the direction of the bias will be the same for each observation in the sample. Furthermore, it is always possible to use the amount of research in any given year or the average amount of research during a number of years.

All this favors a cross-sectional analysis that examines international differences in efficiency and the role that policy-oriented social science research plays in explaining those differences. The underlying hypothesis to be tested is whether countries that produce a lot of policy-relevant knowledge will have, on average, more knowledgeable policymakers who directly pursue better policies and a more knowledgeable general public who indirectly promote them. For analytical convenience, “better” is defined narrowly in terms of economic efficiency alone. In any case, to render the proposal operational, it is necessary to find indexes of both government efficiency and policy-oriented social science research that are theoretically plausible and empirically available.

The most urgent empirical task is to specify a suitable empirical proxy for efficiency in the public sector, since the primary benefit of social science research has been defined as a gain in efficiency. An index of the quality of government policies will be used for this purpose. There is a large literature on the relationship between national economic policies and economic growth, much of which finds strong associations between the two. For example, Barro and Lee (1993) find that an increase in the average years of primary and secondary education of the labor force will raise economic growth by 1 percentage point, while Fischer (1993) finds that a reduction of 28 percentage points in inflation will do the same. Others have studied the effects on growth of, among other things, the ratio of the government budget deficit to GDP (Easterly and Rebelo 1993), the role of the central bank in credit allocation (King and Levine 1993), the difference between official and black market exchange rates (for example, Edwards 1992) and public investment in transport and communication (as in Easterly and Rebelo 1993).

It is theoretically possible to construct an index of the quality of economic policies. The weight of each policy in this index would depend on its significance in economic growth. Those weights can be estimated from numerous empirical studies of the relationship between economic policies and economic growth like the ones cited above. For example, if the balance of the evidence suggests that reducing the government budget deficit does more to spur growth than unifying exchange rates, fiscal policy will have a bigger weight in the index than exchange rate policy. There is no clear-cut basis for assigning weights or deciding which policy variables to include in the index. But once the index is constructed, it can be interpreted as an indicator of the overall quality of policies.

An altogether different approach is to focus on the quality of individual policies. That is, instead of attempting to construct an overall index of policies, variables that represent the soundness of monetary, fiscal, or exchange rate policies could serve as empirical proxies for efficiency in the public sector. For example, the rate of inflation could be an index for the quality of monetary policy, and the ratio of the government budget deficit to GDP could be an index of the quality of fiscal policy. The problem with

this approach is that it requires highly disaggregated data on policy-oriented social science research, such as data on research oriented to either monetary or fiscal policy. Even aside from the previously discussed theoretical problem of classifying policies and research, data at such a high level of disaggregation are probably too difficult to obtain.

Having defined the empirical proxy for the primary dependent variable, the same must be done for the primary independent variable—the stock of knowledge created by social science research. As noted earlier, the issue of lag specification is troublesome indeed. In fact, a major reason for adopting a cross-sectional rather than a time-series analysis was that whatever measurement errors arise from mis-specifying the research lags will at least be common to all the countries in the sample. In any case, as stated earlier, the problem of research lag specification is a problem with the measurement of the effects of research in general and not just social science research. Given that data on international social science research expenditures are likely to be limited, it is perhaps best to be resigned to using research expenditures or their average over several years as proxies for the amount of knowledge.

A central assumption made here is that research expenditures reflect the output of knowledge, although it is much more accurate to consider them an input in the production of knowledge. Furthermore, the relevant figures are not the total amount of knowledge but the amount of knowledge each government official has on average. The policymakers of a country that invests twice as much in social science research as another but has a public sector 10 times larger are likely to be less, not more, knowledgeable than their counterparts. Therefore, the empirical proxy for research-induced knowledge must control for the size of the public sector. For example, the ratio of aggregate social science research expenditures to total government expenditures could be used.

While some may reasonably argue that knowledge generated by policy-oriented social science research is freely available to all countries, it is possible to counter that free availability and relevance are different. Much of such research is country-specific. That is, American economists tend to study the U.S. economy, while Korean economists tend to study the Korean economy. Also, if data on expenditures on economics research are available, an attempt can be made to estimate the returns to that research. Obviously, the same can be done for other disciplines as well. Finally, the analysis would be more precise if policy-relevant research could be distinguished empirically from policy-irrelevant research. In a broad sense, however, all social science research is necessarily policy relevant.

Now to the bigger picture. The methodology for making econometric estimates of the benefits of policy-oriented social science research has three stages. The first stage is a test for the effects of research-induced knowledge on the index of the overall quality of

economic policies. The second stage is an estimate of the effects of the policy quality index on economic growth. In the final stage, the results of the first two stages are combined to deduce the effects of social science research on economic growth.

The basic estimating equation used in the first stage would be cross-sectional for one or more years. It would include an index for the overall quality of economic policies on the left-hand side and variables that theoretically affect the standard of living on the right-hand side. These variables would include an index of the knowledge content of the public sector. The data used would be limited to the countries for which data are available, particularly for social science research. The estimated coefficient of the knowledge content variable can be expected to be significantly positive. The size of the estimated coefficient can be interpreted as the marginal effect of the public sector's knowledge on the overall quality of economic policies. The straightforward interpretation of a significantly positive coefficient would be that, *ceteris paribus*, countries with more knowledgeable governments enjoy better policies than countries with less knowledgeable governments.

In the next stage an estimate would be made of the marginal effects of the overall policy quality index on the rate of growth of per capita income. There is a well-established empirical literature on economic growth that seeks to explain differences in growth rates across countries using a number of explanatory variables (Barro 1991; Barro and Sala-i-Martin 1992; Mankiw, Romer, and Weil 1992; World Bank 1993). Especially significant in this connection is the empirical model developed by Mankiw, Romer, and Weil, which represents an attempt to resurrect the Solow model of economic growth (Solow 1956) by incorporating human capital as well as initial per capita income, the rate of investment, and population growth. The literature on policy and growth, large in its own right, is a branch of this literature.

In particular, Fischer (1991) analyzes the growth effects of macroeconomic stability by adding macroeconomic policy variables to the empirical model associated with Mankiw, Romer, and Weil. In his 1993 paper (Fischer 1993), Fischer himself casts doubt on his earlier interpretation of the coefficients of the policy variables since they are unlikely to be independent of the other explanatory variables. Fischer therefore adopts an approach based on growth accounting. More precisely, he first decomposes the sources of economic growth into physical capital accumulation, human capital accumulation, population growth, and the Solow productivity residual and then tests for the effects of policy variables on capital accumulation and the Solow residual. This approach could be adopted here, but with an index of the overall quality of policies.

The third and final stage simply uses the coefficients estimated in the preceding two stages to estimate the marginal effects of policy-oriented social science research on

economic growth. Recall that the first stage produced an estimate of the marginal effects of research on policy quality and the second stage produced an estimate of the marginal effects of policy quality on economic growth. Therefore, the marginal effect of research on growth would be simply the product of the two coefficients obtained earlier.

8. CONCLUDING REMARKS

This paper addresses the issue of how to measure the benefits of policy-oriented social science research. It begins with the assumption that the basic objective of policymakers and government is to maximize social welfare. Policy-relevant research produces knowledge and information for policymakers and the general public about policies, which are the tools policymakers and governments use for pursuing that fundamental goal. In so doing, research provides valuable guidance and assistance about the construction, improvement, and operation of those tools. Precisely how valuable that guidance and assistance are is a subject about which little has been said. Be that as it may, at a purely qualitative level, the benefits of policy-oriented social science research are the provision of policy-relevant knowledge, better policies, and the promotion of social welfare.

An assumption made in this connection is that social welfare can be equated with economic efficiency. More precisely, the sole objective of government is defined implicitly as the promotion of economic growth and thus an increase in the living standard of its citizens. Governments and policymakers can and do exercise an enormous influence over the allocation of resources in both the public and private sectors and in the process; they play a key role in the economic well-being of a society. The yardstick for measuring the value of policy-oriented social science research then becomes the extent to which the knowledge produced by such research contributes to improvements in living standards. To repeat, the rationale for this simplistic assumption is analytical convenience rather than a presumption that the other objectives of the government are less important. A more complete methodology would incorporate those objectives as well.

The empirical methodology proposed here follows from the chain that leads from policy-oriented social science research to economic growth. Research produces policy-relevant knowledge for policymakers, who can then be expected to design and implement policies that, in turn, will promote greater efficiency and growth. Empirically, the research-knowledge nexus is omitted for obvious reasons. The focus is on the nexus between knowledge and policy quality and the nexus between policy quality and economic growth. More precisely, a three-stage empirical approach is proposed that, first, estimates the effect of research-induced knowledge on policy quality; second, estimates the effect of policy quality on growth; and, third, uses the two coefficients to deduce the effect of knowledge on growth.

Finally, no matter how social welfare is defined, the production of useful policy-relevant knowledge will not yield tangible social benefits if policymakers are unable or unwilling to make use of the knowledge, for the same reason that knowledge that can cure cancer is socially unproductive until it is translated into an actual drug or treatment.

Thus, in the final analysis, the value of policy-oriented social science research depends critically on the policymakers and the constraints and incentives they face. For it is they, not social scientists, who must build and run the tools called policies.

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