Geographical Targeting for Poverty Alleviation: An Introduction to the Special Issue

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Geographical Targeting for Poverty Alleviation: An Introduction to the Special Issue

David Bigman and Hippolyte Fofack

In the face of rising public deficits and shrinking public resources, geographical target-ing may be a viable way to allocate resources for poverty alleviation in developing coun-tries. Efficiency can be increased and leakage to the nonpoor reduced substantially by targeting increasingly smaller areas. This article, and more generally the symposium on geographical targeting for poverty alleviation, proposes several techniques for augment-ing data to produce more detailed poverty maps. It focuses on practical considerations in the design of geographically targeted poverty alleviation programs. In particular, it assesses the advantages and disadvantages of geographical targeting and describes how geographic information systems can be applied to improve poverty mapping.

Why have some geographic areas become pockets of poverty, while others have become islands of prosperity? Many explanations have been offered for the strik-ing differences in living standards between regions and even between communi-ties within the same region. Such disparities can be found in all countries, and they may be caused by a wide range of factors, including differences in agroclimatic conditions, endowments of natural resources, or geographic conditions—par-ticularly the distance to a sea outlet and to centers of commerce—and biases in government policies.

Consider a few examples. Mean per capita consumption of the rural popula-tion in the Indian state of West Bengal is only half that of rural Punjab, and the headcount measure of poverty in West Bengal is nearly four times higher than that in Punjab (Datt and Ravallion 1993). In Burkina Faso the incidence of pov-erty is less than 25 percent in one-fifth of the villages, but well over 60 percent in more than half of the remaining villages (Bigman, Dercon, Guillaume, and Lambotte, this issue). And in Ecuador the incidence of poverty varies from less than 10 percent of the population in some districts to nearly 60 percent in others (Hentschel, Lanjouw, Lanjouw, and Poggi, this issue). Indeed, in many develop-ing countries the differences in living standards between regions are often larger than the differences within regions. Policymakers who seek to design the most

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cost-effective strategies for reducing poverty must consider the implications of these large income disparities between geographic areas.

Studies of income inequality and poverty generally take the approach of the individualistic, human capital model, which explains differences in income and consumption between people by looking at differences in individual and household characteristics. However, differences in standards of living between regions and communities are often far too large to be explained by differences in individual or household characteristics alone. Disparities in living standards may persist because of obstacles to internal migration, which in some countries are the result of deliberate government policies and in all countries are the result of economic, demographic, and cultural factors.

Migration between rural areas, for example, is constrained by the lack of free land for cultivation; rural-urban migration is an option available to only the fittest people, leaving behind the very young and the very old. Moreover, migration is costly and risky, and frequently individuals do not have the information they need to decide whether, when, and how to migrate. Even rural-urban migration, common as it is, often evolves as a gradual process in which one member of a household moves to the urban center in search of employment and is later followed by other members of the household. Further obstacles to migration that particularly affect the poor are large household size, poor health conditions, low levels of human capital, and, in some countries, the "feminization" of poverty (poverty rates are disproportionately high among women). Wealthier and better-educated individuals are less restricted in their ability to migrate, and, as they leave poor areas, the standard of living in those areas declines even further.[1]

Pockets of poverty persist for other reasons as well:

- The low quality of public services, particularly in education and health, further impedes the accumulation of human capital and thus earning capacity.
- The poor condition of rural infrastructure limits trade and retards local investment and growth (Binswanger, Khandker, and Rosenzweig 1993).
- The low level of social capital in poor communities slows the diffusion and adoption of new farm technologies, thus reducing farmers' earning capacity (Foster and Rosenzweig 1995).
- The distance from urban centers inhibits trade, specialization in production, and access to credit.

As a result households in poor areas are less likely to escape the individual and community predicaments that keep them poor.

There are pockets of poverty in both urban and rural areas. The relative ease of identifying these areas makes the place of residence a possible criterion to determine eligibility for poverty reduction programs (Baker and Grosh 1994). The argument holds that although some benefits inevitably leak to the nonpoor

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1. This, however, should be captured by the individual characteristics rather than the spatial characteristics that explain interregional inequalities.

who reside in target areas, and although some of the poor who reside in nonpoor areas will not be covered, geographical targeting has several clear advantages. It is easy to implement and to monitor, thus it typically involves less fraud and much lower administrative costs than many other targeting methods. Moreover, in many developing countries the limited information available on individuals and households reduces the options for implementing other types of targeting. At the same time, severe budgetary restrictions make nontargeted programs infeasible.

The three articles in this symposium present different methods of identifying pockets of poverty in developing countries. The methods call for using all available information, even though it may be limited, in order to map the spatial distribution of poverty. Jesko Hentschel, Peter Lanjouw, Jean Olson Lanjouw, and Javier Poggi bring together household data from Ecuador's census and detailed data from its household income and expenditure survey in order to estimate the incidence of poverty at the village level and to provide a detailed profile of the spatial dimension of poverty in that country. David Bigman, Stephan Dercon, Dominique Guillaume, and Michel Lambotte use data from Burkina Faso's household survey; data from a wide variety of other surveys, including socioeconomic, health, and agricultural surveys; data from the country's population census; detailed climatic data; and detailed road-mapping data in order to determine the spatial distribution of poverty at the village level. These methods can be used in countries where census data provide only very limited information on household characteristics and where data from different surveys must be brought together and, if possible, compared in order to establish a reliable profile of the spatial distribution of poverty. In the third article Hippolyte Fofack uses Ghana's light monitoring survey together with the more comprehensive Integrated Survey to develop criteria for improving targeting.

The general principles of geographical targeting have been thoroughly researched and discussed in the economic literature.[2] This introduction offers a practical guide for using geographical targeting to place poverty alleviation programs and an overview of the questions that are central to selecting targeting criteria. In addition, it discusses applications of a geographic information system (GIS). In recent years the ability to incorporate geographic indicators in public policy planning in general, and in the design of welfare programs in particular, took a quantum leap with the development of new and sophisticated methods for incorporating spatial data and organizing these data as a GIS suitable for computer analysis. Equally important was the surge of technological innovations, such as satellite imagery, for collecting spatial and climatic data. By including in the GIS database not only information on social, economic, climatic, and environmental observations, but also their location and spatial arrangement, this system allows us to present the data in the form of maps and interfaces and to perform comprehensive and sophisticated spatial analysis. In many countries—both de-

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2. See, for example, Kanbur (1987), Bigman (1987), Besley and Kanbur (1993), Ravallion (1993, 1998), Datt and Ravallion (1993), and Jalan and Ravallion (1998).

veloping and industrial—this system has become the single most important tool for analyzing a wide range of geographic and socioeconomic data and for designing policy measures.

I. PRACTICAL CONSIDERATIONS IN DESIGNING A POVERTY ALLEVIATION PROGRAM

Geographical targeting of welfare programs is common in developing countries and is often used in conjunction with additional targeting criteria to narrow the beneficiary population and thus reduce costs. For example, in Mexico the government gave food subsidies only in selected regions and only for tortillas and milk, the main staples of the poor. In Honduras the government restricted a food stamp program to selected areas and required means testing to determine eligibility. And in many Sub-Saharan African countries governments targeted the construction of new health and education facilities to relatively poor areas, and the services provided in these facilities primarily benefited the poor.

Informational Constraints

These and many other similar programs illustrate the intuitive appeal of geographical targeting, as well as its perils. The challenge for policymakers is to use the available resources to provide the greatest possible assistance to those who need it most. In the absence of reliable information on personal income, the first-best solution of identifying the poor and directing all benefits only to them is not feasible. Even in industrial countries that have the necessary data, it is not possible to ascertain whether targeted programs do indeed reach all of the poor and do not leak to the nonpoor.

In the past, since most developing countries did not have reliable information on individual income, many chose programs with universal coverage. In the 1960s and 1970s several countries in Sub-Saharan Africa and South Asia implemented general food subsidy programs. Growing budget constraints in the 1980s, however, forced governments to drastically reduce or even terminate these programs. Some countries replaced universal coverage with means testing, which initially proved quite successful. Sri Lanka is a typical example. In the late 1970s the cost of a universal ration program reached 5 percent of gross domestic product (GDP), and the government was forced to cut costs by replacing it with a food stamp program that cost only 1.3 percent of GDP. However, in the absence of reliable information on household income, means testing led to massive leakage: nearly half the population had access to food stamps, although less than 30 percent were eligible under the program's criteria (Subbarao and others 1997).

The absence of reliable information for identifying the poor, on the one hand, and the mounting constraints on public resources, on the other, made targeting by means of indirect indicators the only viable alternative for most developing countries. The indicators used to determine eligibility included the household's size, the number of children in the household, the size of the

household's landholdings or other assets, and the region in which the household was located. Other alternatives were self-targeted programs (such as food-for-work programs), subsidies for commodities consumed primarily by the poor, and research and extension services targeted to crops consumed primarily by the poor. But these programs were limited in duration and in coverage, thus excluding many of the poor and involving substantial leakage (Kanbur, Keen, and Tuomala 1994).

Targeted programs that use indirect criteria also entail high administrative costs and may have undesirable effects on the target population. For example, Lanjouw and Ravallion (1999) analyze participation rates in various social programs in India and find that it is the nonpoor who capture the early benefits. In family assistance programs implemented in several Latin American countries, eligibility was determined by the number of children in the household. The cost of these programs was pushed to an intolerably high level by slack entitlement conditions and high rates of leakage. Further, they raised the fertility rates of the poor. In Tanzania the difficulty of establishing clear eligibility criteria for distributing food aid forced the government to delegate the authority for distribution to specialized local nongovernmental organizations (NGOs) and village committees, which drove up costs.

Political Feasibility

The effectiveness of a targeted poverty alleviation program thus depends on the availability of efficient indirect criteria for identifying the poor, on the administrative costs of establishing eligibility with these criteria, on the reduction in costs that can be achieved by effectively excluding nonpoor households from the program, and on the government's capacity to administer the program. Grosh (1994) and Gelbach and Pritchett (1997) also emphasize political feasibility as one of the central factors determining a program's effectiveness and sustainability. The main obstacle to targeted programs has often been the opposition of population groups not covered by the programs, primarily middle- and high-income groups. Anand and Kanbur (1990) report that, after the Sri Lankan government introduced a targeted food stamp program, the real value of the food stamps fell sharply during periods of high inflation, as the interest of the middle class shifted to other issues, and public support for the program declined.

Political opposition to targeted programs may arise because only a portion of the general population is bearing their cost and because programs create a stigma for beneficiaries. Smolensky, Reilly, and Evenhouse (1995) distinguish between external and internal stigmas, that is, the stigma created because the welfare program lowers the self-esteem of participants and the stigma created by the society at large, which often leads to tensions between participants and the members of society who bear the tax burden of financing the program. Besley and Kanbur (1993) point out that by stigmatizing welfare recipients, income-based programs have reduced recipients' ability to acquire skills and grow out of poverty. Moffitt (1983) describes the stigma as the "disutility arising from participa-

tion in the welfare program"; Besley and Coate (1992) emphasize the "psychic costs of being on welfare."

In many cases, however, the most significant reason for the political opposition to a targeted program is leakage to ineligible households, which are seen to be free riding on the backs of taxpayers. Improved targeting can go a long way toward reducing such tensions. Rainwater (1982) points out, though, that more accurate targeting might also have the opposite effect of further stigmatizing the poor. This would occur particularly if eligibility required recipients to submit highly personal information (for example, the name of the father of a child born out of wedlock) in order to make entitlement more stringent. In some countries, particularly countries in Sub-Saharan Africa, targeted programs may also exacerbate ethnic tensions if the target group is perceived to be predominantly of a specific ethnic origin.

Advantages of Geographical Targeting

Geographical targeting offers several advantages over other methods of targeting. First, it provides clear criteria for identifying the target population and avoids the informational constraints that impede most other targeted programs. Second, it is relatively easy to monitor and administer, and local institutions and NGOs can greatly assist in implementing the programs. Third, geographical targeting has relatively little influence on a household's behavior, since it is difficult and costly for a household to change its place of residence. Fourth, it is possible to improve targeting by combining the geographic criterion with other eligibility criteria based on individual or household characteristics. Fifth, the instruments of geographically targeted programs can include not only direct income transfers to the target population but also a wide variety of other measures aimed at increasing the living standards of the entire population of the area. Examples include investment in infrastructure, provision of public health and education services, and provision of financial services. Geographical targeting thus can provide guidelines for allocating resources under a country's welfare program as well as under its development program.

The basic rationale for targeting poverty alleviation programs on the basis of geography is the existence of large differences in living standards between geographic areas and the concentration of poverty in some areas. These differences can be found in all countries: the western (inland) areas of China, parts of northeastern India, northwestern rural areas in Bangladesh, northern Nigeria, the rural savannah in Ghana, the northeastern region of Brazil, and the deep South in the United States are just a few examples of pockets of poverty. We even find large disparities in the standard of living between villages and urban communities within the same agroclimatic region. The shantytowns of Johannesburg, the *favelas* of Rio de Janeiro, and the slums of New York City exist side by side with affluent neighborhoods.

These disparities arise because of large differences in the price and quality of housing, the quality of physical infrastructure (primarily the quality of roads),

socioeconomic characteristics of the population, and the quality of public services (particularly health and education)—which perpetuate the cycle of poverty. Low housing costs in poor neighborhoods attract migrants from rural areas and deter local residents who manage to raise their incomes from staying, thereby deepening the pockets of poverty. The quality of the road infrastructure—primarily the availability of all-weather roads—is an important factor in determining an area's development and capacity to trade. And the concentration of welfare recipients in some areas stigmatizes these areas and deters private sector investment and trade.

Large disparities between regions and, even more so, between communities within regions, also arise because of differences in the geographic distribution of government spending, primarily spending on infrastructure (Hammer, Nabi, and Cercone 1995; van de Walle 1995). Such differences reflect the limited political power of poor areas, as well as the efforts of the government to concentrate investment in areas that have strong potential for growth. These two factors explain the urban bias of many governments in developing countries. In rural areas governments tend to invest in regions with good agricultural potential or with a concentration of natural resources, rather than in marginal lands, where the rural poor are concentrated. Election politics also account for large differences in the allocation of public funds, for example, between the relatively densely populated, mostly urban areas and the more sparsely populated, mostly rural areas. In some countries this bias also reflects ethnic, nationalistic, or religious differences between populations.

Although these large disparities and the presence of pockets of poverty make geography an attractive indicator for targeting poverty alleviation programs, the empirical issues and practical difficulties involved in the selection of target areas are far from settled. The main question, which has been examined in a large number of empirical studies, is whether geographical targeting is a cost-effective alternative to universal coverage or to other methods that use proxy indicators as substitutes for means testing.[3]

Baker and Grosh (1994) evaluate the potential impact on poverty of geographical targeting at different levels of aggregation, using household survey data from Venezuela, Mexico, and Jamaica. Their results indicate that geographical targeting can be a useful mechanism for transferring resources to the poor, and the reduction in poverty that can be achieved is larger than the reduction that can be achieved through an equally expensive universal distribution program. These results held for a general food subsidy program and for a food stamp program that used means testing as a self-selection process. Baker and Grosh also demonstrate that the level of geographic aggregation has a noticeable impact on the outcome of targeting—targeting smaller geographic areas makes it possible to improve efficiency and reduce poverty by a greater amount.

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3. See Bigman (1987), Ravallion (1993, 1998), Datt and Ravallion (1993), Ravallion and Wodon (1997), Baker and Grosh (1994).

Ravallion and Wodon (1997) examine the significance of two sets of indicators in determining a household's well-being. One is based on the household's characteristics, and the other is based on the household's location. Using household data from Bangladesh, they show that a household's geographic profile is a more significant indicator of poverty than its other characteristics. Their results for Bangladesh indicate, however, that the gains from geographical targeting at the regional level are small. In a similar study using data from Indonesia, Ravallion (1993: 464) concludes, "The gains to the poor from geographical targeting at the level of regions could be quite small, even with large regional disparities in poverty."

Most of these studies evaluate the cost-effectiveness of geographical targeting when the target areas are administrative regions, provinces, or federal states. There are two reasons for concentrating on these levels. First, most studies use data from the country's household income and expenditure survey to evaluate a program's benefits to the poor and the nonpoor. The number of households selected for this survey is low, and the size of the sample from an area smaller than a region is too small to allow inferences that are statistically significant. Second, in most geographically targeted programs the target areas are the administrative region, the province, or the federal state. At these levels, however, income disparities within an area are, in most cases, still large, and target areas are bound to include many nonpoor households. Regional targeting therefore is likely to result in high leakage and, by excluding many, if not most, of the country's regions, it also leaves out a considerable portion of the country's poor.

Targeting at the Village or Community Level

Within smaller geographic areas, particularly rural areas, income disparities tend to be much smaller. This is because typically smaller areas have more homogeneous socioeconomic characteristics, and the population is subject to the same agroclimatic and geographic conditions. Targeting smaller administrative areas—districts, subdistricts, or even individual villages and urban neighborhoods—can therefore reduce leakage significantly. Moreover, if the program's targets are individual villages, then it is more likely that the selected villages will be spread across all regions, rather than concentrated in a few. This will reduce the ethnic and political tensions that may accompany regionally targeted programs because beneficiaries will include people from all ethnic or national origins and religions.

Further, by including the poorest districts or villages in all regions, targeting at these levels is likely to increase the proportion of the poor who are covered. Targeting smaller areas will also increase the choice of policy instruments that can be used to combat poverty. If a poverty alleviation program is targeted to villages, for example, it may provide a local source of drinking water in some villages, offer a food-for-work program in others, and construct an all-weather access road in still others. This issue will be discussed further below.

Even though targeting smaller geographic areas is an attractive strategy theoretically, it is usually applied only to very specific programs in health and education, not to a more general strategy for reducing poverty. Considerable practical

obstacles arise during implementation because it is difficult to obtain reliable estimates of the incidence of poverty in small areas and thus to determine eligibility. The articles in this symposium develop statistical and econometric methods for mapping poverty in small areas, including villages. These methods may go a long way toward overcoming these obstacles. To examine the practical difficulties and potential benefits that may arise in implementing poverty alleviation programs targeted to small areas, we focus here on programs targeted to individual villages or urban communities; very similar conclusions apply, however, to programs targeted to districts or subdistricts.

One potential difficulty with targeting programs to individual communities is selecting the criteria for determining eligibility. Unless the household survey contains reliable information on the incidence of poverty in each community in the country, we must use indirect indicators that are closely correlated with the incidence of poverty. Some indicators already are widely used in developing countries, often with strong incentives from international organizations or donor countries. Thus, for example, the combination of climatic conditions and the distance from urban centers often identifies villages in marginal lands whose standard of living is much lower than in the rest of the country. The quality of access roads and the distance to sources of drinking water are additional reliable and widely used indicators of living standards, primarily in rural areas. Still another group of indicators includes the availability of public services, the distance from the nearest public school or health clinic, and the type of services provided in the local health clinic. These indicators are obvious selection criteria in choosing the location of new health clinics or public schools; all too often they also indicate the incidence of poverty in the community, both because the relatively well-to-do tend to leave the community if services are inadequate and because poor services damage the earning capacity of the local population.

In the absence of reliable data for each village, however, these criteria are only approximations. They are rarely used to determine eligibility for more general social welfare programs, such as food stamps or child support, and they may generate considerable resistance. Not only will neighboring villages protest, but the urban population may also rail against the use of such criteria if the government does not make a convincing case that the selected villages are indeed likely to be the poorest and that the chosen criteria are highly reliable.

Another issue is the ability of village institutions to administer and monitor the program. At present, local authorities usually only take part in distributing benefits. However, if they are strong, local institutions, particularly religious institutions, can be very effective in fully administering general poverty alleviation programs at the village level. This may be less effective and more costly in villages where local leadership is weak. The main obstacle that village institutions will encounter is deciding who is a resident and therefore entitled to benefits. Disputes between neighboring villages may erupt. And the program may become less effective, since the marginal cases—the households that reside at the outskirts of the village—are often also the poorest and the most likely to be left out.

An important advantage of selecting villages or urban communities as targets is that it widens the choice of policy instruments. At present, different instruments are designed to advance different goals, such as increasing school enrollment or lowering child morbidity, rather than the same general goal of alleviating poverty. As a result, the education department—of the country or the World Bank—prepares a plan for constructing a new school in the community, taking into account only the availability and proximity of existing schools. Very little consideration is given in that plan to other needs of the village and other possible projects, such as improving the access road or health care services for children, that could be more important for improving the standard of living. Likewise, when an administrative department prepares a plan to improve the local road infrastructure, it takes into account the current state of access roads, but not the other needs of the village. Further, there is very little coordination among the departments responsible for these plans.

The need for coordination in designing public projects also arises when the target areas are regions. Suppose that a program for constructing new health facilities identifies target regions on the basis of regional poverty indicators. It is still necessary to determine the exact location of the facilities within the region. An obvious, and the most commonly used, criterion is the distance from existing health facilities to villages within the region. The second consideration is the cost of construction. Program designers often pay little attention to the standard of living in the village, the availability of other public services, and the potential of other projects to reduce poverty. Even distance to a facility can be a complex indicator if one takes into account access to the village during the rainy season, the available modes of transportation (which can be different in villages closer to urban centers and in more remote villages), and the type of health services required in each village.

The possibility of producing reliable poverty maps at the village level opens the door to a more comprehensive strategy for poverty alleviation that proceeds in the opposite direction. In the first stage the general goal of the program—be it the reduction of poverty or child mortality—is determined. In the second stage the policy instrument is tailored to the specific conditions of the local community, on the one hand, and the program's goal, on the other. Only in the third stage are the appropriate departments called on to design health clinics or rural roads—in accordance with that general plan. This approach, which considers the overall needs of the village, requires much more planning, coordination, and data. The data problems have been largely solved in the past decade thanks to significant advancements in the technology of the geographic information system.

II. THE GIS AND ITS APPLICATIONS

Space is central to the decisions, behavior, and even characteristics of individuals and communities. Nevertheless, until recent years it has received little

attention in the social sciences. In statistical and econometric analysis the use of spatial data was limited by the lack of an easy and effective way to incorporate spatial characteristics explicitly into models. The use of the GIS in the social sciences has progressed very slowly, and the application of spatial data analysis in econometric studies is still quite limited. The GIS is used primarily to display, organize, and run simple manipulations of spatial data.

A GIS is a computer-based system used to capture, store, edit, display, and plot geographically referenced data (Longley, Goodchild, and Maguire 1999). Mapping by means of a computer rather than the traditional cartography process can greatly reduce production time and costs. A GIS is also used, primarily in research, for integrating heterogeneous, geographically referenced data sets and providing a common reference framework for analying spatial data in different subjects and over different time periods. Data are integrated by using space as an indexing system. The spatial coordinates of the data make it possible, for example, to combine socioeconomic information on villages from household and community surveys with information on the surrounding farming systems from an agriculture survey and with information on climate and soil conditions from an agroclimatic study. By combining these data sets, a GIS enables us to conduct a comprehensive analysis of social and economic phenomena. In many countries this was the main incentive for compiling national data on infrastructure including basic data on roads, hydrology, settlements, and political and administrative boundaries.

The articles in this symposium present several methods of integrating spatial data in economic and social studies. Hentschel, Lanjouw, Lanjouw, and Poggi combine data from Ecuador's census and its household income and expenditure survey at subregional levels. Bigman, Dercon, Guillaume, and Lambotte integrate household-level data collected in Burkina Faso's household income and expenditure survey with village, district, and regional data collected in a wide variety of other surveys and in the population census. Fofack combines data from the Integrated Survey of Ghana, which has comprehensive information on household income, expenditures, and assets, with a light monitoring survey, which has large coverage and is exhaustive on the location and access to public facilities, in order to draw inferences for targeting.

A GIS allows a wide variety of data integration forms. One layer of data (such as districts) can be presented on top of another (such as climate zones), not only to create a visual display but also to generate a new data set in which each point has attributes from the two original data sets. The points in the integrated data set can then be used to analyze social, economic, and spatial relationships using either cross tabulations or formal statistical and econometric methods. Thus, for example, information on the distance from a village to an urban center can be combined with area-based soil data in order to assess the agricultural potential of rural communities; information on the road network can be combined with information on population density to generate indicators of transportation density for each district. Standard computations using GIS data include straight-line and

network distances, delineating the area that lies within a specified threshold distance from selected features or places. These functions can be used to determine, for example, the nearest hospital for each of a number of settlements or to identify all villages located within a certain distance from public schools.

III. DATA REQUIREMENTS

The data that are most commonly used for estimating poverty come from household income and expenditure surveys. The sample in these surveys is typically small, and the analysis must rely on additional data sources. In most developing countries the principal sources of information on all households with large coverage are the population and housing censuses. However, a census typically is conducted only once a decade, and the census questionnaire contains only limited information on the standard of living. Even so, the census remains one of the most important sources of information on demographic and social conditions.

Household surveys provide more detailed data, but they cover only a relatively small sample of households. Three examples of comprehensive household surveys in developing countries are the World Bank's Living Standards Measurement Study (LSMS) surveys, Integrated Surveys, and the U.S. Agency for International Development's (USAID's) demographic and health surveys. The LSMS surveys and Integrated Surveys concentrate on household income and consumption, while the demographic and health surveys focus on health indicators, including anthropometric measures that indicate the adequacy of food consumption and health care. Because the sample sizes of these surveys are relatively small, it is not possible to generate statistically reliable information for geographic areas smaller than a region. With the aid of a GIS, it is possible to aggregate the survey data according to geographic areas that are different from the administrative regions from which the sample of households was selected. For example, per capita expenditure indicators can be aggregated for agroclimatic zones, and health indicators can be aggregated for areas classified by their access to health services. Additional information from other surveys or from the population census organized as a GIS can then be used to determine, for example, the distance to the market town or the quality of the access road for each survey cluster.

In a rapidly changing economic and social environment, there are rapid and sometimes far-reaching changes in the incidence and spatial distribution of poverty. The surveys must be designed to provide up-to-date information. In most developing countries poverty is strongly affected by macroeconomic shocks, fluctuations in commodity prices, and the spread of diseases, particularly AIDS. These effects are not distributed evenly across economic regions, and, as a result, the geographic distribution of poverty may change considerably in short periods of time. A fall in commodity prices affects predominantly the areas in which these commodities are produced; macroeconomic shocks and a rise in unemployment affect predominantly urban areas, although rural areas also suffer from the re-

duction in government expenditures on rural infrastructure, health, education, and agricultural research; the AIDS epidemic is concentrated in certain geographic areas and affects a very large proportion of the population in these areas. In addition, rural-urban migration continuously deepens the concentration of the poor in urban areas.

These changes require frequent adjustment of poverty reduction instruments and more frequent collection of relevant data to produce an accurate mapping of poverty. In many countries, however, there has been a considerable reduction in the frequency of comprehensive household surveys. After a wave of comprehensive surveys in a large number of developing countries in the 1980s, only a few countries conducted further comprehensive surveys. Instead, many countries conducted far less comprehensive surveys, such as light monitoring surveys or the recent *enquêtes* 1, 2, and 3 that were carried out in several Sub-Saharan African countries and were restricted to large cities. In addition, the time between consecutive surveys has been continuously prolonged.

Two recent initiatives in Sub-Saharan Africa sought to bridge the data gap by using auxiliary data to estimate the geographic distribution of food insecurity and vulnerability. One initiative is USAID's Famine Early Warning System, and the other is the Food and Agriculture Organization's Food Insecurity and Vulnerability Mapping System. These two systems generate comprehensive spatial indicators that are related to the level of well-being and identify the geographic areas that are most vulnerable to shortfalls in food supply and to poverty. Despite the importance of this information, these two systems have only limited use in designing poverty alleviation programs. The main reason is that they describe the spatial distribution of vulnerability at the supranational level, whereas poverty alleviation programs are designed at the national level. However, poverty maps can be updated more regularly for geographically targeted poverty interventions using instrumented consumption variables obtained by combining light monitoring surveys, which are much cheaper and easier to implement, with more comprehensive household surveys (Fofack, this issue).

IV. Performance Criteria

The performance of a targeted program depends on the criteria that are used to determine eligibility for and desirability of the program, and on the instruments that are used to transfer benefits to the target population. A number of performance criteria have been suggested to evaluate the desirability of a program. They include the contribution to poverty reduction, the effect on household behavior, budgetary costs, and errors of inclusion (type I) and exclusion (type II). The error of inclusion measures the number of poor individuals who are excluded from the program, and the error of exclusion measures the number of nonpoor people who are included in the program.

Of these criteria, errors of inclusion and exclusion generally receive the greatest attention because of their intuitive appeal and direct budgetary implications.

Ravallion and Chao (1989) suggest a quantifiable performance measure for targeted programs that takes into account both of these errors. It defines the gains from targeting as the amount by which the budget for a nontargeted program would have to be increased in order to achieve the same reduction in poverty—measured by the poverty gap ratio—that can be attained through targeting. They term this measure the "equivalent gain from targeting." Clearly, the larger is the type I error, the higher are the costs of the targeted program, and the smaller is the equivalent gain. Likewise, the larger is the type II error, the smaller is the cost increase needed to provide the same reduction in poverty, and the smaller is the equivalent gain.

A corollary to this criterion is one that measures the reduction in the poverty gap that can be achieved with the targeted program compared with the reduction in the gap that can be achieved with the nontargeted progam, when the costs of the two programs are the same. The equivalent gain in this case would measure the ratio of the reduction in poverty with a targeted program relative to the reduction in poverty with a universal coverage program.

An alternative performance criterion compares the costs and effectiveness of the targeted program under consideration with the costs and effectiveness of another targeted program. We can term this measure the opportunity cost of targeting. In practice, this measure is more relevant than the equivalent gain, since the alternative of targeting a program to a specific region is to target it to another region, rather than to switch to a nontargeted program. It is easy to see, however, that the two criteria will rank target areas in the same order.

V. A REVIEW OF THE ARTICLES IN THIS ISSUE

The articles in this issue present alternative methods of combining survey data and census data from a wide variety of sources and illustrate how to use the extended data sets to determine the spatial distribution of poverty and the effectiveness of alternative policy instruments. These methods can provide important tools for more comprehensive and coordinated poverty alleviation programs that focus on the needs and specific conditions in villages and urban neighborhoods.

Hentschel, Lanjouw, Lanjouw, and Poggi present a method for mapping poverty to guide the allocation of resources for public projects. This method combines household survey data on income and consumption, which are available for only a sample of communities and households, with census data, which are available for all communities and households, in order to estimate per capita consumption for all households included in the census. This article shows that poverty measures calculated with these consumption estimates closely match the measures calculated with the original household survey data. Although the consumption estimates are unbiased, their standard errors remain large, and they therefore provide only a first cut at drawing a detailed poverty map.

Bigman, Dercon, Guillaume, and Lambotte present another method of bringing together and analyzing data from different sources. They geo-reference the

data from all sources and bring them together at the village level on the basis of the names of the villages and the geographic coordinates identifying their location. They integrate agroclimatic and environmental data into the analysis at the provincial or regional level. Organizing the data as a GIS enables them to incorporate data on the distance from each village to other villages, to towns, and to public facilities such as schools and health clinics. Some of the data were available for all villages in the country; others, including data on household expenditures and health, were available only for a sample of households and villages.

The authors use the sample of villages included in the household survey to identify the significant community variables that best explain the average level of well-being and the prevalence of poverty in each village. They then use these variables to estimate the level of well-being of all villages in the country. They divide all of the villages in the country into four categories of well-being, ranging from the poorest to the least poor. These estimates thus identify not only the villages that should be the target of antipoverty programs, but also the villages that should be the target of cost-recovery programs.

Fofack presents a third method of using the data collected in household surveys to obtain criteria for geographical targeting. His method is based on the use of a light monitoring survey in which households are asked only about a small sample of their expenditure items. The light monitoring survey is unlike the full LSMS or Integrated Surveys, which are more comprehensive, typically covering dozens of household expenditure items. The use of the light monitoring survey may, however, lead to significant errors in allocating resources. The resulting cost and leakage may far outweigh the savings from using a light monitoring survey instead of a full household survey. Fofack presents a methodology for estimating total household expenditures from a light monitoring survey and demonstrates the reduction in the rate of mistargeting and leakage that can be achieved. The regional poverty predictors derived from this methodology are shown to be effective instruments for targeting poverty alleviation.

VI. CONCLUDING REMARKS

Geographical targeting can be a significant alternative for allocating resources to poverty alleviation in developing countries, especially in the face of shrinking public resources. With the accumulation of geographic data and improvements in GIS techniques, much greater efficiency can be achieved with this targeted scheme. The articles in this symposium present alternative econometric methods for mapping poverty at increasingly smaller geographic areas. Two of the articles present methods for targeting at the village level. At this level the budgetary costs of geographical targeting and the leakage to the nonpoor can be significantly reduced. The main reason for this greater efficiency is that the population tends to be relatively homogeneous and variations in per capita income between households in a village are low. In large geographic areas, in contrast, income variance is much higher, and the potential for greater leakage may increase the budgetary

costs and reduce program effectiveness. However, the lack of necessary data and administration needed to oversee poverty reduction programs in many developing countries makes geographic targeting cost-effective, even for larger geographic areas.

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