Inequality and Social Welfare

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Chapter 2
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2.1 Introduction

High levels of inequality contribute to high levels of poverty in several ways. First, for any given level of economic development or mean income, higher inequality implies higher poverty, since a smaller share of resources is obtained by those at the bottom of the distribution of income or consumption. Second, higher initial inequality may result in lower subsequent growth and, therefore, in less poverty reduction. The negative impact of inequality on growth may result from various factors. For example, access to credit and other resources may be concentrated in the hands of privileged groups, thereby preventing the poor from investing. Third, higher levels of inequality may reduce the benefits of growth for the poor because a higher initial inequality may lower the share of the poor's benefits from growth. At the extreme, if a single person has all the resources, then whatever the rate of growth, poverty will never be reduced through growth.

The rationale of this chapter is not principally related to the arguments above regarding the impact of inequality on growth. We argue that, independent of inequality's impact on poverty, inequality has a direct, negative impact on social welfare. According to the theory of relative deprivation, individuals and households do not assess their levels of welfare in terms of their absolute levels of consumption or income only. Individuals also compare themselves with others. Therefore, for any given level of income in a country, high inequality has a direct, negative effect on welfare. There are good reasons to be interested in inequality and social welfare from the perspective of a comprehensive evaluation of public policies and social programs that go beyond their impact on poverty.

Policymakers constantly confront the problems inherent in evaluating social programs and policies. With an emphasis on poverty reduction, the countries preparing Poverty Reduction Strategy papers (PRSPs) may rely on poverty-derived distributional weights for assessing the effects of social programs and other public policies on welfare. The problem with distributional weights based on standard poverty measures is that they place no weight at all on the welfare of the nonpoor, even though those just above the poverty line may be highly vulnerable. The framework presented in this chapter provides an alternative in which the gains to all members of society are taken into account, although such gains are weighted differently. Using a flexible social welfare function, two summary parameters (one for growth, one for redistribution) can be estimated to assess the impact of a program or policy on social welfare. The parameters are flexible enough to take into account weighting schemes with various degrees of emphasis placed on poorer members of society. Decompositions of the distributional parameter provide insights into the targeting mechanisms of programs and policies. In other words, this chapter provides a simple yet flexible framework for evaluating social programs and public policies that differs from the traditional approach based on poverty measurement.

The chapter has four main sections. Section 2.2 presents the extended Gini index used for measuring inequality. It also presents and illustrates the source decomposition of the Gini used to analyze how changes in income and consumption sources affect overall inequality. Sections 2.3 and 2.4 provide a wide range of policy applications of the source decomposition of the extended Gini index. Section 2.3 shows applications of the basic framework. Section 2.4 presents extensions for testing the robustness of evaluation results for the social preferences implicit in the choice of a specific inequality measure. It also provides techniques for analyzing the impact on inequality of the targeting of programs as opposed to the rules for the allocation of benefits among program participants. Section 2.4 further presents extensions for analyzing the impact of programs on the poor and the nonpoor separately.

In very poor countries, economic growth rather than income redistribution is the key for long-term poverty reduction. Evaluating programs and policies according to their impact on distribution alone may lead to the rejection of interventions that may not be highly redistributive yet have strong growth potential. This may be detrimental not only to poverty reduction but also to the overall level of well-being in society. Section 2.5 demonstrates how to take into account the impact of programs and policies on growth while still considering their impact on inequality. The section introduces a flexible social welfare function for evaluating public policies. Section 2.5 analyzes changes in social welfare by distinguishing between the impact of programs and policies on the level of well-being achieved in a society (growth component) and the inequality in well-being among society's members (redistribution component). The

section also discusses the issues related to the financing of public interventions. This discussion is based on the concept of the marginal cost of funds used in public finance.

Section 2.6 summarizes the main advantages and potential drawbacks of the evaluation framework proposed in this chapter. Because the preparation of this chapter was funded in large part by the Regional Studies Program of the Office of the Chief Economist for the Latin America Region at the World Bank, many of the illustrations are based on data from Latin America. Yet examples from other regions are provided as well, and the tools can be applied to any region or country. Technical notes to this chapter detailing the methodologies are given in the annex to volume 1 of this book.

2.2 Inequality Measures and Decompositions

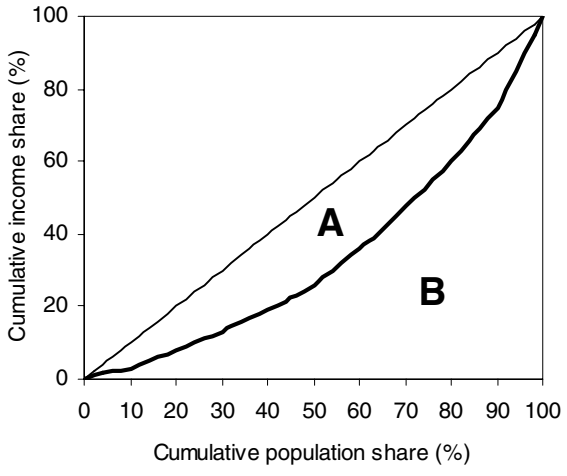
Inequality in income, consumption, and other indicators of well-being is a concern for policymakers. After introducing the inequality measure we rely on in this chapter—the extended Gini index—we present the Gini source decomposition that has been used in the literature to analyze the determinants of inequality and the policies that can be implemented to reduce it. The decomposition reviews the impact of various income or consumption sources on the overall level of inequality. Using the decomposition, we explain how to assess the impact at the margin of social programs and public policies on the distribution of income and consumption. An illustration is provided for Mexico. Section 2.5 extends the framework to take into account the impact of programs and policies on both the distribution of income and on growth, which enables us to look at the overall effects on social welfare.

2.2.1 Inequality measures and the extended Gini

As with poverty, various inequality measures are used in the literature. Practitioners use three main inequality measures: the Gini, Theil, and Atkinson indexes. Chapter 1, "Poverty Measurement and Analysis," defines these three measures. In this chapter, we extend the discussion to focus on policy applications. This chapter focuses exclusively on the Gini index, or coefficient (we use the terms "index" and "coefficient" interchangeably), not only because the Gini index is the most commonly used measure of inequality, but also because it has attractive properties that inform the policy analysis.

The Gini coefficient is a summary statistic that in most cases varies between zero and one.[1] A Gini index of zero implies complete equality of incomes: all individuals or households have exactly the same income per capita or per equivalent adult. A Gini index of one implies complete inequality; that is, one individual or household has all the income, and the others have no income at all. As noted in chapter 1, "Poverty Measurement and Analysis," the Gini can be represented graphically as a function of the Lorenz curve. In figure 2.1, the horizontal axis gives the cumulative share of the population ranked by increasing

Figure 2.1. Lorenz Curve and Gini Coefficient



per capita income. The interval 0–10 corresponds to the bottom income decile, while the interval 90–100 corresponds to the top income decile. The vertical axis represents the share of income enjoyed by the corresponding percentage of the population. It can be seen, for example, that the bottom 20 percent of households has about 5 percent of the total income in the sample. The Lorenz curve goes through the points (0, 0) and (100, 100). Perfect equality is represented by the diagonal line. The Lorenz curve is always below the diagonal line. A Lorenz curve farther away from the diagonal indicates a higher level of income inequality. A curve going through the points (0, 0), (100, 0) and (100, 100) would represent perfect inequality, with one household having all of the income in the sample. The Gini coefficient is equal to the area A divided by the sum of A and B (see technical note B.1 for a formal definition of the Gini index).

There are several intuitive interpretations of the Gini that make it easy to understand the meaning of what is measured. We give two such interpretations below.

- The value of the Gini represents the expected difference in incomes of two individuals or households randomly selected from the population as a whole. For example, a Gini index of 0.60 implies that if the mean per capita income in the population is $1,000 (all dollar amounts are current U.S. dollars), the expected difference in per capita income of two randomly selected households will be $600 (60 percent of mean income of $1,000).
- In terms of social welfare (this concept is discussed in more detail in section 2.5.1), if individuals or households assess their level of well-being not only in absolute terms (that is, how much income or consumption they have), but also in relative terms (that is, how much do they have in comparison to how much others have), the level of social welfare (W) in a society can be represented as the product of the mean income (μ) times one minus the Gini (G)—that is, $W = \mu (1 - G)$. With a Gini index of 0.60, a society with mean per capita income of $1,000 would have a level of social welfare of $400. This would be lower than the level of social welfare of a society with mean per capita or equivalent income of $800 and a Gini index of 0.40, yielding a social welfare level of $480. While this type of comparison of social welfare in two societies depends on the distributional weighting structure implicit in the use of the Gini, it can be generalized to other weighting structures or social preferences when using the "extended" Gini instead of the standard Gini. (The extended Gini provides flexibility in social preferences and is discussed below.)

The Gini coefficient is both a purely statistical measure of variability and a normative measure of inequality. The main advantages of the Gini over alternative inequality measures are as described below.

- As a statistical measure of variability, the Gini can handle negative income, a property some other inequality measures do not possess. This is important when dealing with the impact of a change in policy on inequality in income because the income of some households can be negative. Another advantage of the Gini and related concepts (such as the Gini income elasticity, defined below) is that these measures have statistical properties that are better known than those of other inequality measures. It is thus feasible to assess whether the impact of a change in policy on inequality in income or consumption is statistically significant at the margin.[2] This is currently not feasible for most other inequality measures. As shown in figure 2.1, the Gini has a geometrical representation, so that one can visualize differences in inequality among alternative distributions, as well as the differential impact of various income or consumption sources.
- The Gini index has solid theoretical foundations, which is not the case for some other inequality measures. As a normative index, the Gini represents the theory of relative deprivation (Runciman 1966), which is a sociological theory explaining the feelings of deprivation among individuals in society (Yitzhaki 1979, 1982). The Gini can also be derived as an inequality measure from axioms on social justice (Ebert and Moyes 2000).

As will be shown in section 2.4.1, the standard Gini index is a special case of a more general family of inequality measures known as the extended Gini.[3] The extended Gini can reflect different preferences among policymakers (that is, more or less pro-poor) when assessing the extent of inequality and the impact of various programs and policies on inequality. Specifically, the extended Gini can take into account various social preferences in terms of the weights placed on various parts of the distribution of income or consumption when measuring inequality. This is important to provide flexibility in the evaluation of development programs and policies. For example, when the emphasis is placed on poverty reduction, policymakers

using poverty-derived distributional weights for assessing the impact of social programs and other public policies on welfare are implicitly placing no weight at all on the welfare of the nonpoor. A similar lack of flexibility arises with the standard Gini coefficient, whose weights are fixed and largest at the mode or midpoint of the distribution. To provide an evaluation framework in which the gains to all members of society are taken into account, although weighted differently, policymakers may use the extended Gini instead of the standard Gini. The weights placed on various members of the population can then vary from a situation in which only the welfare of the poorest members of society matters (this is referred to as Rawl's maximin) to complete indifference toward inequality. As with the Gini, the extended Gini is based on the area between the 45 degree line and the Lorenz curve.

2.2.2 Source decomposition of the Gini and the Gini income elasticity

Source decompositions of the (extended) Gini have been used extensively[4] to analyze the determinants of inequality by income or consumption source—that is, to analyze how various sources of income or consumption affect the inequality in total income or consumption per capita (or per equivalent adult if the user relies on a specific equivalence scale, as discussed in chapter 1). Technical note B.1 presents the source decomposition in which a distinction is made between the absolute and the marginal contribution of an income or consumption source to inequality in total income or consumption. For policy simulations, it is the *marginal* contribution that matters.

The marginal impact on inequality of a change in income or consumption from a specific source depends on the source's Gini income elasticity (GIE). The formula for computing the change in inequality following a small proportional change in one income or consumption source is very simple (by proportional, we mean that all households with that particular income or consumption source are similarly affected in percentage terms). Specifically, the change in the Gini as a proportion of the initial Gini resulting from a 1 percent increase in income or consumption from source k, denoted by $\Delta G/G$, is equal to the share of source k in total income or consumption, denoted by S_k, times the GIE minus one.[5] The share of the source in total income or consumption matters because, all other things being equal, a 1 percent change in income or consumption from a large source is bound to have a larger impact on inequality than a 1 percent change from a smaller source. As for the GIE, it is an elasticity that tells us how much the overall Gini is affected by a small change in overall mean income or consumption resulting from a small proportional change in a particular income or consumption source. This type of change occurs, for example, when there is a change in the price of a commodity.

When an income or consumption source has a GIE of one, it means that it moves perfectly in sync with total income or consumption, so that a change in the source does not affect the overall inequality. A source with a GIE larger than one affects the richer part of the population more in percentage terms, while a source with a GIE smaller than one affects the poorer part more (the meaning of "richer" or "poorer" depends on the parameter chosen for the extended Gini). A source with a GIE equal to zero is not correlated with total income or consumption—for example, a universal allocation or a lump-sum tax identical for all would have a GIE of zero.

As mentioned above and described in more detail in technical note B.1, on a proportional basis (for instance, for a change in tax rate or interest rate applied to a given income or consumption base), the magnitude of the impact on inequality of a marginal change in a specific income or consumption source depends on the product of the share of total income or consumption represented by the source and its GIE minus one. On a per dollar basis, it can be shown that the magnitude of the impact on inequality of a marginal change in a source depends only on the GIE of the source minus one, and not on the share of the source in total income or consumption. In both types of simulations, the direction of the change in inequality depends solely on whether the GIE is smaller or larger than one. Table 2.1 gives the basic rules for interpreting the value of a GIE for income and consumption sources as well as taxes.

- ***Income or consumption source.*** When an income source has a GIE larger than one, a marginal increase in the income of that source results in a higher level of inequality. The larger the GIE, the larger the increase in overall inequality. The explanation for this result is that a GIE greater than one means that the share of the income source in a household's total income increases as total income rises. Hence, increasing the income source further will increase inequality. If the income

from a source with a GIE larger than one is reduced, inequality will be reduced at the margin. Income sources with a GIE close to one have no or little impact on inequality, whether the income from these sources is increased or reduced. A GIE smaller than one implies that increasing at the margin the income from the source reduces inequality (and, similarly, reducing the income from the source will increase inequality). The same rules apply for consumption. Sources with a GIE larger than one increase inequality at the margin as consumption from the source increases, while sources with a GIE below one reduce inequality at the margin. Sources with a GIE near one are inequality neutral.

- ***Income or consumption tax.*** The interpretation of the GIE is reversed when one deals with a tax because a tax reduces the household's income or its ability to consume. When an income tax or a tax on a commodity (a sales tax or a value added tax [VAT]) has a GIE larger than one, a marginal increase in the tax results in a lower level of inequality. The larger the GIE, the larger the decrease in inequality. For example, increasing taxation on luxury goods tends to reduce inequality. By contrast, if a tax with a GIE larger than one is reduced, inequality increases. Taxes on income or consumption goods with a GIE close to one are inequality neutral. Taxes on income or consumption with a GIE smaller than one increase inequality. Thus, reducing the tax on consumption items classified as basic needs reduces inequality.
- ***Price subsidies.*** A price subsidy is equivalent to a negative tax. Hence, increasing (decreasing) the subsidy for a consumption good with a GIE larger than one increases (decreases) inequality. For an increase (decrease) in the subsidy to reduce (increase) inequality, the good must have a GIE smaller than one. Price subsidies for goods with a GIE close to one are inequality neutral. Since a subsidy is a negative consumption tax, the rules for subsidies are reversed compared to those for consumption taxes.
- ***Public good.*** When dealing with a public good or any other good provided by the government, one has to look at the GIE of the willingness to pay. If the willingness to pay has a GIE greater (lower) than one, then increasing the quantity of the public good increases (decreases) inequality in real income.

A numerical example may elucidate the mechanics of decomposing the Gini by source and the use of the results of the source decomposition for policy analysis. In order to estimate the change in the Gini (ΔG) following a change in an income source k, we need to compute the value of $G * S_k * (\text{GIE}_k - 1)/100$. Assume that a government transfer accounts for 10 percent of total mean per capita income ($S_k = 0.1$) and has a GIE of 0.5. If the Gini is equal to 0.4, a 1 percent increase in the value of the transfer will reduce the

Table 2.1. Interpreting the GIE of an Income or Consumption Source

	GIE smaller than one	*GIE larger than one*
Income source		
Marginal increase in income from the source	Inequality reduced	Inequality increased
Marginal decrease in income from the source	Inequality increased	Inequality reduced
Consumption source		
Marginal increase in consumption from the source	Inequality reduced	Inequality increased
Marginal decrease in consumption from the source	Inequality increased	Inequality reduced
Tax on income source		
Marginal increase in the tax	Inequality increased	Inequality reduced
Marginal decrease in the tax	Inequality reduced	Inequality increased
Tax on consumption source or change in price		
Marginal increase in the tax or price	Inequality increased	Inequality reduced
Marginal decrease in the tax or price	Inequality reduced	Inequality increased
Price subsidy		
Marginal increase in the price subsidy	Inequality reduced	Inequality increased
Marginal decrease in the price subsidy	Inequality increased	Inequality reduced

Source: Authors.

Gini by $0.4 * 0.1 * (0.5 - 1)/100 = -0.0002$. The impact of an increase of 10 percent in the transfer outlays will be approximately 10 times larger, at -0.002, resulting in a new Gini of 0.398. Although this is a small change in the Gini, it was obtained from an increase of only 1 percent in total mean income (since the original transfer represented 10 percent of total income, and it has been increased by 10 percent). If the GIE for the transfer were equal to -0.5 (which would reflect better targeting to the poor), the same 10 percent increase in transfer outlays would decrease the Gini by $0.4 * 0.1 * (-0.5 - 1)/100 * 10 = -0.006$, with a new Gini approximately equal to 0.394.

Now assume that in order to finance the increase in transfer outlays, the government taxes an income source whose share of total income is 20 percent. To finance the 10 percent increase in transfers for a program that originally represents 10 percent of total income, a 5 percent tax must be imposed on the income source that represents 20 percent of income. If the income source that is taxed has a GIE of 2, the change in inequality due to the taxation of that source is equal to $-0.4 * 0.2 * (2 - 1)/100 * 5 = -0.004$. The minus sign results from a reduction in the incomes of the source being taxed. The total combined impact on inequality of raising transfers and raising taxes is the sum of both impacts (-0.006 - 0.004), so that after more taxation and more transfers, the new Gini is equal to 0.39.

Finally, assume that the policymaker is using the social welfare function $W = \mu (1 - G)$ mentioned in section 2.2.1, whereby social welfare is equal to the mean per capita income times one minus the Gini. If there are no negative or positive incentive effects from the policies,[6] social welfare will increase by 1 percentage point, since the Gini decreases by 1 percentage point and the mean level of per capita income remains the same. As this example shows, it is easy to use the mechanics of the source decomposition of the Gini to simulate the impact on social welfare of alternative policies. While the example relies on one specific social welfare function, the use of the extended Gini instead of the standard Gini helps in relaxing the assumptions placed on the social preferences of society's members or policymakers.

2.2.3 Application to income and consumption inequality in Mexico

To demonstrate what can be learned from the source decomposition of the Gini index of inequality, tables 2.2 and 2.3 provide the GIEs for a wide range of income and consumption sources in Mexico, with the overall Gini index computed using total per capita income or consumption. The exercise is done at the national, urban, and rural levels.

- ***Income sources in Mexico.*** Income sources related to assets (financial assets and ownership of houses, land, machinery, and other assets) tend to increase inequality at the margin; that is, growth in those components will increase inequality, as measured by per capita income. Pensions also tend to increase inequality slightly. Labor income and land rentals are inequality neutral. Gifts (which relate in part to remittances), agricultural and some other types of production, and public transfers tend to reduce inequality. The inequality-reducing effects of stipends from institutions (essentially for education) and of Procampo—a program that gives cash transfer payments to farmers—are strong. The GIE for the Procampo transfers is lower (more inequality-reducing) nationally than in both urban and rural areas, essentially because the majority of the transfers go to rural areas that are poorer than urban areas. In other words, the inequality-reducing impact of Procampo transfers within rural areas is not very large, because those who benefit from the transfers in rural areas are not much poorer than the rural population as a whole. But when those who receive Procampo transfers in rural areas are compared to the national population, they tend to be poorer than the typical Mexican family. As this example shows, the national GIE is not a straight population-weighted average of the urban and rural GIEs, and it is not even bounded by the urban and rural GIEs.[7] Apart from Procampo, several other income sources have national GIEs outside the range defined by the urban and rural GIEs. This is the case for sale of stocks; sale of houses and land; income from cooperatives, loans, and investments; income from services provided; rent received for land; labor income; and remittances from abroad.

Table 2.2. GIEs for Various Income Sources in Mexico (1996)

	Nation	Urban	Rural		Nation	Urban	Rural
Inequality-increasing sources				**Inequality-neutral sources**			
Sale of stocks	1.885	1.951	1.991	Small business, commercial	1.055	0.971	1.340
Mortgage and life insurance	1.668	1.662	2.039	Rent received for land	1.023	1.065	1.479
Rent received for housing	1.616	1.611	1.736	Labor income	0.953	0.910	0.928
Sale of houses and land	1.613	1.735	1.797	Other sources of income	0.939	0.953	0.858
Interest income	1.612	1.644	1.274	**Inequality-decreasing sources**			
Income from cooperatives	1.523	1.561	1.849	Agricultural production	0.903	1.593	0.672
Sale of machinery	1.499	1.636	1.304	Gifts from within the country	0.878	0.945	0.754
Indemnities	1.487	1.420	2.002	Small business, industrial	0.844	0.790	1.047
Other capital income	1.347	0.653	1.953	Remittances from abroad	0.734	0.782	1.218
Loans and investments	1.325	1.378	1.518	Other types of production	0.731	0.665	1.349
Income from services provided	1.176	1.131	1.065	Stipends from institutions	0.123	0.371	0.070
Pension and retirement	1.154	1.055	1.633	Income from Procampo	0.103	0.633	0.607

Source: Wodon and others (2000).

- ***Consumption sources in Mexico.*** Expenditures for culture and leisure, private transportation, communications, housing expenses, and education tend to be luxury goods, so that reducing their price will be inequality increasing. Water and most food items are normal goods, so that a decline in their price will be inequality decreasing, as are (somewhat surprisingly) health expenditures. Two government-means-tested programs—Liconsa (Leche Industrializada Conasupo)-subsidized milk and Fidelist free tortillas—are redistributive, even though it has been documented that leakage to the nonpoor in the two programs is substantial. Both programs have negative income elasticities in urban areas, which implies that the program benefits are "inferior" goods; that is, goods, whose consumption declines as income per capita increases. The redistributive impact of the programs is lower in rural areas, but the GIEs remain negative nationally. As was the case for various income sources, the GIE of many commodities at the national level are outside the range defined by rural and urban elasticities.

The results from source decompositions of the Gini index of inequality can be depicted graphically. In figures 2.2 and 2.3, the share of income or consumption of a source is represented on the vertical axis.

Table 2.3. GIEs for Various Consumption Sources in Mexico (1996)

	Nation	Urban	Rural		Nation	Urban	Rural
Inequality-increasing sources				**Inequality-decreasing sources**			
Other expenses	1.578	1.558	1.766	Water	0.918	0.791	0.987
Culture and leisure	1.549	1.456	1.699	Cleaning	0.913	0.867	0.854
Private transport	1.526	1.474	1.806	Meat and fish	0.750	0.605	0.977
Post, telegraph, phone	1.384	1.246	1.605	Health expenditures	0.650	1.144	1.324
Furniture, tools	1.357	1.306	1.738	Public transport	0.612	0.432	0.983
Imputed rent and charges	1.125	0.998	1.019	Cheese, oils, and so forth	0.488	0.419	0.604
Education	1.181	1.082	0.868	Vegetables and fruits	0.478	0.431	0.545
Inequality-neutral sources				Cereals	0.463	0.435	0.580
Other food and drinks	1.072	1.004	1.090	Other kinds of milk	0.398	0.252	0.944
Tobacco and alcohol	1.053	1.090	1.003	Sugar, salt, and so forth	0.340	0.383	0.459
Pasteurized milk	1.044	0.851	1.293	Tortillas	0.120	-0.126	0.732
Auto consumption	1.039	1.005	0.934	Liconsa (subsidized milk)	-0.343	-0.783	0.417
Clothes and shoes	1.008	0.986	1.006	Fidelist (free tortillas)	-0.666	-1.042	0.341
Domestic material	0.991	1.029	1.175	Corn flour	-0.841	-0.262	-0.154
Electricity	0.952	0.842	1.043				

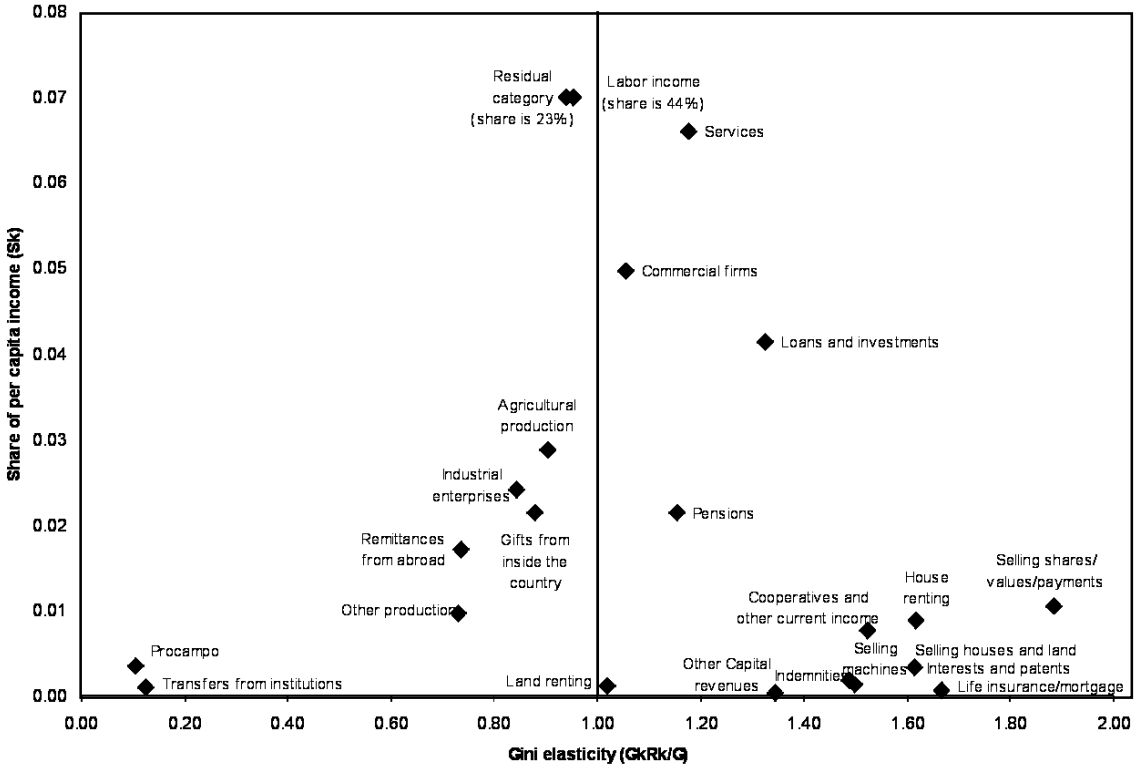
Source: Wodon and others (2000).

The GIE is represented on the horizontal axis. All sources to the left of the vertical line (crossing the horizontal axis at a value of the GIE of one) are inequality decreasing at the margin, while sources to the right side of the vertical line are inequality increasing. The farther a source is to the left (right) of the vertical axis, the more it is inequality reducing (increasing) at the margin. Government programs such as Procampo, other public transfers, and food subsidies tend to be on the far left, which indicates their redistributive impact.

All GIEs are per dollar of income or consumption, so they do not depend on the size of the income or consumption source. Therefore, the GIEs can be used for policy recommendations, because one can compare the GIE of one income or consumption source with the GIE of another source. The following are examples of policy discussions for food subsidies (for more details, see Wodon and Siaens [1999]).

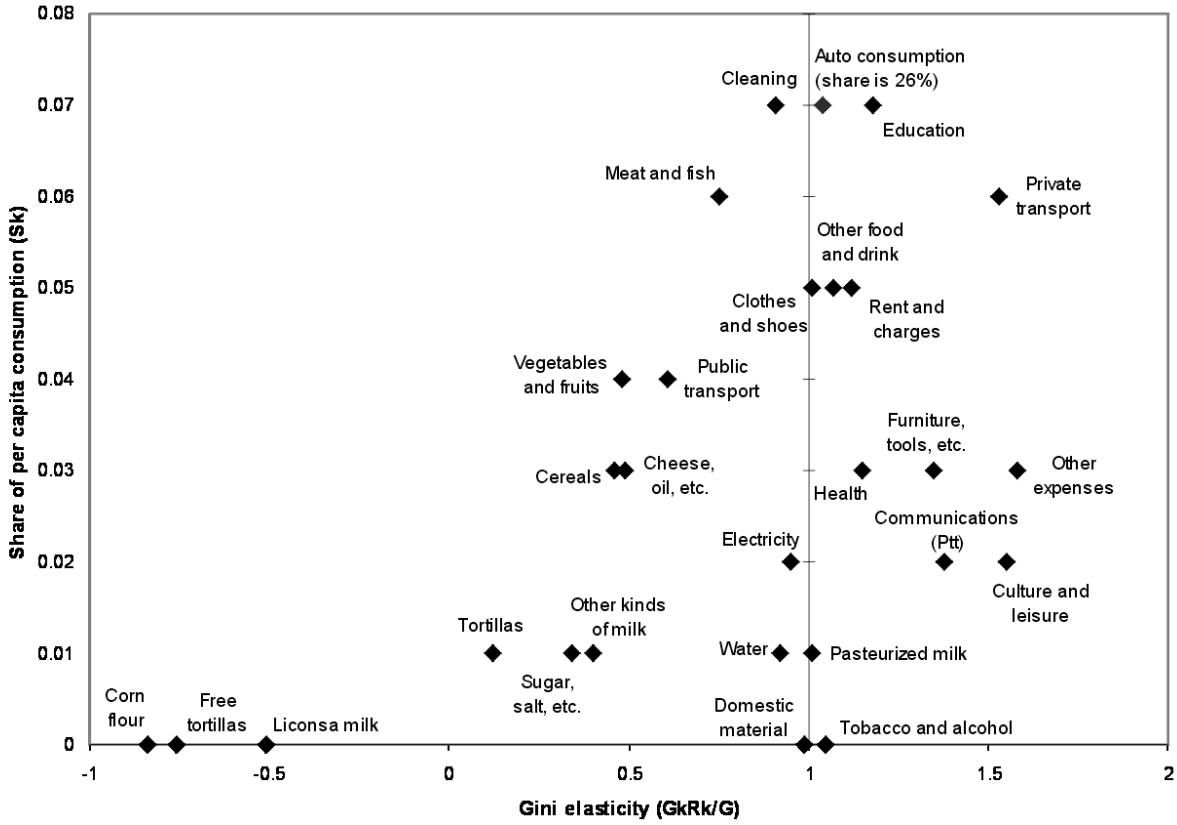
- For many years, the government of Mexico provided general subsidies for tortillas. Part of the rationale was that, since tortillas represented a larger share of the consumption of the poor than the consumption of the nonpoor, the subsidy was to some extent self-targeted. It is true that the tortilla subsidy reduced inequality, since its GIE was well below unity (0.120 nationally). The subsidy was inequality reducing, especially in urban areas (GIE of -0.126 versus 0.732 in rural areas), and its impact was much larger than that of subsidies for utilities such as water (national GIE of 0.918) and electricity (national GIE of 0.952). However, the tortilla subsidy generated price distortions (These cannot be analyzed with the GIE alone; they are discussed conceptually in section 2.5.2), and it was costly. Furthermore, the subsidy was less effective in reducing inequality than would have been a generalized subsidy on corn flour, the basic ingredient used to make tortillas. This can be seen in figure 2.3, where corn flour is to the left of tortillas; that is, the GIE for corn flour is smaller.
- Within food subsidies, means-tested subsidies tend to be better than generalized subsidies. The general subsidy for tortillas was phased out in the first few months of 1999, and the proceeds were used to improve and expand targeted subsidies. A free tortillas program administered by Fidelist

Figure 2.2. National Gini Decomposition by Income Source in Mexico (1996)



Source: Wodon and others (2000).

Figure 2.3. National Gini Decomposition by Consumption Source in Mexico (1996)



Source: Wodon and others (2000)

is currently accessible to families earning less than the sum of two minimum wages. These families are eligible to receive one kilogram of free tortillas per day. Participants use a bar-coded card that is scanned at participating tortillerias. The owner of the tortilleria is later reimbursed for the cost of the free tortillas distributed. Independent of the more fundamental question of whether or not food subsidies are a good policy instrument, the move from generalized to targeted subsidy was a good decision because means-tested food subsidies are more inequality reducing and less costly. Figure 2.3 shows that the reduction in inequality achieved with the generalized tortilla subsidy (represented in the figure by the category "Tortillas") does not come close to the reduction achieved with the means-tested tortilla subsidy (represented in the figure by "Free tortillas").

- Within means-tested food subsidies, the various programs have a similar redistributive effect. This can be seen by noting that "Liconsa milk" and "Free tortillas" are close to each other in figure 2.3. Liconsa has been producing milk for Mexico's poor for the last 15 years. Qualifying families can purchase from eight to 24 liters of milk per week at a discount of roughly 25 percent versus the market price. To qualify, families must earn less than the combined total of two minimum wages and have children under 12 years of age. The ration of milk is determined by the number of children under 12 (eight liters for families with one or two children, 12 liters for three children, and 24 liters for four or more children). About 5.1 million children benefit from the subsidies. Overall, the two programs have similar effects.

2.3 Policy Applications of the Source Decomposition

In this section, we show how to use the concept of the GIE for policy analysis in a wide variety of areas, focusing on the redistributive effects of programs and policies, that is, ignoring their impact on growth (this aspect is discussed separately in section 2.5). Although the tools provided by the source decomposi-

tion of the Gini can be applied to the analysis of inequality over time and the risks faced by households, we do not discuss this here.

2.3.1 Simulations per dollar spent: Transfers in the Czech Republic

The first example deals with income transfers in the Czech Republic. We use GIE estimates from Piotrowska (2000), who used household survey data for 1994 and 1997 to analyze the impact of income taxes and various government transfers on inequality in the Czech Republic. Column 1 in table 2.4 presents some of Piotrowska's results for 1997. Apart from the income tax, four types of transfers are analyzed. All transfers reduce inequality (each GIE is well below one). The ranking of the transfers in terms of their redistributional effect, from the least to the most redistributive, is the following: unemployment benefits, child allowances (means-tested and paid to families with children, with the benefit depending on the age of the child), supplementary benefits (means-tested and given to households with income below the subsistence level), and parental benefits (means-tested and paid to a nonworking parent who takes care of a child under three years of age, or under seven years of age if the child is disabled). Columns 2 and 3 in table 2.4 use the GIEs from column 1 to perform simulations.

- ***Balanced budget inequality reduction.*** Assume that the government wants to reduce inequality by reallocating expenditures between programs without increasing total outlays. One possibility is to reduce funding for unemployment benefits and increase funding for other programs. The GIE of an intervention shifting $1.00 from unemployment benefits to child allowances is -0.330.[8] A more redistributive alternative would be to shift $1.00 from unemployment benefits to parental benefits (with a resulting GIE of -1.108).
- ***Constant inequality budget saving.*** Now assume that the government wants to reduce its budget deficit while keeping inequality unchanged. For every dollar of unemployment benefits that is cut, what should be the increase in other transfers needed so that inequality remains constant? It can be shown that inequality will remain intact if a $1.00 decrease in unemployment benefits is accompanied by an increase in child allowances of $0.830, which would result in a net savings for the state of $0.170. For parental benefits, the required increase is only $0.594, which would result in a savings of $0.407.[9]

2.3.2 Simulations with percentage changes: The VAT in South Africa

The next example of applying source decomposition to policy modeling is based on South African data. This example reveals the distributional impact of indirect taxes levied on consumption goods and services. The first line in table 2.5 shows the VAT, which represents 6 percent of total income. The VAT is slightly regressive (GIE is smaller than one). The commodities in the rest of table 2.5 have no VAT; that is, they are not taxed. The GIEs for these commodities suggest, for example, that expenditures on sour milk decline with income (negative GIE). By contrast, the GIEs of skim milk, brown bread, fish, and oil are closer to the GIE of the VAT. This means that, although inequality would increase if these commodities were taxed, they might still be candidates for incorporation into the base of the VAT if the government

Table 2.4. Policy Simulations per Dollar Spent: Transfers in the Czech Republic (1997)

	Gini income elasticity	*Balanced budget inequality reduction: GIE of a $1.00 cut in unemployment benefits compensated by an additional $1.00 in another program*	*Constant inequality budget saving: Spending needed to offset a $1.00 cut in unemployment benefits in order to keep overall inequality unchanged*
Unemployment benefits	- 0.614	1.000	$1.000
Child allowances	- 0.944	-0.330	$0.830
Supplementary benefits	- 1.333	-0.719	$0.692
Parental benefits	- 1.712	-1.108	$0.594

Source: Authors' computations based on GIEs from Piotrowska (2000).

deemed a revenue increase necessary. To give another example, table 2.5 suggests that exempting eggs from the VAT is more justified on distributional grounds than exempting vegetables, which itself is more justified than exempting fresh fruits.

If policy simulations were to be conducted on a per dollar basis, one would subtract from each GIE, and the results between commodities would be compared, as was done in the previous section with income sources. If the effect of a reform of the VAT is to be evaluated, however, the change in tax revenue caused by changes in tax rates must be evaluated. The analysis must be conducted on a proportional rather than on a per dollar basis. Assuming that there is no behavioral response to the tax changes, the share of the expenditure on the commodity can serve as a proxy for the revenue collected through the tax. For example, if we assume that a tax is imposed on fresh milk, inequality will increase, because the GIE is less than one. To compensate for that, one could ask what should be the subsidy on rice to keep inequality intact. A 3 percent subsidy on rice would be needed to offset the effect on inequality of a 1 percent tax on fresh milk. Similar exercises could be done to find the effect on inequality of revenue-neutral, indirect tax reforms.

2.3.3 Combining taxes and transfers: Unemployment benefits in Chile

Our third example deals with the proposal to move from unemployment assistance to Unemployment Insurance Savings Accounts (UISAs) in Chile. Although unemployment benefit programs remain rare in very poor countries, a number of middle-income countries have implemented, or at least considered, such programs in recent years, especially in Latin America. These programs have also existed for some time in transition economies.

Under Chile's current system, upon losing their jobs, formal sector workers receive limited unemployment benefits and potentially larger severance payments. The unemployment benefits are financed through general tax revenues (tax revenues from many different sources, including the income tax and the VAT), while the severance payments are paid by firms. The main problem with the current system is not so much that the system might create negative incentives (for the supply of labor among those receiving benefits, for instance) but that unemployment benefits are low, so that the coverage of the program among the unemployed is also low, partly because many workers choose not to apply for benefits.

Under the Chilean UISA system, which has been discussed by the legislature but not yet implemented, each employed worker would make a fixed, mandatory minimum contribution to his or her UISA each month, with the option of voluntary contributions above the minimum level. Upon becoming unemployed, an individual worker would be entitled to withdraw a fixed maximum amount per month from his or her UISA (smaller withdrawals would also be permitted). If the individual's UISA balance were to fall to zero, or become seriously depleted, he or she would be entitled to unemployment assistance financed through a tax levied on all wage earners. If workers retire with a positive balance in their UISA, they can use the balances to supplement their pensions. Overall, the workers themselves would play a much larger role in financing their own support during periods of unemployment.

The main advantage of UISAs is that they would set the right incentives; they would not distort the behavior of employees and firms. This is because the funds taken by an unemployed individual from the

Table 2.5. Policy Simulations on a Proportional Basis: The VAT in South Africa (1994)

	Share	*GIE*		*Share*	*GIE*
VAT	6.00	0.90	Mealie meal	0.02	-0.02
Fresh milk	0.07	0.38	Rice	0.02	0.27
Sour milk	0.0	-0.20	Mealie rice and samp	0.0	-0.01
Skim milk	0.0	0.47	Brown bread	0.02	0.42
Eggs	0.02	0.27	Fish	0.01	0.61
Fresh vegetables	0.09	0.31	Oil	0.01	0.52
Fresh fruit	0.06	0.39	*Total*	0.30	0.69

Source: Yitzhaki (1999).

UISA directly reduces the individual's personal wealth by an equal amount, so that individuals fully internalize the cost of unemployment compensation. UISA systems are not without risks, however, and one of the risks relates to the distributional implications of moving from the current system to the proposed reform. An analysis of these distributional implications has been done by Castro-Fernandez and Wodon (2001), using information on the GIEs of the two alternative unemployment benefit systems and their financing mechanisms through taxes.

To analyze the distributive impact of the current system, it is necessary to take into account both the benefits provided and the way funds are raised to provide these benefits.

- ***GIE for the current system of unemployment assistance.*** This GIE was estimated using data from the 1998 *Caracterización Socioeconómica Nacional* (CASEN) survey, which gives information on who benefits from the program and the amount received by program participants. The GIE is equal to -0.84, which is highly redistributive. The low value of the GIE is not surprising because the amount provided by the program is fairly small. Hence, participation in the program is higher among those unemployed who have few other resources on which to rely to cope with the loss of earnings resulting from unemployment.
- ***GIE for the general tax revenues used to fund the current system.*** The current system of unemployment assistance is funded through general tax revenue. Since each additional dollar provided for assistance must be raised through taxation, we need to take into account the GIE of general tax revenues, which in 1996 was equal to 0.90. Hence, the current tax system is regressive (the GIE is smaller than one).[10]
- ***Combining both estimates for the current system.*** In order to estimate the distributive impact of the current system of unemployment assistance, it is necessary to total the impacts for the unemployment benefits and the taxes. Each marginal impact is equal to the relevant GIE minus one. This yields a marginal impact on inequality proportional to -0.84 - 1 - (0.90 - 1) = -1.74. To assess the actual impact on the Gini, we would need to take into account the income share accounted for by the benefits, but this is not necessary here because our objective is only to compare at the margin the current benefits with the proposed UISAs.

To analyze the distributive impact of the proposed UISAs, it is also necessary to take into account both the benefits provided and the way through which funds are raised to provide the benefits. This requires estimates for two GIEs. On the benefits side, we need to estimate the GIE for the unemployment allowance that would be received by workers once they have depleted or exhausted their UISA. On the tax side, we need to estimate the GIE for the tax on formal sector wages that would be used for the unemployment assistance benefits received after the UISA is exhausted. (The part of the levy on formal wages used to fund the UISA of the individual need not be taken into account since this tax is directly returned to the worker.)

- ***GIE for the benefits (UISA-based system of unemployment assistance).*** To estimate this parameter adequately, we would need to forecast the probability of being unemployed for formal sector workers, the expected balance in their UISA when unemployed, and the expected public

Table 2.6. Assessing the Impact of a Reform of Unemployment Benefits in Chile (1998)

	Impact on inequality
Current system of unemployment assistance	
GIE for benefits minus one	-1.84
Minus (GIE for taxes minus one)	0.10
Combining both GIEs	-1.74
Proposed UISAs reform	
GIE for benefits minus one	-1.46
Minus (GIE for taxes minus one)	0.00
Combining both GIEs	-1.46

Source: Castro-Fernandez and Wodon (2001).

unemployment assistance once they have depleted their UISA. This is a difficult task. As a proxy, we can use a GIE representing the position in the income distribution of those unemployed workers who belonged to the formal sector before becoming unemployed. This information is available in the 1997 National Employment Survey. Using this survey, the GIE was found to be equal to -0.46. Using this GIE is equivalent to assuming that all the workers who are now unemployed, and who belonged to the formal sector before being unemployed, have the same length of unemployment, deplete the funds available in their UISA at the same time, and have the same expected benefit from unemployment assistance after the depletion of their UISA.

- ***GIE for the taxes (to fund the UISAs and the proposed public transfers once the UISAs have been exhausted).*** Since the taxes that would fund the UISA system are proportional to the wages of formal sector workers, the GIE for the taxes is equal to the GIE for the source of income represented by these wages. It turns out that the GIE is virtually equal to one, so that on the taxation side the taxes for the UISA have no impact on inequality.
- ***Combining both estimates for the proposed reform.*** Given that under the new system, the GIE for the UISA-based assistance would be -0.46, and the GIE for tax revenues on formal sector wages would be 1.00, the total impact at the margin would be proportional to -1.46.

In comparing the GIE of the benefits under the proposed reform with the GIE of the benefits under the current system, the unemployment assistance provided under the UISA system, although still redistributive (the GIE is less than one), would be less redistributive than the current system per dollar spent, essentially because in the new system we implicitly assume that participation would not be limited to the poorest. On the tax side, however, using a wage tax rather than general tax revenues for financing unemployment benefits would be beneficial from a distributional point of view because the GIE for general tax revenues was found to be equal to 0.90, while the GIE for taxes on formal sector wages is one. Overall, under the simple assumptions made for obtaining the GIE estimates, the new system would be less redistributive than the current system (GIE of -1.46 for UISAs versus -1.74 for the current system), but it would still be highly redistributive.

Although the exercise above provides useful information for policymakers, other considerations would have to be taken into account for evaluating the pros and cons of both types of unemployment benefits. For example, although the redistributive impact per dollar spent on unemployment benefits of a UISA-based system would probably be smaller than the redistributive impact of Chile's current unemployment assistance system, the complementary unemployment assistance component of the new system would likely have a much better coverage because the value of the benefits would be higher.

2.3.4 Beyond taxes and transfers: Basic infrastructure in Honduras

The fourth example deals with the provision of basic infrastructure services to households that currently lack access to these services. Various methods can be used to assess the impact on inequality and social welfare of policies promoting access to basic infrastructure services for the poor. One possibility is to estimate the implicit rental value of access to services and to add this value to the income or consumption of households without access.[11] Since the total rent paid by tenants reflects the various dwelling amenities, the willingness to pay for each separate amenity can be retrieved from the estimation of a regression relating the rent paid to the dwelling's characteristics. The implicit rental value of amenities can also be used in owner-occupied houses as a proxy for the willingness to pay for access to basic services, or as a proxy for the value of these services if access is provided by the state or municipality without charge.

The method above was applied by Siaens and Wodon (2001) to data from several Latin American countries. Using a nationally representative survey for September 1998 in Honduras, access to electricity, water within the house, and a sanitary installation were found to increase the rental value of a dwelling by 31 percent, 41 percent, and 36 percent, respectively. The resulting value of access to basic services was added to the income of households to simulate the effect on inequality of the public provision of access to the services. In doing so, it is assumed that the households pay for their consumption of, say, water and electricity, but not for their initial connection to the network; that is, the cost of access is publicly funded.

The GIEs in table 2.7 reveal that providing access to electricity for those who have none would be more inequality reducing (GIE of -0.30) than providing access to sanitation (GIE of -0.15) or water (GIE of 0.07), even though, for all three services, providing access would be inequality reducing at the margin. Table 2.7 also shows the GIE for the existing electricity subsidy in Honduras. The subsidy is given to all households that consume below 300 kilowatt-hours per month (these households represent 85 percent of the population with access to electricity). There is some level of self-selection in the electricity subsidy because of the consumption ceiling above which households are not eligible, but the ceiling is so high that the subsidy is poorly targeted to the poor. This is reflected in the GIE for the subsidy, which is inequality increasing at the margin (value of 2.06, well above the inequality-neutral value of one). Table 2.7 suggests that unless it is prohibitively expensive to provide access to electricity to households currently without access, providing such access would have larger positive effects on social welfare than the current practice of giving consumption subsidies to those with access.

2.4 Extensions to the Source Decomposition Methodology

This section presents three extensions to the GIE method. The first extension assesses the robustness of the results obtained for the GIEs of various social programs to the underlying structure of social preferences implicit in the use of the standard Gini index, as opposed to the extended Gini index. In the second extension, we show how to decompose the GIE of a program or policy into two components: a targeting GIE that reflects who does and does not benefit from the program and an allocation GIE that reflects the impact of potentially different benefit levels for program participants. In the third extension, we show how to decompose the GIE in order to analyze the impact of a program on the poor and the nonpoor.

2.4.1 Robustness test with the extended Gini

The comparison of the redistributive impact of various programs and policies can be sensitive to the weights placed on various segments of the population. The choice of a weighting scheme is inherent in the use of an inequality measure. However, as mentioned earlier, to test for the sensitivity of the policy analysis to the distributional weights implicitly used in the inequality measure, one can use the extended Gini coefficient instead of the standard Gini. The extended Gini depends on one parameter, typically denoted by ν. The standard Gini corresponds to ν equal to two. A lower value places more weight on the top part of the distribution, while a higher value places more weight on the bottom part of the distribution. The higher the value for ν, the larger the weight placed on poorer households or individuals.

To illustrate the use of the extended Gini, we rely on an analysis of income sources in the United States done by Lerman and Yitzhaki (1994). Using the March 1987 Current Population Survey, Lerman and Yitzhaki estimated the GIEs of 22 income sources. As was the case in figure 2.2, the horizontal axis in figure 2.4 represents the GIE of the income source, while the vertical axis represents the source's share in total per capita income. The income sources located farther to the left of the horizontal axis are the most redistributive at the margin.

Consider, for example, the energy voucher Low-Income Home Energy Assistance Program (LIHEAP). The program provides vouchers to low-income households to help them pay for their energy

Table 2.7. Assessing the Impact of Access to Basic Infrastructure in Honduras (1998)

	Impact on inequality
Access to basic infrastructure services	
GIE for water	0.07
GIE for sanitation	-0.15
GIE for electricity	-0.30
Existing consumption subsidies	
GIE for electricity subsidies	2.06

Source: Siaens and Wodon (2001).

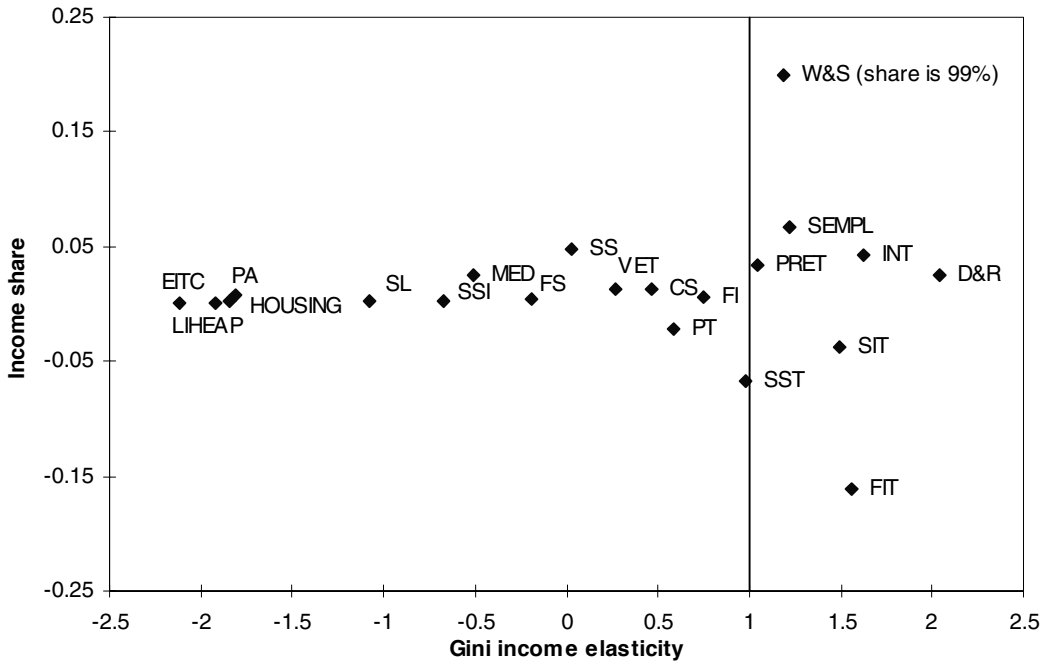
needs. LIHEAP was created in the United States in 1980 following rising energy prices. Today, the program remains means tested, with three main components: (1) a crisis component for preventing utility disconnection in times of high heat and very cold weather, (2) a year-round heating and cooling assistance component for low-income households, and (3) a weatherization component to improve housing quality and reduce energy bills. Although LIHEAP is a small program (small income share), it is fairly good in terms of its marginal redistribution of income toward the poor. There is only one social program more inequality reducing than LIHEAP: the Earned Income Tax Credit, which reduces the tax rate for the working poor. LIHEAP does better in terms of reducing inequality than public assistance (PA), low-income housing (HOUSING), school lunches (SL), Supplemental Security Income (SSI), medical benefits such as Medicare and Medicaid (MED), food stamps (FS), and social security (SS).

In table 2.8 the GIEs computed by Lerman and Yitzhaki are used to answer the question, What would be the magnitude of the change in an income source that would be necessary in order to have the same impact on inequality as a $1.00 increase in wages and salaries? For the standard Gini ($\nu = 2$), the table shows both the GIE and the change in each income source having the same impact on inequality as a $1.00 increase in wages. LIHEAP's GIE is -1.924, as opposed to a GIE of 1.192 for wages and salaries. When applying the rules for using GIEs, in order to have the same increase in inequality as that caused by a $1.00 increase in wages and salaries, it would be necessary to decrease LIHEAP benefits by $0.066. If more emphasis were placed on the poor by using the extended Gini, a smaller reduction in LIHEAP benefits would have the same impact ($0.047 for $\nu = 4$, $0.035 for $\nu = 6$). One can also see from table 2.8 that in most cases, the ranking of the redistributive impact of transfer programs is not sensitive to whether the standard or the extended Gini is used.[12] In normative terms, the use of the extended Gini helps in checking whether the ranking of the redistributive impact of various programs is robust to the social preferences implicitly taken into account when using any one inequality measure.

2.4.2 Targeting versus allocation among program beneficiaries

The rules of operations of social programs often include eligibility mechanisms as well as allocation mechanisms for the distribution of program benefits among the population deemed eligible. The

Figure 2.4. National Gini Decomposition by Income Source in the United States (1987)
(standard Gini with ν = 2; for symbols, see table 2.4)



Source: Adapted from Lerman and Yitzhaki (1994).

Table 2.8. Changes in Income Sources with Equal Effects on Inequality in the United States (1987)

	Change in income source for standard Gini (ν = 2)		*Change in income source for the extended Gini*	
	GIE for ν = 2	*Change in income source for ν = 2 ($)*	*Change in income source for ν = 4 ($)*	*Change in income source for ν = 6 ($)*
Wages and salaries (W&S)	1.192	1.000	1.000	1.000
Self-employment income (SEMPL)	1.219	0.877	1.801	2.203
Farm income (FI)	0.751	- 0.771	- 0.885	- 3.457
Dividends and rents (D&R)	2.039	0.185	0.283	0.300
Interest income (INT)	1.620	0.310	0.454	0.049
Private retirement income (PRET)	1.041	4.683	2.316	1.407
Child support (CS)	0.461	- 0.356	- 0.263	- 0.201
Social security, railroad retirement (SS)	0.027	- 0.197	- 0.206	- 0.194
Supplemental Security Income (SSI)	- 0.671	- 0.115	- 0.280	- 0.254
Veterans' benefits, unemployment insurance (VET)	0.273	- 0.264	- 0.105	- 0.094
Public assistance (PA)	- 1.808	- 0.068	- 0.050	- 0.038
School lunch benefits (SL)	- 1.083	- 0.092	- 0.075	- 0.060
Medical benefits noninstitutional (MED)	- 0.512	- 0.127	- 0.112	- 0.095
Food stamps benefits (FS)	- 0.190	- 0.161	- 0.048	- 0.036
Housing benefits (HOUS)	- 1.847	- 0.067	- 0.049	- 0.037
Earned Income Tax Credit (EITC)	- 2.112	- 0.062	- 0.041	- 0.028
Energy assistance (LIHEAP)	- 1.924	- 0.066	- 0.047	- 0.035
Property taxes (PT)	0.589	- 0.467	- 0.405	- 0.293
Federal income taxes (FIT)	1.559	0.343	0.628	1.411
Social security taxes (SST)	0.978	- 8.727	- 13.160	- 2.887
State income taxes (SIT)	1.494	0.389	0.613	1.025

Source: Lerman and Yitzhaki (1994).

performance of programs or lack thereof may thus be due to the selection mechanism for determining eligibility and the participation rate of the program among those eligible (this is referred to as targeting), to the rules for distributing benefits among program participants (this is referred to as allocation), or to both. The decomposition of the GIE proposed in this section enables the analyst to measure whether good (bad) performance of a program is due to good (bad) targeting or good (bad) allocation of benefits among participants. Specifically, as discussed in Wodon and Yitzhaki (forthcoming), the GIE of an income or consumption source can be decomposed into the product of a targeting GIE and an allocation GIE (see technical note B.2).

- ***Targeting GIE.*** The targeting GIE measures what would be the effect of a program on inequality if all those who benefit from the program were receiving exactly the same amount. Because all participants receive the same transfer, this GIE provides the impact of pure targeting (who gets the program and who does not) on inequality.
- ***Allocation GIE.*** The allocation GIE measures the effect of social welfare of the differences in the benefits received by various program participants, controlling for the existing targeting of the program. If there are no differences in the benefits received by various participants, the allocation GIE is equal to one. If poorer participants receive more, or less, the elasticity will be different from one.

To demonstrate the methodology, we follow Clert and Wodon (2001), who analyzed programs targeted by the government of Chile using a means-testing procedure known as the *ficha* CAS (*ficha de estratificación social*). The *ficha* CAS is a two-page form that households must complete if they wish to apply for benefits. Each household is given a score on the basis of the form, which is used to determine program eligibility. The use of the *ficha* for many programs reduces the cost of means testing. The cost of

the interview needed to complete the CAS is $8.65 per household. Chile's Ministry of Planning estimates that 30 percent of households undergo interviews, which seems reasonable given that the target group for the subsidy programs is the poorest 20 percent. In 1996, administrative costs represented 1.2 percent of the benefits distributed using the CAS system. If the costs were borne by the water subsidies alone, for example, they would represent 17.8 percent of the subsidies. The main programs targeted with the *ficha* CAS are: (a) means-tested state pensions provided to elderly or disabled individuals through a program called PASIS (*Pensión de Asistencia*); (b) family allowances to help parents cope with the extra expenses of the birth of a child, as well as with the possible reduction in earnings resulting from pregnancy and delivery; (c) water subsidies of 20 to 85 percent of the utility bill for the cost of consuming up to 15 cubic meters per month; (d) subsidies for the construction of new social housing units, or the improvement of existing units; and (e) free childcare for working mothers.

Table 2.9 gives the estimates of the GIEs. Consider the case of the pension assistance provided under PASIS. The table indicates that the GIE for PASIS is -0.58, which is low and, hence, highly redistributive. (Any GIE below one indicates that the corresponding program is redistributive; a negative GIE implies a large redistributive impact.) The GIE for PASIS is equal to the product of the targeting GIE (-0.56) and the allocation GIE (1.05). That the allocation GIE is close to one suggests there are few differences in pension benefits among PASIS participants. In other words, the redistributive impact of the program comes from its good targeting based on the *ficha* CAS. For comparison purposes, table 2.9 includes other sources of pension income even though these are not targeted through the *ficha* CAS and are often provided by private operators. As expected, the pension assistance provided through PASIS is much more redistributive than other pensions.

Two main conclusions can be drawn from table 2.9. First, all the programs targeted with the ficha CAS have large redistributive impacts. This is evidenced by the low values of the GIEs for the income transfers and water subsidies and by the low values of the targeting GIEs for the housing and childcare programs. (For these programs, we know only who participates and who does not, so we cannot compute an allocation GIE nor estimate the overall GIE elasticity.) Yet some programs are more redistributive than others. Among transfers and subsidies, family allowances are the most redistributive, while water subsidies are the least redistributive. Among other programs, childcare tends to be slightly better targeted than housing programs, perhaps because of savings requirements for participation in the latter.

The second conclusion drawn from table 2.9 is that the redistributive impact of the programs is essentially because of their good targeting, which is based on the ficha CAS. The allocation GIEs are close to one, which suggests few differences in the amount of benefits received from the programs by different households. Only in the case of water is there an allocation GIE well below one, probably because those who consume more water, thereby receiving more subsidies, tend to be richer.

2.4.3 Impact of programs and policies on the poor and the nonpoor

Within the context of a PRSP, it is necessary for the evaluation of programs and policies to give special consideration to the impact on the poor as opposed to the nonpoor. This can be done in two different ways. First, one can use the extended Gini to place a higher weight on the social welfare function of the population at the bottom of the distribution of income or consumption. An alternative is to decompose the GIE for the overall population into three components: the GIE among the poor, the GIE among the nonpoor, and a third term taking into account the impact of programs and policies on the inequality between the poor and the nonpoor (between-group GIE). When the GIEs for the poor and the nonpoor are similar, it is the between-group GIE that is the most important factor that determines the poverty alleviation capacity of a program. The reason is that it shows the ability of the program to transfer resources from the haves to the have-nots. In this section, following Yitzhaki (forthcoming), we illustrate this decomposition of the GIE.[13] The illustration uses data from Romania's 1993 Family Expenditure Survey. For simplicity, we will assume that the bottom 20 percent of the population is poor.

Table 2.10 gives the results for selected income and consumption sources in Romania. The first column in the table provides the overall GIE, and its decomposition in three terms is given in the other three

Table 2.9. Targeting and Allocation GIEs of Means-Tested Programs in Chile (1998)

	Income transfer programs and water subsidies			
	Non-PASIS pensions (not targeted)	***Pension assistance PASIS***	***Family allowances SUF***	***Water subsidies***
Overall GIE	0.91	-0.58	-1.03	-0.35
Targeting GIE	0.47	-0.56	-0.95	-0.43
Allocation GIE	1.91	1.05	1.09	0.80

	Other targeted programs				
	Housing Viv. Basica	***Housing Viv. Prog I***	***Housing Viv. Prog II***	***Childcare JUNJI***	***Childcare INTEGRA***
Targeting GIE					
Actual value at individual (per capita) level	-0.41	-0.68	-0.59	-0.50	-0.71
Actual value at household level	-0.32	-0.54	-0.48	-0.44	-0.65

Source: Clert and Wodon (2001).

columns. The first row in the table shows that although an across the board increase in wage income would mildly increase inequality overall (GIE of 1.05), it would increase inequality among the poor (GIE of 1.85), decrease inequality among the nonpoor (GIE of 0.91), and increase inequality between the poor and the nonpoor. By contrast, an increase in agricultural income would increase overall inequality, decrease inequality among the poor, increase inequality among the nonpoor, and not affect inequality between groups. An increase in pension income would increase inequality in both groups as well as between groups.

The results for income transfers are more interesting because they have direct policy implications. An increase in child allowances would decrease inequality among both the poor and the nonpoor, although the effect would be smaller among the poor than among the nonpoor. Unemployment benefits display a similar pattern: although an increase in benefits would reduce inequality, the impact would be comparatively smaller among the poor than among the nonpoor. The effect of changing social assistance at the margin is almost the same for the poor and the nonpoor.

Now assume that the government could either increase the allowances for children or create a new basic allowance granted on a per capita basis, following the principles suggested for universal allowances in some academic circles in Europe. Under a universal allowance, transfer benefits would be proportional to family size. The last line in table 2.10 presents the overall GIE for family size in addition to its decomposition. The GIEs among the poor and the nonpoor are equal to -0.48, while the GIE between groups is equal to -0.67. If the impact of the whole population were taken into account, when confronted with a choice between increasing child allowances and creating a new per capita universal allowance in order to improve social welfare, the government could choose to increase child allowances because the GIE for child allowances (GIE of -0.70) is lower than the GIE for a universal allowance (GIE of -0.52). If

Table 2.10. Selected GIEs for the Poor and Nonpoor in Romania (1993)

	All households	***GIE within the poor***	***GIE within the nonpoor***	***GIE for between groups***
Wage income	1.05	1.89	0.91	1.21
Agricultural income	1.08	0.45	1.16	0.99
Pension income	1.19	1.61	1.05	1.34
Child allowance	-0.70	0.34	-0.92	-0.64
Unemployment compensation	-0.67	0.42	-0.80	-0.72
Social assistance	0.60	0.67	0.61	0.62
Family size (not an income source)	-0.52	-0.48	-0.48	-0.67

Source: Yitzhaki (forthcoming).

only the impact among the poor is taken into consideration, however, the creation of a universal allowance would have a larger welfare impact (GIE of -0.48) than an increase in the child allowances (GIE of 0.34).

Although these results could be sensitive to the choice of the poverty line (as is always the case when evaluating programs according to a poverty-based method), this sensitivity can be tested by redoing the decomposition with a different poverty line. The method will still be able to identify the impact of programs and policies on the poor only, if this is needed for policy purposes.

2.5 Impact of Policies on Growth and Cost of Taxation

In countries that are preparing a PRSP, economic growth is more important than redistribution for improving well-being and reducing poverty. If programs and policies are evaluated on the basis of their distributional impact only, it may lead to the selection of interventions that are not optimal in the medium to long run. This section shows how to extend the methodologies presented earlier in order to take into account the effect of social programs and policies on growth. This is done by decomposing the marginal impact of programs on social welfare into a growth component and a redistribution component. Section 2.5.1 discusses the issue of the cost of taxation, which must be taken into account when assessing whether it is beneficial to implement a particular redistributive policy.

2.5.1 From inequality to social welfare: Growth and redistribution

To account for the level of well-being (the mean income per capita or per equivalent adult) as well as the inequality in well-being when designing or evaluating social policies, one needs to use a social welfare function. Social welfare functions typically follow a number of basic principles. Three such principles are described below.

- Social welfare functions tend to be based on the preferences of the individuals composing society rather than on societal goals. At the same time, it is perfectly valid to weight the welfare of various individuals differently in the social welfare function, provided this is done in an objective way (for example, according to income or consumption or to the rank of the individual or household in the distribution of income and consumption).
- Social welfare functions tend to respect the Pareto principle of efficiency, meaning that if one can improve the well-being of one person without decreasing the well-being of any other, it should improve the well-being of the first person (it would be inefficient not to do so). This in turn implies another principle that any action increasing the well-being of one individual without decreasing the well-being of any other yields an improvement in social welfare.[14]
- For those favoring redistribution toward poorer members of society, a third principle can be added: All other things being equal, a transfer of income or consumption from a richer individual or household to a poorer one should increase social welfare.[15]

If we accept these three principles, then we are in the realm of "welfare dominance," a term signifying that it is feasible for a policymaker to compare one distribution of income or consumption in society with another without using a specific social welfare function. All that is known at this stage is that the social evaluation of the extra income or consumption received by individuals or households—that is, the marginal utility of income or consumption—is positive and declining.

Unfortunately, one can have cases in which one distribution or public policy does not dominate the other, and vice versa, in the general framework above. This means that there are some legitimate social welfare functions that show that the first distribution results in a higher welfare than the second distribution and other legitimate social welfare functions that will show exactly the opposite. When neither distribution dominates the other, it is impossible to rank them, so that the policymaker cannot make a recommendation that obeys the fairly general principles regarding the properties of social welfare. In technical terms, this means there is an incomplete ordering of alternative policies. To avoid such cases, one must impose more structure on the social welfare function.

One possibility for obtaining a complete ordering of policy alternatives is to assume that the marginal utility of income (the increase in well-being that follows from an increase in income, possibly but not necessarily following a social program or public policy) is derived from a specific inequality measure. Then the social welfare W can be written as the product of the mean income μ and one minus the inequality measure I, so that $W = \mu (1 - I)$. An increase in mean income will lead to a higher level of social welfare, while an increase in inequality will reduce social welfare. If the inequality measure is the Gini index, one obtains $W = \mu (1 - G)$, which is the social welfare function that was mentioned previously in providing a numerical example for the interpretation of the Gini index in section 2.2.1 (see also Sen 1976). The rationale for using the Gini as the inequality measure in the social welfare function is that the Gini has several attractive properties, some of which have already been discussed.

- ***Welfare dominance.*** If two programs or policies are ranked according to the social welfare function $W = \mu (1 - G)$, then the ranking will respect the conditions of welfare dominance that are the three basic principles outlined previously. In other words, ranking the distributions according to the social welfare function will not contradict what would have been obtained under the principles underlying welfare dominance. The main difference is that the social welfare function will be able to rank all distributions, while the conditions for welfare dominance may not be able to yield a ranking among some of the distributions.
- ***Relative deprivation theory.*** The social welfare function $W = \mu (1 - G)$ is consistent with the relative deprivation theory put forward by Runciman (1966). According to this theory, individuals care not only about their own income but also about how they compare to others. This comparison is captured by the rank of the individual in the distribution of income in the population as a whole. A higher rank implies a lesser feeling of deprivation.
- ***Statistical properties and flexible distributional weights.*** The Gini and the parameters that are based on it, such as the GIE, provide more robustness in the empirical results than would be the case with some alternative measures of inequality. Because the Gini is based in part on the ranks of the individuals in the distribution of income, it is less sensitive to extreme observations or manipulations of the data. The Gini and its related concepts, such as the GIE, also possess known statistical properties, so that standard errors can be estimated. The corresponding properties for other measures of inequality, such as the Atkinson index or the Theil index, have not yet been developed. Finally, instead of using the Gini, the extended Gini can used if one wants to place more or less weight on comparatively poorer households or individuals. This provides flexibility in adapting the social welfare function to various types of preferences while keeping the properties of the Gini related to welfare dominance and relative deprivation theory.
- ***Ease of manipulation.*** In some applications, the Gini is more difficult to use than other inequality measures. For example, it is not decomposable by population subgroups in an additive way. As a result, the Gini does not lead to an additive social welfare function whereby overall social welfare is just a weighted sum of the welfare of all individuals or households. In other ways, however, the Gini is easier to use than other inequality measures because it can be written as a covariance, enabling the analyst to use the linear properties of the covariance operator to analyze the properties of the Gini itself.

From a practical and policy perspective, as shown in technical note B.3, one of the advantages of using the social welfare function $W = \mu (1 - G)$ is that the marginal impact of a program or policy on social welfare (the increase or decrease in social welfare resulting from a marginal change in a program or policy) can be decomposed into two components.

- ***Growth component.*** The growth component captures the increase in mean income brought about by the program or policy. If a program simply consists of taxing one household to transfer income to another without any changes in behavior on the part of the two households, there may be no growth effect, in which case the growth component is equal to one. The growth component can be larger than one if the program or policy induces behavioral changes conducive to the generation of higher incomes right now or in the future. For example, if the transfer given to a poor household is conditional on having the children in that household enroll in school and attend classes regularly, the transfer may increase the human capital of the children, thereby in-

creasing future expected earnings. After appropriate discounting, the increase in the future stream of income to be earned by the children thanks to the impact of the stipend may be such that each dollar transferred through the program generates two or three dollars of additional (discounted) income. In some instances, the growth term may also be lower than one. This will be the case, for example, if, in order to provide transfers to some households, the taxation of other households creates a distortion (a lower supply of labor from those who are taxed, those who receive the benefits, or both, for instance) that is not compensated for by a positive externality.

- ***Redistribution component.*** As mentioned, the redistribution component is proportional to the GIE. A GIE well below one, for example, is indicative of a good redistributive capacity and would generate a large gain in social welfare, holding the growth component constant.

Formally, the marginal impact on social welfare, ΔW, of a change in income or consumption from a specific source depends on the source's impact on growth and on its GIE. Specifically, ΔW is equal to the impact of the policy on growth, denoted by Δx, times the impact on inequality, which is itself equal to one minus the product of the GIE and the Gini.[16]

The roles of the growth and distribution components can be shown by briefly comparing different types of programs discussed in section 2.2.3 devoted to the application of the source decomposition to per capita income and consumption in Mexico. On the income side, the program is Procampo, which provides cash transfers to farmers. On the consumption side, the two programs are the food subsidies for milk (Liconsa) and the free tortillas of Fidelist. We will assume for the sake of the illustration that we can directly compare the GIEs obtained for these various programs even though they apply to income in one case and to consumption in the other two cases. For the illustration, we use the Gini for per capita income, estimated at 0.510.

While the GIEs of the food subsidies are lower than the GIE for Procampo (-0.543 for Liconsa and -0.666 for Fidelist versus 0.103 for Procampo), it has been suggested that Procampo has positive behavioral effects, while the food subsidies may not have such effects, or at least not to the same extent. According to Cord and Wodon (forthcoming), Procampo appears to have a multiplier effect over time in that a transfer of one peso leads to benefits of two pesos. This multiplier may be Keynesian (higher income leads to higher consumption, which generates employment and more income). It may also be because of the possibility of farmers taking more risks with higher-yielding investments thanks to the security provided by the program. Thus, although different explanations may be at the source of Procampo's multiplier effect, the effect itself could make Procampo a better program for raising social welfare than food subsidies, despite the fact that food subsidies have a lower GIE than Procampo (see table 2.11).

The growth impact of Procampo is estimated at two because of the program's multiplier effect. The growth impact of Liconsa and Fidelist is one (no growth effect but also no negative incentive effects), assuming that these programs do not affect behaviors. Taking into account the GIEs of the various programs and the value for the overall Gini, we find that the welfare impact of Procampo ($\Delta W = 1.895$ per dollar spent) is larger than that of the two food subsidies (1.175 for Liconsa milk and 1.340 for Fidelist free tortillas).

2.5.2 Financing programs and policies: The marginal efficiency cost of funds

Cost constitutes an important consideration in assessing whether to implement a program or policy. When dealing with an individual or household, the cost of a program is the dollar amount that the program costs. When dealing with a society, things are more complicated. Raising taxes may be costly to society because in order to avoid paying taxes, individuals may change their behavior. For example, if fiscal revenues are raised through a VAT, individuals may shift their consumption patterns toward commodities that are taxed less heavily than others. This will generate distortions in the economy and a corresponding welfare loss. Individuals may also try to evade taxes all together, in which case the government must increase its tax administration staff, which is also costly because it diverts workers from the productive sectors of the economy. The concept of the marginal cost of

Table 2.11. Hypothetical Impact on Social Welfare of Alternative Programs in Mexico (1996)

	Growth impact per dollar spent Δx	*GIE*	*Gini*	*Welfare impact* $\Delta W = \Delta x\ (1 - GIE * Gini)$
Income from Procampo	2	0.103	0.510	1.895
Liconsa milk (subsidized)	1	-0.343	0.510	1.175
Fidelist free tortillas	1	-0.666	0.510	1.340

Note: The growth impacts for Liconsa and Fidelist are not based on detailed evaluations of these programs. They are provided solely for illustration purposes. If these food subsidies were found to generate positive impacts on child nutrition, they would increase the future productivity and earnings of children, thereby yielding growth impacts larger than one.

Source: Authors' calculations.

funds, or in its exact terminology, the Marginal Efficiency Cost of Public Funds (MECF), represents an estimate of the social cost incurred by society when tax revenues are increased by one dollar. That is, the MECF answers the question: What are the costs to the society of increasing the tax revenues by $1.00 through one of the tax instruments that the government can modify?

One should usually expect that raising revenues through different taxes may result in different cost, so that it is not possible to refer to a unique cost. Rather, one may come with several estimates, representing the cost of raising public funds through several different ways. In practice, these estimates can be obtained through a number of techniques, including computational general equilibrium models. Devarajan and Thierfelder (2000) explain the basic construction of such models. The authors present a list of estimates by other authors for the United States, Sweden, New Zealand, and India. The estimates for the MECF range from $0.67 to $4.51 per dollar raised, but a typical value is in the range of $1.30 to $1.50 in industrial countries. The values for India provided by Ahmad and Stern (1987) are higher at approximately $1.60 to $2.20. Using data for Bangladesh, Cameroon, and Indonesia, Devarajan and Thierfelder find that the MECF varies according to the commodity on which an indirect or import tax is levied. The range is from $0.48 to $2.18 (table 2.11). The estimates for the MECF were below $1.00 only when the economy had a pre-existing distortion that was reduced as a result of the tax change. In more typical circumstances, it may cost more than $1.00 to raise each tax dollar in a developing country.

The MECF should affect the list of social programs and policies that a government may want to implement. If taxation were to generate relatively high welfare losses of, say, $0.50 for each dollar in tax revenues, social programs should generate a gain in social welfare (through growth, redistribution, or both) of at least $1.50 per dollar spent in order to be cost effective. Under such a high MECF, programs such as Liconsa and Fidelist in table 2.12 might not be effective. A lower MECF makes it more likely for redistributive programs to raise social welfare.

Table 2.12. Marginal Cost of Public Funds for Selected Sectors in Selected Countries

	Indirect tax			*Import tax*		
	Sector with highest tax rate	*Sector with lowest tax rate*	*Uniform adjustment*	*Sector with highest tariff*	*Sector with lowest tariff*	*Uniform adjustment*
Bangladesh	1.07 Tobacco	0.95 Fisheries	1.05	2.18 Sugar	1.17 Livestock	1.20
Cameroon	0.48 Cash crops	0.96 Food and forestry	0.90	1.37 Food and consumption	1.05 Intermediate goods	1.05
Indonesia	0.97 Liquid natural gas	1.11 Electricity and gas	1.04	1.18 Other industries	0.99 Business services	0.99

Source: Devarajan and Thierfelder 2000.

2.6 Conclusion

The concept of poverty in developing countries usually refers to the inability of households to meet their basic needs. Although there are differences in terminology in the various regions of the world, one often says that a household is in extreme poverty if it cannot meet its basic food needs, while a household is said to be moderately poor if it can meet its food needs but not its nonfood needs. Other definitions of poverty have been used in the literature, and some of these are "relative" (for example, when the poverty line is defined by the mean or median income of a country). Yet for practical purposes, in a developing context, poverty can be considered an absolute concept. By contrast, inequality deals with the differences in well-being between households (or individuals), not with the level of well-being achieved by these households. Inequality measures capture how far households are from each other in terms of well-being. Indeed, most inequality measures do not depend on the absolute level of well-being achieved in a society. That is, income inequality measures typically do not depend on the mean income observed in a country. It is thus possible for two countries, one very rich and one very poor, to have the same level of income inequality.

Poverty is a condition shared by a segment of the population, not the population as a whole. As a result, the measurement of poverty is not affected by gains or losses in well-being occurring among those who are not poor. The level of inequality in a country applies to the population as a whole, however, and changes in income or consumption will affect the measurement of inequality wherever they occur in the distribution of well-being. While there are ways to place more weight on the poorer segments of the population when measuring inequality, the measurement of inequality will always take into account, at least to some extent, all the changes affecting households, wherever they are located in the distribution of well-being.

Because the concept of inequality tends to be independent of the level of well-being achieved in a society, it is not in itself a good indicator for evaluating social programs and public policies. To evaluate programs and policies, it may be better not to rely on a poverty measure (which will give no value at all to the welfare of the nonpoor) but on a social welfare function that depends in part on the level of well-being achieved by the nonpoor even though more weight may (and probably should) be placed on the poor than on the nonpoor. Although some social welfare functions depend only on the absolute level of well-being observed in a society by various households (both poor and nonpoor) without attempting to compare how far apart the various households are from each other, other social welfare functions depend both on the absolute level of well-being achieved and on the inequality in well-being between households and individuals. Taking inequality into account when measuring social welfare is important because individuals and households do not assess their well-being only with respect to their own absolute levels of consumption or income. They also compare themselves to others. This implies that for any given level of mean income in a country, a high level of inequality reduces the overall level of social welfare. In other words, independent of its impact on poverty—even if there is no poverty at all in a society—inequality has a negative impact on social welfare.

2.6.1 Advantages of the framework presented in this chapter

Many of the tools presented in this book deal with the evaluation of the impact of social programs and public policies on poverty. But even in very poor countries, the concepts of inequality and social welfare used in the formulation of policy can be advantageous beyond poverty analysis. This chapter has provided tools and illustrations to take into account the whole population when analyzing inequality and social welfare. This helps in three areas.

- ***Pareto inefficiency.*** Focusing on the poor may be reasonable for the evaluation of a number of targeted programs and policies. In practice, however, poverty measures are being increasingly used to evaluate policies that affect the whole population. For example, most countries do not rely exclusively on means-tested programs (instruments directed at the poor) for poverty alleviation. Instead, they use instruments directed at the entire population. When analyzing the effect of a general fiscal instrument or policy, policymakers should take into account not only the impact on the poor, but also the impact on the nonpoor. Truncating the distribution at the poverty line in-

hibits such analysis, and ignoring the nonpoor may lead to the adoption of inefficient policies that violate the Pareto principle. The principle states that if one or several households benefit from one policy more than a second household, and no other household is harmed from adopting the first policy, then the first policy should be adopted. Consider two alternative policies with identical effects on the poor but different effects on the nonpoor. Concentrating exclusively on the poor may lead the policymaker to the conclusion that the two policies are equivalent, leading to the choice of an inefficient overall policy.

- ***Discontinuity at the poverty line.*** Poverty lines are an administrative necessity, whether explicitly or implicitly, if policymakers are to be able to restrict the eligibility of households to receive benefits according to their income or other indicators. Yet since no substantive difference exists between someone who is just above the poverty line and someone who is just below the line, the discontinuity in the treatment of households inherent in the use of a poverty line may cause problems. For example, consider an economist who advises a government on how to reduce the number of poor people, subject to a budget constraint. The economist may be inclined to recommend helping those who are close to the poverty line and ignoring (or possibly taxing) those who are even worse off, because such an "optimal" policy would yield the largest decrease in the objective, which is to reduce the number of the poor. While this type of problem may be avoided by not using the headcount index of poverty, relying instead on poverty measures that take into account the distance separating each poor household from the poverty line, it is simply not an issue in a social welfare framework.
- ***Political economy and taxation.*** The most important argument in favor of considering the whole distribution of income when evaluating programs and policies is related to political economy and taxation issues. Since it is generally the nonpoor who pay for the alleviation of poverty, one needs to take into account their interest when designing programs and policies. Failing to consider the nonpoor is likely to lead to a lack of political sustainability for poverty reduction strategies. Moreover, one cannot "close the system" from a fiscal point of view without taking the nonpoor into account. Closing the system requires a model that includes the whole economy and, thereby, the whole population. This is important given that most forms of taxation imply at least some welfare losses somewhere in the distribution of income. This has been highlighted in this chapter through the concept of the MECF. In extreme cases, not taking these losses into account may lead to the adoption of policies with small benefits for the poor, and sizable drawbacks for the nonpoor.

2.6.2 Limitations of the framework

While the framework presented in this chapter has advantages, it also has limitations.

- ***Marginal versus discrete changes in policy.*** The framework is designed to analyze the impact on inequality and social welfare of "small" changes in programs and policies—that is, the analysis is done at the margin. In many cases, the margin is good enough for policy analysis because most social programs and policies affect only a small share of total per capita income or consumption. In some cases, however, what takes place at the margin may not reflect the full impact of programs. For example, section 2.3.3 discusses the distributional implications in Chile of a shift from state-funded unemployment assistance to individual UISAs. One of the reasons the Chilean legislature is considering such a shift is because the current system of unemployment assistance has low coverage, due in part to low participation among eligible individuals. Low participation is itself due to the low level of the benefits, which are not worth the trouble for those who are not in extreme poverty. Shifting to unemployment insurance, and thereby to higher benefits, might increase participation dramatically, in which case the impact measured at the margin may no longer be a valid representation of the overall impact. Still, even in such a case, the impact at the margin would give a good idea of the direction of the distributional impact of the shift, and thereby be informative for policy.
- ***Monetary versus multiple objectives.*** Traditional poverty analysis deals with income and consumption, and the same is true for our analysis of inequality and social welfare. Thus the critique

that asserts that the monetary focus of the traditional analytical work on poverty is too limited also applies to the techniques developed in this chapter. While it is difficult to extend the tools developed here to the analysis of nonmonetary indicators, it is feasible to some extent. But even then, many social programs and public policies have multiple objectives that surpass what can be captured through income and consumption, and this is not discussed in this chapter. In practical terms, this implies that the impact of programs and policies on inequality and social welfare should be only one of the parameters to be taken into account when allocating public funds. For example, funding for the arts may not be highly redistributive, but it may still be deemed worthwhile for the purpose of protecting a society's culture and identity.

- ***Behavioral changes.*** Although some behavioral changes can be taken into account in the framework, in most instances behavioral changes are not discussed. The main limitation relates to the inability of the framework to take into account some indirect effects of policies. This weakness is common to much of the traditional work on poverty, and the main line of defense for the methodology consists of emphasizing the fact that, for the most part, the methodology does give the right initial direction for the impact of interventions on welfare. The concept of the MECF, in principle, enables the analyst to take into account behavioral responses to policies, but in practice it is not easy to estimate.
- ***Externalities.*** If public policies and programs have positive or negative externalities, they should be taken into account. Although this can be done in principle, in this framework, as in others, it is difficult to do satisfactorily in practice.

2.6.3 Flexibility to emphasize the poor

We are not suggesting that the framework proposed in this chapter should replace analytical work on poverty or extreme poverty for the design of Poverty Reduction Strategies. Circumstances exist that warrant a strict focus on poverty or extreme poverty. At the same time, much of the analysis typically done within a poverty framework can also be done within an inequality and social welfare framework. Specifically, there are two main possibilities for explicitly considering the poor within a broader social welfare framework.

- ***Flexible inequality measures and social welfare functions.*** A first possibility to emphasize the poor or extreme poor is to use inequality indexes and social welfare functions that stress the lower portion of the distribution of income or well-being. These include Atkinson's index of inequality and the extended Gini coefficient, as well as their associated social welfare functions. The main property of these inequality indices and the associated social welfare functions is that by changing one parameter, one can increase the sensitivity of the index or social welfare function to transfers at the lower end of the income distribution. One can thus place a greater weight on the poor or extreme poor in program evaluations without having to cope with the difficulties inherent in the truncation of the income distribution that occurs with the use of a poverty line. Still, flexible inequality measures and social welfare functions are not going to satisfy analysts who would like to single out the poor as a distinct group. The extended Gini coefficient will still be affected by changes in the incomes of the nonpoor even if the weight placed on them is very small. That is, if the analyst wishes to isolate the impact of a program or policy on the poor alone, the extended Gini will not do the job.
- ***Decomposing overall impacts into impacts on the poor and the nonpoor.*** The second possibility to conduct analytical work on poverty within a framework based on inequality indexes and the associated social welfare functions is to decompose the index of inequality or the social welfare function into its value among the poor and the nonpoor in addition to taking into account the differences between the poor and the nonpoor (the between-group component). If the inequality or welfare among the nonpoor is not a consideration, one can simply work with the first component, which captures the effect of programs and policies on the poor only. Yet the analyst's ability to rely on the various components of the evaluation has several advantages. First, the informational content provided when using the whole population is richer than that provided by the use of poverty measures alone because the investigator can take into account the nonpoor if he or she desires.

Second, the approach avoids some of the arbitrariness and measurement errors involved in the use of poverty lines. Under the poverty measurement approach, whether an observation is above or below the poverty line is crucial. Under the inequality and social welfare approach, the poverty line only determines the classification of the observation into poor or nonpoor. An error in misclassification does not affect the overall impact on inequality or welfare and, therefore, the analysis is less sensitive to the poverty line.

Notes

1. When the distribution of (per capita) income or consumption includes negative values, which may be the case if self-employed workers or farmers suffer a net loss in income over the period considered in a household survey, the Gini index may be larger than one.
2. To date, the most interesting decompositions for policymakers have been worked out only for the extended Gini. Although the decompositions and policy applications that we present in this chapter could in principle be developed for the Atkinson and general entropy indexes, the tools necessary to carry out the analysis have not yet been developed for these measures. Because the extended Gini has properties similar to those of the Atkinson index, there is no real gain in investigating both of them.
3. The Theil and Atkinson indexes also belong to more general families of inequality measures in which it is feasible to put more or less weight on various parts of the distribution of income or consumption when computing the inequality index.
4. See, for example, the papers by Lerman and Yitzhaki (1985) and Garner (1993) for the United States.
5. In formal terms, $\Delta G/G = Sk * (\text{GIE}k - 1)/100$. The division by 100 is a normalization. For a numerical illustration, see the example provided at the end of the section.
6. We assume no change in the behavior of individuals and households, so that the mean per capita income remains the same after the policy. As discussed in section 2.5, this assumption may not be valid.
7. The property that national GIEs can be outside the range of the rural and urban GIEs is a property shared by all types of income elasticities, not only those related to the Gini.
8. This is simply the difference between the GIE for child allowance and the GIE for unemployment benefits; that is, –0.330 = –0.944 – (–0.614).
9. The estimate of $0.594 for parental benefits in column 3 is obtained by dividing two numbers: the GIE minus one for unemployment benefits and the GIE minus one for parental benefits. That is, 0.594 = (–0.614 – 1)/(–1.172 – 1). The reason for subtracting one from the two GIEs is that the marginal impact on the Gini on a per dollar basis of a change in each income source is proportional to its GIE minus one.
10. The estimate of the GIE for overall tax revenues was obtained by combining information on the income tax, the VAT, and other taxes. Although the income tax is progressive (GIE of 1.73), the VAT is regressive (GIE of 0.79), and other taxes are also regressive (GIE of 0.90). The combination of the GIEs weighted by their tax base yielded the overall GIE of 0.90.
11. In practice, to estimate the implicit rental value of access to basic services, one uses hedonic semi-log rental regressions with the logarithm of the rent (for those households paying rent) expressed as a function of the characteristics of the dwelling and its location. Using the parameter estimates from the regressions, the impact of access to, say, electricity on the rent for those who pay a rent (and on the imputed rental value of the house for home owners) is computed as the expected percentage increase in the rent paid. To use this hedonic regression method, one must assume that the rental housing market is in equilibrium, with the rents paid by tenants reflecting the amenities provided in their dwelling.
12. The constancy of the results for the change of the parameter of the extended Gini means that the Engle curves of benefits from the various programs tend to be approximately linear. If a Gini income

elasticity were increasing with ν, then one would conclude that the corresponding Engle curves are concave; that is, their slopes decline with income. In this sense, changes in the GIEs, depending on the values chosen for the parameter of the extended GIE, enable us to learn about the pattern of the distribution of the underlying income source.

13. The methodology is not summarized in the technical notes, but it is described in Yitzhaki (forthcoming).

14. In technical terms, this means that the social evaluation of the marginal utility of income (or consumption) is positive for all individuals or households. If well-being is measured through income (or consumption), all other things being equal (that is, if nobody else suffers a loss), an increase in income (or consumption) for one individual must increase the utility of that individual and, thereby, social welfare.

15. In technical terms, this is referred to as the Dalton principle, and it is equivalent to assuming that the social evaluation of the marginal utility of income or consumption is positive (due to Pareto) but declining with the level of income or consumption of the individual.

16. That is, $\Delta W = \Delta x * (1 - \text{GIE} * \text{Gini})$.

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Annex B
Inequality and Social Welfare: Technical Notes

Technical Note B.1 Gini Index of Inequality and Source Decomposition

To analyze the impact of various sources of income on inequality in per capita income, we use the source decomposition of the Gini index proposed by Lerman and Yitzhaki (1985; see also Garner [1993} for an application to inequality in consumption rather than income). Denote total per capita income by y, the cumulative distribution function for total per capita income by $F(y)$ (this takes a value of zero for the poorest household and one for the richest), and the mean total per capita income across all households by $\bar{y}$. The Gini index can be decomposed as follows:

$$G_y = 2\, cov\,[y,\, F(y)]/\bar{y} = \Sigma_i\, S_i R_i G_i$$

where G_y is the Gini index for total income, G_i is the Gini index for income y_i from source i, S_i is the share of total income obtained from source i, and R_i is the Gini correlation between income from source i and total income. The Gini correlation is defined as $R_i = cov[y_i, F(y)]/cov[(y_i, F(y_i)]$, where $F(y_i)$ is the cumulative distribution function of per capita income from source i. The Gini correlation R_i can take values between -1 and 1. Income from sources such as income from capital that tend to be strongly and positively correlated with total income will have large positive Gini correlations. Income from sources such as transfers tend to have smaller, and possibly negative, Gini correlations. The overall (absolute) contribution of a source of income i to the inequality in total per capita income is thus $S_i R_i G_i$.

This decomposition provides a simple way to assess the impact on the inequality in total income of a marginal percentage change equal for all households in the income from a particular source. As shown in Stark, Taylor, and Yitzhaki (1986), the impact for all households of increasing the income from source i in such a way that y_i is multiplied by $(1 + e_i)$, where e_i tends to zero, is

$$\frac{\partial G_y}{\partial e_i} = S_i(R_i G_i - G_y)$$

This equation can be rewritten to show that the percentage change in inequality due to a marginal percentage change in the income from source i is equal to that source's contribution to the Gini minus its contribution to total income. In other words, at the margin, what matters for evaluating the redistributive impact of income sources is not their Gini, but rather the product $R_i G_i$, which is called the pseudo Gini. Alternatively, denoting by $\eta_i = R_i G_i / G_y$ the so-called Gini income elasticity (GIE) for source i, the marginal impact of a percentage change in income from source i identical for all households on the Gini for total income in percentage terms is

$$\frac{\partial G_y / \partial e_i}{G_y} = \frac{S_i R_i G_i}{G_y} - S_i = S_i(\eta_i - 1)$$

Thus a percentage increase in the income from a source with a GIE η_i smaller (larger) than one will decrease (increase) the inequality in per capita income. The lower the GIE, the larger the redistributive impact. The GIE of income source i can be written as:

$$\eta_i = \frac{\text{cov}(x_i, F(y))}{\text{cov}(y, F(y))} * \frac{1}{S_i}$$

where x_i is income source (or expenditure item) i per capita, y is income per capita, and S_i is the share of source i in income. The ratio of the covariances is an instrumental variable estimator of the slope of the Engel curve of source i with respect to income y, with $F(y)$ being the instrument. Hence, the ratio of the covariances can be interpreted as the slope (or the marginal propensity) of the Engel curve of x with respect to y. S_i is the average propensity so that the ratio of the two yield the income elasticity of the Engel curve. At the same time, the GIE is the income elasticity of the Gini with respect to an increase in income source i.

The same decomposition can be applied to per capita consumption and its sources, and the same decomposition can also be applied to the extended Gini that uses a parameter, ν, to emphasize various parts of the distribution. The higher the weight, the more emphasis that is placed on the bottom part of the distribution ($\nu = 2$ for the standard Gini index):

$$G_y(\nu) = \frac{-\nu \operatorname{cov}(y, [1 - F(y)]^{\nu-1})}{\bar{y}}$$

Technical Note B.2 Decomposition of the GIE into Targeting and Allocation GIEs

A decomposition of the GIE proposed by Wodon and Yitzhaki (2001) can be used to differentiate between two properties of a program that can affect its impact on inequality: targeting and the allocation mechanism among participants (internal progressivity). The decomposition enables the analyst to assess whether the (lack of) performance of social programs and policies results from either the selection mechanism for participants or the allocation of benefits among program participants. To differentiate between targeting and internal progressivity, define z as the targeting instrument:

$$z = \begin{pmatrix} \bar{x}_p & if \quad h \in P \\ 0 & if \quad h \notin P \end{pmatrix}$$

That is, z is equal to the mean benefit among households' participants in the program, and it is zero for households that do not participate (one could substitute the average benefit by an indicator that is equal to one without affecting the results). The variable z is an indicator of targeting because it is only concerned with who is affected by the program rather than with the actual benefit received. Using this definition of z, we can rewrite the GIE as a product of two elasticities as follows:

$$\eta = \left(\frac{\operatorname{cov}(z, F(y))}{\operatorname{cov}(y, F(y))} \frac{\bar{y}}{\bar{z}} \right) \left(\frac{\operatorname{cov}(x, F(y))}{\operatorname{cov}(z, F(y))} \frac{\bar{z}}{\bar{x}} \right) = \eta_T \eta_A$$

The first term is related to the targeting of the program (targeting effect). The second term is the progressivity among participants (allocation effect). The distributional impact of a program depends on the product of its targeting and allocation elasticities. Good targeting, for example, can be offset by a bad allocation mechanism among program beneficiaries. This equation is useful to assess whether the (lack of) performance of a program is the result of its targeting or of the allocation of benefits among beneficiaries.

Technical Note B.3 Social Welfare Function, Growth, and Redistribution

To assess the effect of government programs on welfare per dollar spent in each program, following Yitzhaki (2000), we denote by y the mean income in the population and by G_y the Gini index of income inequality. A common welfare function used in the literature is $W = y(1 - G_y)$ (for example, Sen, 1976). The higher the mean income, the higher the level of social welfare; but the higher the inequality, the lower the aggregate level of welfare. This welfare function takes into account not only absolute but also relative deprivation (people assess their own level of welfare in part by comparing themselves with others). Using the implicit distributional weights embodied in this welfare function, we can derive the marginal gains from additional investments in government programs. If $\bar{x}$ denotes the mean benefit of a social program x across the whole population, and if η is the Gini income elasticity of that program

(defined below), increasing at the margin the funds allocated to the program by multiplying the outlays by $1 + \Delta$ for all program participants, with Δ small, will result in a marginal social welfare gain equal to

$$\Delta W = (\Delta \bar{x})(1 - \eta G_y).$$

This equation makes it clear that considerations related to both growth (as represented by the mean marginal benefit $\Delta \bar{x}$) and distribution (as represented by the Gini income elasticity η times the Gini index G) must be taken into account in program evaluations.