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ASSESSING THE SOCIAL WELFARE EFFECTS OF GOVERNMENT TRANSFER PROGRAMS: SOME INTERNATIONAL COMPARISONS

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This paper offers a new way of assessing government transfer programs using a social welfare function framework. It demonstrates how one can use social welfare functions to measure such programs' efficiency without requiring the specification of a poverty line or particular poverty measures. The paper introduces three alternative principles of targeting, which provide a basis for measuring program efficiency. By applying the methodology developed in this paper, we compare the targeting efficiencies of 44 countries, which include both middle and high-income countries.

JEL Codes: C52, H53, I38

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1. INTRODUCTION

Assessing the social welfare effects of government transfer programs has important implications for addressing income inequality and improving social welfare. In many developed countries, governments follow redistributive policies to reduce inequality (Kuznets, 1955; Baymul and Sen, 2019). A large number of developing

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countries also invest in a variety of social programs to reduce poverty. The World Bank Report entitled "The State of Social Safety Nets 2015" concluded that almost 1.9 billion people are now beneficiaries of government transfer programs (Honorati *et al*., 2015). Governments use redistributive policies, including progressive taxation and welfare programs expenditures, to reduce poverty and, more generally, enhance people's welfare (Kakwani *et al*., 2019; Kakwani, Li, Wang and Wu, 2019).

A government levies taxes that it then spends on welfare programs. The progressivity of taxation and its implications for social welfare has been researched extensively in the literature.[1] However, the progressivity and the welfare implications of social transfers have not been well examined. This paper fills in this gap.

This paper offers a new perspective on assessing government programs using a framework based on social welfare functions.[2] Improving targeting accuracy and program efficiency is crucial for the programs to achieve their intended objectives of alleviating poverty and reducing inequality. This paper demonstrates how we can use social welfare functions to measure program efficiency without specifying a poverty line or poverty measures.

In the tax literature, A.C. Pigou (1928) first proposed the precise definition of tax progressivity in his book, *Public Finance*,[3] where he argues that a tax structure is progressive if the average tax rate rises as income increases. This definition of progressivity is consistent with the familiar and much-researched progressive tax principle that "richer people must pay taxes at higher rates."[4] Following this Principle, Kakwani (1977) developed a measure of tax progressivity, popularly known as the Kakwani index, widely used in the analysis of equity in taxation (Kakwani, 1984, Gerber *et al*., 2020).

Government transfer programs aim to help those in need. For example, safety-net programs transfer cash to the poor, who cannot typically meet their basic needs. The problem is that there exists no formal principle of progressivity of transfers in the literature to evaluate government transfers. We cannot apply the same Principle of tax progressivity on government transfers. In this paper, we derive a new measure of government transfers' progressivity based on the principle "the richer people should receive fewer benefits." We can interpret this measure as the gain (loss) of social welfare due to transfers' progressivity (regressivity).

In this paper, we have extended the idea of the social rate of return (SRR) developed by Kakwani and Son (2016) to evaluate welfare programs. All welfare programs incur costs and ought to be judged based on how much social welfare

[1]See Kakwani and Son (forthcoming) for a review of this literature.

[2]Our paper deals with an important policy issue concerning how the government can target the poor employing a social welfare framework that does not require specifying a poverty line. Hence, our focus in this paper is essentially on social welfare functions. We could have supplemented the analysis by using other statistical tools such as means, Gini coefficients, concentration ratios, moment estimates and stochastic dominance (Handcock and Morris, 1999; Durlauf and Quah, 2002; Carneiro *et al*., 2003) or indulged in a discussion of the technical debates about Sen's SWF, but the inclusion of these, although useful, would be likely to divert attention away from the main policy focus of the paper.

[3]See Dalton (1936) and Musgrave and Thin (1948) for other alternative definitions of tax progressivity.

[4]See Blum and Kalven (1953) and Bos and Felderer (1989) for discussion of a range of politically and economically relevant facets. Kakwani and Lambert (1998) defined equity in taxation by means of three axioms, of which this *progressive principle* is one of them.

they generate compared to their operational costs. The SRR measures how much welfare programs generate social welfare as a percentage of the program's total cost. There are two types of costs associated with the running of a program. One is the amount of money that the program transfers to beneficiaries, and the other is the administrative cost.[5] SRR incorporates both kinds of program costs.

Since many social programs aim to target the poor, it is essential to link between targeting the poor and the SRR approach. We link the two by introducing three alternative principles of targeting. The first Principle relates to the universal basic income (UBI) approach, which has recently become a focus of public debate.[6] A critical policy question we address in this paper is under what circumstances a government should adopt the universal basic income scheme over the alternative methods of targeting the poor. The second Principle relates to targeting the poor but with equal amounts of transfers to every beneficiary. Our third Principle relates to perfect targeting so that the program lifts all the poor out of poverty.

Policymakers are often interested in knowing which targeting principle they should adopt to achieve the maximum efficiency in their welfare programs. We answer this question by comparing the SRR of a given transfer program against the three principles. We can also employ this methodology to compare the efficacy of different types of programs operating in a country.

We then apply this measurement framework to make international comparisons of welfare programs' efficacy using income distribution data from the Luxembourg Income Study (LIS) Data Base for 44 middle and high-income countries. This cross-country analysis shows that governmental transfers can explain the Kuznets curve, implying that inequality increases at the initial development stage. Then, inequality reduces when countries develop at a later stage. Our empirical results also show that richer countries often have more efficient transfer programs and achieve more significant poverty reduction.

The rest of the paper is organized as follows: Section 2 discusses the Gini social welfare function; Section 3 describes the method of assessing the impacts of government programs on social welfare; Section 4 presents three targeting principles; Section 5 provides the results and analysis of an international comparison; Section 6 provides a rank correlation analysis to show the role of government transfer in explaining the Kuznets curve. Section 7 concludes and discusses possible policy implications.

[5]Taxation provides revenue to the government, which it spends on a variety of government operations, including on welfare programs. There can be economic costs if there is a distortionary tax. There is substantive literature on optimal taxation that deals with the loss of welfare due to distortionary taxes. This literature has failed to provide a clear guideline on how progressive the taxes should be (for example, see Villamil *et al*., 2019 for a discussion of this). This paper focuses on the progressivity of government welfare transfers and their impact on social welfare. An integrated tax and benefit system could be evaluated but in this article (for example, see Caminada *et al*., 2019), we separate these and only look at the benefits system because for typically policy making purposes these are two different aspects of government finance that are administered separately. We have assumed that the revenue collected from taxation is given exogenously to the government to spend on welfare programs. In this paper, we are dealing with the tradeoffs between the administrative costs and to what extent the government should target the poor to increase the program efficiency. The issue is vital in the understanding of the effectiveness of government welfare programs on people's welfare.

[6]For example, Ozler (2017) argues that the relative performance of UBI makes it appealing for consideration, given the poor performance of methods to target the poor in developing countries,

2. A Gini Social Welfare Function

In this paper, we use the Gini social welfare function to analyze government welfare programs' progressivity. In this section, we discuss the foundation of the Gini social welfare function.

Suppose income x is a random variable with density function $f(x)$, then, a general form of the Gini social welfare function proposed by Sen (1974, 1976, 1979) is defined as

$$W(\tilde{x}) = \int_0^\infty x v(x, \tilde{x}) f(x)\, dx \tag{2.1}$$

where $\tilde{x} = (x_1, x_2, \ldots\ldots, x_n)$ is the vector of incomes of all n persons in society. The social welfare function in (2.1) is the weighted average of income levels; $v(x, \tilde{x})$ is the weight attached to income x in given income distribution $\tilde{x}$. The total weight in the domain of x must add up to 1:

$$\int_0^\infty v(x, \tilde{x}) f(x)\, dx = 1 \tag{2.2}$$

In an egalitarian social welfare function, the poorer people get a higher weight than richer ones. It implies that $v(x, \tilde{x})$ must decrease monotonically with x. Further, note that weight $v(x, \tilde{x})$ is a function of the whole income distribution vector $\tilde{x}$, and not just of income x. This social welfare function is interdependent because each person's utility depends not only on her income, but also on other persons' incomes in society. Atkinson's (1970) well-known social welfare function, derived from the concept of an equally distributed equivalent level of income, is additively separable, whereby every person's utility depends only on her consumption, and hence, is more restrictive.[7]

However, people compare their welfare with others in society and feel relatively deprived if their welfare is lower. To capture the idea of relative deprivation, Sen (1974) assumed that the weight function $v(x, \tilde{x})$ to depend on the ranking of all individuals in society. A basic intuition behind the rank ordering is that the lower a person is on a welfare scale, the higher this person's sense of deprivation. Thus, Sen postulated that the weight on income level x should depend on the proportion of persons in society who are richer than the person with income x in the given income vector $\tilde{x}$. Based on this formulation, the weight function $v(x, \tilde{x})$ is given by

[7]Sen's social welfare function is quasi-concave, and depends on the ranking of individuals. It nicely captures the relative deprivation suffered by individuals. An essential feature of this function is that it analyzes how different targeting methods can change the rankings of individuals that lead to a loss of social welfare. If the social welfare function is utilitarian in which every person has the same utility function, it will be consistent with the third-order dominance, when the utility function has positive first order and third-order derivatives and negative second-order derivatives. However, the utilitarian social welfare function with everyone having the same utility function is highly restrictive. Sen's social welfare function is more general in the sense that it is interdependent, and not additive separable.

$$v(x,\ \tilde{x}) = 2\,[1 - F(x)] \tag{2.3}$$

where $F(x)$ is the probability distribution function. $[1 - F(x)]$ is the proportion of people who have income higher than x. Note that the sum of weights over the whole population adds up to 1:

$$\int_0^\infty 2\,[1 - F(x)]\,f(x)\,dx = 1 \tag{2.4}$$

Substituting (2.3) into (2.1) gives Sen's social welfare function as

$$W = 2\int_0^\infty x\,[1 - F(x)]\,f(x)\,dx \tag{2.5}$$

Arranging the population in ascending order of their pre-transfer income, we can define the Lorenz curve $L(p)$ as the income share of the bottom p percent of the population. The Gini index, a widely used measure of inequality, is defined as one minus twice the area under the Lorenz curve. Following Kakwani (1980), the Gini index is written as

$$G = \frac{2}{\mu}\int_0^\infty x\left[F(x) - \frac{1}{2}\right]f(x)\,dx \tag{2.6}$$

Combining (2.5) and (2.6) gives the Gini social welfare function as

$$W = \mu\,(1 - G) \tag{2.7}$$

where μ is the mean income of a society, commonly used as a measure of society's average standard of living. The Gini index is interpreted as the proportional loss of social welfare due to inequality in society.

The Gini social welfare function in (2.7) is homogeneous of degree 1, implying that if everyone's incomes increase by the same proportion, social welfare also increases by the same proportion. The inequality measure implicit in such a welfare function is a relative measure of inequality, implying that inequality remains unchanged if the same proportion alters every income.

3. Impact of Government Transfers on Social welfare

The governments, through their welfare programs, aim to enhance people's welfare. Suppose a government program transfers an average of one unit of income to every person in the population. How much will the increase in per person social welfare in society? This section attempts to answer this question.

Suppose y is the post-transfer or gross income of an individual defined by

$$y(x) = x + b(x) \tag{3.1}$$

where x is the pre-transfer or market income, $b(x)$ is the transfer received by the individual with income x.

The mean gross income is given by

$$\mu_y = \mu + \bar{b} \tag{3.2}$$

where $\bar{b}$ is the per-person government transfer going to the population. Denoting G_x *and* G_y as the Gini indices of the pre- and post-transfer incomes, respectively, then, the social welfare functions of the pre-and post-transfer as obtained from (2.7) are given by

$$W = \mu\left(1 - G_x\right), \tag{3.3}$$

and

$$W^* = \left(\mu + \bar{b}\right)\left(1 - G_y\right), \tag{3.4}$$

respectively.

Arranging the population in ascending order of their pre-transfer income, we can define the concentration curve of the post-transfer income, denoted by $C_y(p)$ as the share of the post-transfer income of the bottom p percent of the population. The concentration index of the post-transfer income denoted by C_y is then defined as one minus twice the area under the concentration curve $C_y(p)$. Note that $C_y = G_y$, only if the individuals have the same ranking when arranged by x and y. If the welfare transfers change the ranking of individuals, then, following Kakwani (1980), $C_y < G_y$. Similarly, we define the concentration index of transfers C_b as one minus twice the area under the concentration curve of transfers when the individuals are arranged in ascending order of the pre-transfer income.

Applying *Theorem 8.5* from Kakwani (1980)[8] on (3.1) gives

$$\left(\mu + \bar{b}\right) C_y = \mu G_x + bC_b \tag{3.5}$$

which on substituting into (3.3) and (3.4) yields

$$B = \frac{\left(W^* - W\right)}{\bar{b}} = \frac{\mu_y}{\bar{b}}\left(C_y - G_y\right) + 1 - C_b \tag{3.6}$$

[8]Theorem 8.5 from Kakwani (1980) states that, if $g(x) = \sum_{i=1}^{k} g_i(x)$, so that $E\left[g(x)\right] = \sum_{i=1}^{k} E[g_i(x)]$, then $E\left[g(x)\right] C_g = \sum_{i=1}^{k} E[g_i(x)]\, C_{g_i}$, where C_g and C_{g_i}, are concentration indexes for $g(x)$ and $g_i(x)$, respectively.

where B is the change in social welfare when the government transfers an average of one unit of transfer to the population. B is the average social return from one unit of government transfer. When $B > 1$, the social gain is higher than the money spent on transfers.

Suppose the first term in the right-hand side of (3.6) is negative. In that case, it means the program transfers change individuals' ranking, which can happen when the transfers make some poorer individuals richer and the more affluent individuals poorer. The change in ranking contributes to the loss of social welfare.

The government transfers are said to be progressive if the poorer individuals receive more benefits than the richer ones. According to Kakwani's (1980) *Corollary 8.1*, the transfers are progressive if $C_b < 0$. Thus, equation (3.6) demonstrates that progressive transfers contribute to an increase in social welfare. Similarly, if transfers are regressive when $C_b > 0$, the more impoverished persons receiving fewer benefits than the richer ones, the program reduces social welfare. If everyone in society gets the same transfer, equal to one unit of transfer, there will not be any change in ranking, so equation (3.6) shows that social welfare will increase by one unit per person.

A social transfer program is associated with two types of costs: the amount of money transferred to beneficiaries and the administrative cost. The transfer of funds to households has a direct impact on people's welfare. Although the administrative cost does not directly affect people's welfare, it is an essential expenditure to deliver funds to the program beneficiaries efficiently. We may assume that the administrative cost is proportional to the amount of funds transferred to the households for simplicity. Suppose the administrative cost is $\in$% of the transfers delivered to the beneficiary households, then, the average program cost will be given by $(1+\in)\bar{b}$, which is the per capita program expenditure by the government. Thus, equation (3.6) adjusted for the administrative cost will be given by

$$R = \frac{B}{(1+\in)} = \frac{(W^* - W)}{(1+\in)\bar{b}} = \frac{\mu_y}{(1+\in)\bar{b}}\left(C_y - G_y\right) + \frac{\left(1-c_b\right)}{(1+\in)} \tag{3.7}$$

R is the money metric social welfare contributed by the program as the proportion of the program cost. R measures the social rate of return (SRR), defined as the increase of social welfare for the average one unit of the program cost per person. When $R > 1$, the social return from a program is higher than its cost.

For example, suppose the program transfers \$100 million to households, and the administrative cost is 5 percent of funds transferred to the beneficiary households, then, the total cost of the program will be \$105 million, and if the increased social welfare in monetary units is \$120 million, the total return of this program is $\frac{120}{105} = 1.14$. Thus, the social rate of return (SRR) equals 14 percent. The policymakers' social objective should be to maximize the SRR. The SRR will be optimized when the program is run efficiently with a low administrative cost. If the program is well-targeted to the lower income individual, it contributes to higher social welfare resulting in higher SRR.

4. Three Targeting Principles

The previous section presented a social welfare framework to calculate social rates of return; the higher the SRR, the better is the targeting of the individuals with incomes at the lower end of the income distribution, and the more efficient is the social transfer programs.

The evaluation of programs, as commonly done, is always based on some poverty measures. The construction of poverty measures requires the specification of the poverty line, the threshold income below which a person is poor. In this paper, we propose an evaluation method that avoids the contentious issue of setting poverty lines for different countries. We achieve this objective by calculating the SRR through three targeting principles.

4.1. *Universal Basic Income*

Principle I *The benefits received by a person with income x is given by*

$$b(x) = \bar{b} \text{ for all } x \tag{4.1}$$

where $\bar{b}$ *is the average transfers going to the population*.

Principle 1 is derived from a universal basic income (UBI) scheme, a form of social security in which all individuals in society receive the same transfer from the government. This idea ultimately gets rid of the targeting problem for all social transfers. The poor and the rich are all equal beneficiaries of social programs (see, for example, Hanna and Olken, 2018).

Using the Gini social welfare function in (2.5) on (4.1), it is easy to show that

$$B_1 = W_1^* - W = \bar{b} \tag{4.2}$$

where W_1^* is the social welfare of the post-transfer income under the UBI scheme. Suppose the administrative cost is $\in_1 \%$ of the funds transferred to the beneficiaries, then, the total cost of the program under *Principle I* is $\left(1+\in_1\right)\bar{b}$. Thus, using (4.1), the money metric measure of social welfare contributed by the universal basic income scheme as the proportion of the total program cost is given by

$$R_1 = \frac{1}{\left(1+\in_1\right)} \tag{4.3}$$

which demonstrates that the SRR for the universal basic income scheme will always be negative if the administrative cost is positive. The magnitude of it will depend on the administrative costs of delivering transfers to the population.

The efficiency of the government program can now be defined as

$$E_1 = \frac{R}{R_1} \tag{4.4}$$

where R is the social rate of return of the current transfer program as in (3.7) and R_1 is the SRR under the UBI scheme. Therefore, if $E_1 > 1$, we have $\frac{B}{(1+\epsilon)} > \frac{B_1}{(1+\epsilon_1)}$ which implies that the current government program is more efficient than the untargeted UBI scheme because it generates higher social welfare for every unit of money per person spent on the program.

The government program may not always produce a higher SRR than the UBI scheme because (1) it may not have progressive transfers, and (2) it may have a higher administrative cost. If a program is well-targeted to the poor, and at the same time, it does not incur a too high administrative cost, the program will produce higher social welfare than the UBI scheme. Thus, E_1 provides an empirical test for the efficiency of the program relative to the UBI.

4.2. *Equal Subsidies for the Poor*

Suppose instead of giving equal transfers to everyone in the society; the government provides the same amount of transfers to everyone belonging to the bottom p percent of the population. Suppose x_p is the market income of an individual at the p th percentile, then, $x_p = z$ will be the poverty line for that country. Note that we are not specifying any pre-determined poverty line. We identify the bottom p percent of the population as poor given $\bar{b}$ is fixed, which we estimated from $\bar{b} = p\left(z - \mu_p\right)$ given in (4.12). Thus, in a sense, the poverty line is determined endogenously.

Principle II *The benefit received by a person with market income x, given by*

$$b(x) = \begin{cases} \bar{b}_1 \text{ if } x \le z \\ 0 \text{ if } x > z \end{cases} \tag{4.5}$$

where $\bar{b}_1$ $p = \bar{b}$*, which for the estimated value p from (4.12) provides* $\bar{b}_1$.

This Principle implies that the poor receive the per capita transfer of $\bar{b}_1$ from the program, and the non-poor do not receive any transfers. This Principle focuses on the welfare of the poor and is in line with the concept of shared prosperity, as discussed in Narayan *et al*. (2013), Dollar *et al*. (2015), and Shen *et al*. (forthcoming). The post-transfer income under this Principle will be given by

$$y(x) = \begin{cases} x + \bar{b}_1 \text{ if } x \le z \\ x \text{ if } x > z \end{cases} \tag{4.6}$$

Under this Principle, those non-poor people whose income is only just above the poverty line will not receive any transfer. Some poor below the poverty line before transfer may after the transfer cross the poverty line and become non-poor. Their income may exceed those of non-poor who did not receive any transfer. Therefore, under this Principle, there may be a change in ranking between the pre- and post-transfer income distributions. This would result in a loss of social welfare. Villamil (forthcoming) argues that the transfer payment mechanism should be designed to satisfy the Fairness Axiom; i.e. a transfer payment system should cause no re-ranking in people's living standards. This requirement is applied in taxation literature, and it is consistent with Axiom 3 in Kakwani and Lambert (1998).

The Gini social welfare function in (2.5) satisfying Principle II yields

$$W_2^* - W = \mu_y \left(C_{y2} - G_{y2}\right) + \bar{b}\,(2-p) \tag{4.7}$$

W_2^* is the social welfare of the post-transfer income under Principle II and C_{y2} and G_{y2} are the concentration and Gini indices, respectively, of the post-transfer income satisfying Principle II. The first term on the right-hand side of (4.7) shows that the change in ranking under Principle II reduces social welfare.

Using (4.2) and (4.7) yields

$$W_2^* - W_1^* = \mu_y \left(C_{y2} - G_{y2}\right) + \bar{b}\,(1-p) \tag{4.8}$$

Intuitively we would assume that, when there is no administrative cost, if the program is targeted to the poor with the same transfers, the social welfare would be higher than that of the untargeted UBI scheme. Equation (4.8) shows that this assumption might not hold when there is a change in ranking. If there is no change in ranking, the second term on the right-hand side of (4.8) demonstrates that the program targeted to the poor would be welfare superior.

Suppose the administrative cost is $\in_2 \%$ of the funds transferred to the beneficiaries under the targeted program satisfying Principle II, then, using (4.7), the money metric measure of social welfare contributed by the targeted program as the proportion of the total program cost is given by

$$R_2 = \frac{\mu_y \left(C_{y2} - G_{y2}\right)}{\bar{b}\,(1+\in_{2)}} + \frac{(2-p)}{\left(1+\in_2\right)} \tag{4.9}$$

The efficiency of the government program relative to targeted program satisfying Principle II can now be defined as

$$E_2 = \frac{R}{R_2} \tag{4.10}$$

If E_2 is greater (less) than 1, it implies that the government program is more (less) efficient than the program targeted to the poor (as in Principle II).

4.3. *Perfect Targeting (Filling the Poverty Gap)*

Not all the poor have the same market income. A perfectly targeted program will be the one that fills the income gap of the poor individuals from the poverty line so that the income of every one of the poor is lifted to the poverty line. This targeting scheme would meet the strongest requirement, which we present below as Principle III.

Principle III *The benefit received by a person with market income x is given by*

$$b(x) = \begin{cases} (z-x) \ \ if\ x \le z \\ 0 \ if\ x > z \end{cases} \tag{4.11}$$

which gives

$$\bar{b} = p\left(z - \mu_p\right) \tag{4.12}$$

where μ_p *is the mean of the poor. We solve this equation for p given* $\bar{b}$.

The post-transfer income under this Principle will be given by

$$y(x) = \begin{cases} z \ if\ x \le z \\ x \ if\ x > z \end{cases} \tag{4.13}$$

Principle III requires that all poor have the post-transfer income equal to the poverty line, and the non-poor have the same gross income as their before transfer income. It is easy to verify that under this Principle, there will be no change in ranking between the market and gross income distributions.

We can show that the Gini social welfare function in (2.5) yields

$$W_3^* - W = \bar{b}(2-p) + p^2 \mu_p G_p \tag{4.14}$$

where W_3^* is the social welfare function of the post-transfer income under the perfectly targeted program as described in Principle III, and G_p is the Gini index of the market income among the poor.

Note that

$$W_3^* - W_2^* = \mu_y \left(C_{y2} - G_{y2}\right) + p^2 \mu_p G_p > 0 \tag{4.15}$$

Since the first term in the right-hand side of (4.15) is negative, it follows that the perfectly targeted program yields higher social welfare than Principle II, where only the poor are targeted, and every poor person receives the same amount of program benefits.

Suppose the administrative cost is $\in_3$% of the funds transferred to the beneficiaries under the perfectly targeted program, using (4.14), the money metric social welfare contributed by the perfectly targeted program as the proportion of the total program cost is given by

$$R_3 = \frac{2-p}{(1+\in_3)} + \frac{p^2 \mu_p G_p}{(1+\varepsilon_3)\bar{b}} \tag{4.16}$$

We can now define the efficiency of the government program relative to the perfectly targeted program satisfying Principle III as

$$E_3 = R / R_3 \tag{4.17}$$

If E_3 is greater (less) than 1, it implies that the government program is more (less) efficient than the perfectly targeted program to the poor (as in Principle III). If $E_3 > 1$, we can classify the government program as the most valuable.

4.4. *Administrative costs further discussed*

Administrative costs vary from one program to another and even for similar programs in different countries. More importantly, they depend on how well the targeting method is applied. The universal basic scheme does not have to identify the poor, so it should incur the least administrative cost. The targeted programs require more resources to identify the poor so that they will incur higher administrative costs. The perfectly targeted program should bear the most administrative cost because it requires every poor individual's market income. Thus, the administrative costs should satisfy the inequality $\in_1 < \in_2 < \in_3$.

This paper has developed a methodology to calculate the social welfare contributions of different targeting principles. Still, we need to know the administrative costs of targeting methods seldom available to researchers in practice. Suppose the administrative costs are insignificant relative to the size of the program. In that case, we may judge the program's efficacy by ignoring these costs and only focus on the social welfare contributions of different targeting methods. However, the administrative costs can be significant for some programs. We do not know a priori how high the administrative costs are. And hence, policymakers cannot ignore the administrative cost of running the programs. They can judge the efficacy of targeting methods only when they know administrative costs.

Due to scarce resources, policymakers' objective should be to design a program that generates maximum social welfare at a fixed cost. When policymakers create a welfare program, they should make estimates of administrative costs of different targeting principles. Given these estimates, they can follow the following decision criteria. If

$$\frac{R_2}{R_1} > 1 \tag{4.18}$$

TABLE 1
Income Sources and the Details of the Public Social Benefits

Current income	Factor income	Labor income	Wage income
			Self-employment income
		Capital income	Interest and dividends
			Rental income
	Transfer income	Pensions	Public non-contributory pensions
			Public contributory pensions
			Private pensions
		Public social benefits (excl. pensions)	Family benefits
			Unemployment benefits
			Sickness and work injury pay
			Disability benefits
			General assistance
			Housing benefits
		Private transfers	Cash transfers from private institutions
			Inter-household cash transfers

the right-hand side of this inequality is the social rate of return of targeting Principle II relative to that of Principle I. It is equivalent to $\frac{B_2}{B_1} > \frac{1+\epsilon_2}{1+\epsilon_1}$. If inequality in (4.18) is satisfied, targeting the poor would be more efficient than the UBI scheme because it will generate higher social welfare at a given cost. If the condition in (4.18) is not satisfied, providing transfers to everyone will be preferred. The proponents of universal basic income must test this rule before promoting universal basic income.

Similarly, if

$$\frac{R_3}{R_2} > 1 \tag{4.19}$$

then the policy of perfect targeting will be more efficient than targeting the poor with equal transfers, and it is equivalent to $\frac{B_3}{B_2} > \frac{1+\epsilon_3}{1+\epsilon_2}$.

5. International Comparisons of Government Transfer Programs

5.1. *Setting the Stage*

Almost all developed countries have made substantial investments in safety-net programs. These are targeted programs designed to help low-income and vulnerable populations. They provide support to low-income families, unemployed, students, the elderly, etc. Generally, the safety-net programs are means-tested, targeted to the low-income population, but the degree of targeting varies substantially in different countries. From the policy perspective, a pertinent question is: what targeting method should be employed in designing a welfare program?

This section provides an international comparison of safety-net programs using the measures developed in the previous sections. We have utilized income distribution data for 44 middle and high-income countries. These data are obtained from the Luxembourg Income Study (LIS, 2020) Database, which has the most extensive available income database from about 50 countries in Europe, North America, Latin America, Africa, Asia, and Australia. The household surveys of 44 selected in this study were conducted around 2013.

The LIS acquires micro-level data sets to provide information on income, wealth, employment, and demographics at the household level. The primary sources of these data sets are the household income surveys conducted by national statistical authorities or research institutes. The LIS harmonizes them into a common framework to enable cross-national comparisons. The data sets contain household and person-level data on labor income, capital income, pensions, public social benefits (excluding pensions), and private transfers, as well as taxes and contributions, demography, employment, and expenditures.

We have made comparisons of safety-net programs across countries for which comparable data on government transfers were available. In Table 1, we show the detailed income sources and categories used in this study. This paper focuses on public transfer programs, which includes all the public social benefits but excludes pensions. As indicated in the table, these public social benefits go to various

TABLE 2
EVALUATION INDICATORS OF SAFETY-NET PROGRAMS FOR TEN SELECTED COUNTRIES

Indicators	India	Brazil	Russia	France	UK	Finland	Germany	Australia	Canada	US
Gross income	3781	11889	24661	28982	32074	35856	37522	42981	42382	46962
Transfers	76	258	1273	2301	2805	2905	2001	2164	2185	1135
Transfer as % of gross income	2.02	2.17	5.16	7.94	8.75	8.10	5.33	5.03	5.15	2.42
Gini index without transfers	0.52	0.51	0.38	0.37	0.45	0.37	0.40	0.43	0.40	0.45
Gini index with transfers	0.51	0.49	0.36	0.31	0.37	0.32	0.36	0.39	0.37	0.43
Redistribution effect	2.22	3.27	5.47	14.74	17.99	14.72	9.35	9.23	9.53	4.15
Progressivity of transfers	−0.08	−0.30	−0.14	−0.42	−0.57	−0.38	−0.36	−0.44	−0.40	−0.39
Horizontal inequity	−0.03	−0.04	−0.12	−0.10	−0.09	−0.08	−0.06	−0.08	−0.05	−0.07
Gain/loss due to progressivity	0.08	0.30	0.14	0.42	0.57	0.38	0.36	0.44	0.40	0.39
Gain due to equal transfers	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Total Gain/loss of welfare	1.05	1.26	1.02	1.32	1.48	1.30	1.30	1.36	1.34	1.33
Efficiency of program R/R1	1.05	1.26	1.02	1.32	1.48	1.30	1.30	1.36	1.34	1.33
Efficiency of program R/R2	0.58	0.70	0.61	0.80	0.91	0.80	0.76	0.80	0.78	0.74
Efficiency of program R/R3	0.55	0.66	0.57	0.72	0.83	0.72	0.70	0.74	0.73	0.70
R2/R1	1.81	1.80	1.67	1.64	1.62	1.63	1.71	1.69	1.72	1.80
R3/R1	1.92	1.90	1.81	1.82	1.78	1.80	1.85	1.84	1.85	1.89
R3/R2	1.06	1.05	1.08	1.11	1.10	1.11	1.09	1.09	1.07	1.05

populations with relatively low income. They only constitute the safety-net programs. All other income sources, such as factor income, pension income, and private transfers, are included in market income.[9]

Gross household income is the total monetary and non-monetary (such as in-kind) current income. It includes market income and government transfers to households. We have equivalized household incomes and transfers by dividing by the number of household members' square roots. This equalizing procedure takes into account the different needs of household members and economies of scale that occur in larger households. Income and transfers are available from household surveys in a local currency, but relative prices significantly impact cross-country income levels (Inklaar and Rao, 2017). To make international comparisons, we converted local currency into international dollars based on the 2011 purchasing power parity (PPP). Thus, income and transfers are comparable across countries.

5.2. *Empirical Analysis for Ten Countries*

In this sub-section, we provide a detailed analysis of ten selected countries out of 44 countries. We have not applied any rigorous criterion in choosing these countries except that they are large economies, and our objective is mainly illustrative. Table 2 presents empirical results for the ten countries selected. Results for the remaining countries are in the Appendix. Interested readers can use the same analytical framework to understand and explain those countries.

5.2.1. The Scale and Progressivity of Transfers

The average standard of living is measured by the per equivalent adult (household size-adjusted) gross income in 2011 PPP. According to this criterion, India is the poorest country on the list, with per equivalent adult annual income of $3,781. The wealthiest nation is the United States, with an income of $46,962 per capita. The countries spend different amounts on their safety-net programs. A country's commitment towards providing a safety-net to its people can be roughly measured by the transfers as the percentage of household income. We could expect that the more prosperous countries would have a more significant commitment to safety-net programs than the poorer ones, but the results suggest that this is not the case. The USA, being the wealthiest country on the list, spends only 2.42 percent on safety-net programs. The European countries have a much higher commitment to providing a safety-net to their people. The United Kindom, France, and Finland spend 8.75, 7.94, and 8.10 percent of income on transfers, respectively.

The redistribution effect of programs is measured by the change in the Gini index of pre- and post-program income distributions.[10] In all countries, the programs contribute to a reduction in the Gini index. The countries with a higher

[9]We have not included those other types of transfers in our analysis because they generally are not part of the welfare programs in many countries. It was also not feasible to evaluate partial redistributive effects of expenditures on different programs from the data, as that would imply a sequence of the transfer policies. The countries in our sample had a variety of programs but the detailed expenditures on individual programs were not available in the data set.

[10]Redistribution effect = (Gini index without transfers—Gini index with transfers)/Gini index without transfers.

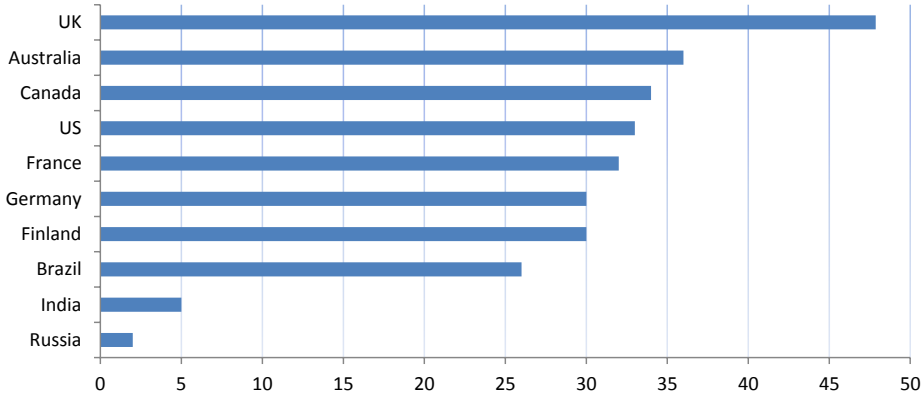

Figure 1. Social Rates of Return of Welfare Programs in Ten Countries (%) [Colour figure can be viewed at wileyonlinelibrary.com]

commitment to welfare programs achieve a higher reduction in inequality due to their programs.

The total gain (loss) of welfare is the sum of three components. They are social welfare gains (losses) due to (1) horizontal inequity, (2) progressivity, and (3) equal transfers. There would be welfare loss when there is horizontal inequality resulting from a change in the rank of income among households. Social welfare would increase when everyone receives one unit of transfer in line with our first Principle of the universal basic income approach. The more progressive a transfer program is, the higher the welfare gain will result. The government transfers to households are said to be progressive if the poor receive more transfers than the rich. The degree of progressivity is measured by the gain in social welfare when, on average, one dollar of transfers going to households.

We illustrate this using the United Kingdom as an example. In the U.K., the increase in social welfare is 0.57 cents due to progressivity for every dollar of the transfer, and the gain due to equal transfer is 1. But there is a loss of social welfare equal to 9 cents due to horizontal inequity (when there is a change in ranking). The total gain in social welfare in the United Kingdom is $1.48 per person when the government transfers one dollar to every person. Thus, the social program generates a 48 percent social rate of return. In India, the social return rate is 5 percent because the increase in social welfare due to the programs is only marginally higher than the households' transfers.

Figure 1 provides a snapshot of social rates of return in various countries. The social programs in the United Kingdom produce the highest social rate of return, followed by Australia, Germany, and Finland. Following this method, a social rate of return can be compiled for all the countries to assess social programs' efficiency and effectiveness.

5.2.2. Evaluating the Efficiency of the Transfer Programs

The UBI scheme has been attracting much attention recently. Under this scheme, all individuals in society receive the same amount of transfer from the government. As pointed out, the World Bank is now promoting this idea on its blog "Basic Income: Can we transfer our way out of poverty?" This scheme was recently tested in Finland. Hanna and Olken (2018) admit that government-led anti-poverty programs have a crucial role in eliminating extreme poverty worldwide, but question the form of these transfers, and in particular, whether they should be universal or targeted more narrowly to the poor.

Therefore, it is essential to know how the current programs perform compared to the universal basic income. To answer this question, we calculated R/R1,[11] the ratio of social welfare generated by the program to that under the UBI scheme with the same amount of transfers to households. If this ratio is higher (lower) than 1, the program performs better (worse) than the UBI scheme. From Table 2 and Figure 1, we can see that for Russia and India, this ratio is 1.02 and 1.05, respectively, implying that welfare programs in these two countries only marginally perform better than the UBI scheme. But for all other countries in our sample, the ratio varies from 1.26 to 1.48, significantly higher than 1, from which we conclude that the currently running targeted programs in developed countries perform considerably better than the universal basic income.

This conclusion is valid because the programs' administrative cost is the same as that of the UBI scheme. This condition is unlikely to hold because the targeted programs incur higher administrative costs than the untargeted programs. If the actual administrative costs are known through small scale trials in a country, a more meaningful comparison can be made, before deciding which program to adopt.

The primary aim of social welfare programs is to reduce poverty and, more generally, to increase social welfare. So, the programs are designed to target the poor. Various countries adopt different targeting methods to transfer benefits to the poor. There are two distinct issues in designing targeting programs: (1) identifying the poor, and (2) how much transfers should be given to them so that their minimum basic needs are met.

Our targeting principle II is related to making equal transfers to those who have been identified as poor. We want to know how social programs in different countries have performed against Principle II. i.e. how they perform compared to the counterfactual scenario where the program beneficiaries are only the poor. At the same time, the non-poor do not receive any benefit from the program. As discussed in subsection 4.2, a program is more efficient than under Principle II if $R/R2 > 1$.

[11]The LIS data used in the paper is micro level household data, where the information on administrative costs of the social programs is not available. As we have emphasized that the administrative costs are essential in evaluating the programs, but a hard fact is that none of the welfare programs implemented in the world provide information on administrative costs. Even the World Bank Report entitled "The State of Social Safety Nets 2015" does not discuss administrative costs. We have, however, pointed out this as an important area and to suggest potential methods that can be used, and have attempted to draw some broad conclusions from our empirical application without the administrative data.

In global poverty studies, it is often the norm to follow the same exogenously given poverty line, such as the (PPP) $1.9 a day for all the countries. Since we compare the efficiency across countries with widely different living standards, we cannot use the same exogenously determined poverty line for all countries. Our model determines the poverty line endogenously based on government subsidy incurred on welfare programs in different countries.

The results in Table 2 show that the indicator R/R2 is less than 1 for all countries in our sample. The poor belong to the bottom p percent of the population. None of the countries can correctly identify the poor belonging to the poorest p percent population. This revelation is significant because safety-net programs were supposed to alleviate or at least reduce poverty. For instance, the value of the indicator for India is only 0.56, signifying a very low targeting efficiency of social programs in India. The indicator has the highest value of 0.90 for the United Kingdom. Australia is the second-best on the list with a targeting efficiency of 0.84. The United States has considerably lower efficiency at 0.76.

Principle III implies perfect targeting whereby every poor person's income is lifted to the poverty line, meaning that the programs are designed to eliminate poverty. The program would be more efficient than perfect targeting (Principle III) if $R/R3 > 1$. As expected, the results in Table 2 show that this targeting indicator is less than 1 for all countries in our sample.

The results also show that $R/R3 < R/R2$ for all countries in our sample. The efficiency of the United Kingdom reduces from 0.90 to 0.82. This result is expected because targeting Principle III is a stronger requirement than Principle III, so it achieves higher social welfare. These conclusions are valid only under the condition that the program's administrative costs are the same as those under Principles II and III. This assumption is unlikely to hold because targeting the poor with equal transfers or perfect targeting incurs higher administrative costs.

How should policymakers base their targeting strategy? First, they have to determine the administrative costs of different targeting scenarios, as outlined by the three principals at the program design phase. Once this is done, then, the empirical results in Table 2 can help to make this decision. R2/R1 indicates how much social welfare is generated if the program targets the poor with equal transfers relative to no targeting scenario. Everyone in society receives equal transfers so that the total transfer cost is the same. For instance, ratio R2/R1 for Australia, from Table 2, is equal to 1.71, which implies that targeting the poor generates 71 percent higher social welfare than no targeting. If the cost of targeting the poor relative to no-targeting is significantly less than 71 percent, it would then be a more efficient strategy to target the poor than no targeting. A similar interpretation applies to the ratio R3/R2, which compares the social welfare efficiency of perfect targeting relative to equal transfers to the poor. Thus, the empirical results presented in Table 2 can guide policymakers on what targeting strategy they could adopt.

6. Rank Correlations Analysis

An important issue in development economics is whether there is a relationship between development and income inequality. In his pioneering paper, Kuznets (1955)

TABLE 3
Spearman's Rank Correlations

Evaluation Indicators	Per Equivalent Adult Income
Program transfers as a share of income	0.60*
Gini index without the program	−0.46*
Gini index with the program	−0.57*
Redistribution effect of the program	−0.63*
Progressivity of transfers	−0.47*
Program efficiency relative to targeting Principle I	0.46*
Program efficiency relative to targeting Principle II	0.62*
Program efficiency relative to targeting Principle III	0.57*

Note: Significant at the 1% level of significance.

proposed an inverted U-shaped curve of economic development. At low levels of economic development, income inequality increases, but inequality begins to decline when it reaches a threshold level. He explained this curve's existence in terms of structural transformation, which takes place due to migration from rural to urban sectors.

Another possible explanation of the Kuznets phenomenon could be that as countries become wealthier, their commitment to social programs also increases. At a later phase of economic development, as governments follow redistributive policies combining progressive taxation with welfare spending, inequality may decrease (Baymul and Sen, 2019). We argue that the decrease in inequality with economic development is not a natural result but a consequence of government redistribution policies. For example, Caminada *et al*. (2019), Wang and Piesse (2010), and Wang *et al*. (2012) show that government transfers played more significant roles than taxes in narrowing income inequality. In this section, we first clarify some theoretical issues and, then, look at the empirical results.

Whether the Kuznets process holds for any particular economy depends on the specific characteristics of the structural transformation path that the economy follows (Baymul and Sen, 2019). The relationships involving social welfare functions and progressivity of government transfers are often non-linear. The correlation coefficients that measure deviation from linearity may invariably show that the variables are not significantly related or weakly related. Given the non-linear nature of variables, linear regressions can be estimated after applying a non-linear transformation to the original data.

Because the exact forms of non-linear relationships are not known, Spearman's rank correlation coefficient is used to test whether there is a significant relationship between variables.[12] The following test statistic is used to test the significance of relationships.

$$t = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}} \tag{6.1}$$

[12]The Spearman's rank correlation coefficient is a nonparametric measure of rank correlation, often used in statistics to assess how well the relationship between two variables can be described using a monotonic function. See Spearman (1904), Corder and Foreman (2014) for more detailed discussions.

where r is the Spearman's rank correlation and distributed approximately as Student's t distribution with (n–2) degrees of freedom. This test procedure performs better than the usual normal approximation.

The correlation analysis does not establish a causal relationship between the variables, which would require a highly complex general equilibrium model. Our aim is limited to determining whether there are significant monotonic relationships between variables.

We carried out the rank correlation analysis using data on 44 countries, with the statistical significance level set at 1%. If rank correlation coefficients among the variables are statistically significant, we can conclude that their relationships would exist with a high degree of confidence.

Table 3 reports the Spearman's rank correlation coefficients. As pointed out, we can measure the commitment to social programs by transfers to households as a share of their income. We note from Table 3 that the rank correlation between income and commitment is 0.6, which is significant at the 1 percent level of significance. This observation suggests that the wealthier a country, the higher is its social expenditure as the share of its income. We also find that all the other rank correlations reported in Table 3 are significant at the 1 percent significance level. These observations suggest that social programs in wealthier countries have more progressive transfers that redistribute income to poorer households. The wealthier countries also have social programs that have higher efficiency in targeting the poor. Thus, the more effective redistributive welfare policies are important contributors in explaining the Kuznets' phenomenon of reducing inequality when countries become more affluent.

7. Conclusions

Social welfare programs' effectiveness is essential for public policymakers in selecting a program based on the comparison with three targeting principles proposed. This paper develops a social welfare framework for measuring government social programs' impact on the welfare of the people and applies this set of evaluation measures to 44 countries to undertake an empirical evaluation and allow international comparison using LIS data.

We introduced the measurement of the social rate of return to the policy evaluation framework. The social rate of return approach enables a cross-country comparison of policy effectiveness and allows the decomposition of the efficiency into different effects. According to their social programs' efficiency and effectiveness, a social rate of return index can be compiled for countries in the world. For example, countries such as the U.K. and Australia perform very well in this league table, but Russia and India perform very poorly. This social rate of return index can be an excellent index for assessing institutions and governance quality.

This paper also introduces relative efficiency in policy evaluation, enabling an assessment of a given program comparative to alternative targeting principles. We proposed three transfer principles and compared the current social programs in various countries against these principles. For example, the UBI scheme has been advocated primarily due to the advantage of its low administrative cost. However, it performs much worse than almost all other social welfare programs in all 44 countries when the administrative cost is not considered.

Even if the UBI incurs lowers administrative costs than that of other programs, it is likely that the saved administrative cost by the UBI may not be enough to compensate for the social welfare loss caused by non-progressivity and other problems. Many developed countries such as the U.K. are doing very well now, so the need for adopting the UBI may not be necessary in light of the evidence presented in the paper.

The rank correlation analysis presented in the paper suggests that many high-income countries have lower inequality and higher redistribution effects, where they relatively spent a lot more money investing in social programs and with higher efficiency overall. Through the rank correlation analysis, we argue that one of the fundamental reasons for the second phase of the Kuznets' inverted-U shape is not only a natural outcome of structural transformation but, more importantly, maybe due to the extensive commitment to social programs.

There are a couple of directions suggested for further research. First, a more accurate assessment of social programs and international comparisons can be conducted when more detailed administrative costs become available. We have discussed the paper's critical methodological issues, but we were unable to provide a more accurate assessment of the programs without knowing their administrative costs. The administrative costs are seldom used to evaluate the efficiency of programs. In this paper, we have emphasized how crucial administrative cost in assessing the efficacy of programs. The World Bank Report entitled "The State of Social Safety Nets 2015" has provided a comprehensive compilation of welfare programs worldwide. Even this flagship publication does not incorporate any discussion of the administrative costs.

Second, the paper's essential contribution has been to show how the idea of the social rate of return can be applied to evidence-based policy analysis that could improve the quality of institutions and governance. Future research into the development of a social rate of return would provide concrete evidence for public policies' effectiveness. It will incentivize nations to improve their welfare programs that play a crucial role in reducing poverty and inequality.

We have not discussed any non-income consideration in our analysis. For instance, as Sen (1987) famously points out, if somebody is disabled, he might need a higher income to obtain the same quality of life. Therefore, if two people are equally poor, but one is disabled, it is reasonable that the disabled should get a larger government transfer. The transfer programs must take into account the different needs of the people. However, if we take into account the diverse needs of all people, the programs will become unmanageable. Many countries have separate programs providing transfers directly to the neediest, such as chronically sick or disabled persons. The idea of the social rate of return developed in the paper can apply to these programs also.

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Supporting Information

Additional supporting information may be found in the online version of this article at the publisher's web site:

Table A: Evaluation Indicators of Safety-net Programs for 44 Selected Countries