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Social rate of return: A new tool for evaluating social programs

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Abstract

This study proposes the method of social rate of return (SRR) to evaluate safety net programs such as conditional cash transfer (CCT) schemes. Two types of SRRs are derived in the study: one based on the poverty social welfare function that focuses on the poorest 20% of the population and the other based on the Gini social welfare function that focuses on inequality as measured by Gini. Defined as the social welfare generated by a program as a percentage of the cost of the program, the SRR is used in this study to conduct a comparative evaluation of CCT programs in Brazil (*Bolsa Familia* Program) and the Philippines (*Pantawid Pamilyang Pilipino* Program or 4Ps). The findings reveal that the targeting of *Bolsa Familia* has improved substantially during 2001–2012, with the poor comprising almost two-thirds of the beneficiaries in 2012. Meanwhile, the 4Ps has rapidly expanded to cover 21% of the population in 2013, but at the expense of increased leakage of beneficiaries from 45.33% in 2011 to 52.20% in 2013. The study finds that both programs have become more efficient in alleviating poverty and inequality – albeit *Bolsa Familia* is deemed more efficient given its better targeting system and lower operational cost. Nevertheless, the 4Ps' targeting efficiency and administrative costs associated with the delivery of transfers have improved within a short period. The findings also indicate that both programs contribute more to the reduction in poverty than inequality.

Keywords: Social rate of return, Gini social welfare function, poverty social welfare function, inequality, targeting, beneficiary and benefit analysis, cost effectiveness, poverty, education, conditional cash transfer program, Bolsa Familia, Pantawid Pamilyang Pilipino Program, social assistance.

JEL Classification: D61, D63, I24, I32, I38.

1. Introduction

A growing number of developing countries are investing in a variety of social programs to improve the welfare of their people, particularly those who are poor and vulnerable. According to a 2015 World Bank report, *The State of Social Safety Nets 2015,* as many as 1.9 billion people are beneficiaries of safety net programs. Of which, 44% receive in-kind transfers, 37% receive cash based transfers, and the remaining 19% receive other forms of benefits such as fee waivers. These programs are now becoming an important pillar of economic development policies.

Given the popularity of these programs, it has become important to rigorously evaluate them so that policy makers are informed of the extent to which these programs meet their intended objectives. A social program primarily aims to reduce poverty and, more generally, to increase social welfare. A social welfare function is often used to evaluate whether or not the program has achieved its intended objectives. To achieve program efficiency, the program should be designed to maximize social welfare with minimum cost.

Cost is clearly important for any social program. Programs ought to be judged based on how much social welfare they generate in relation to their respective operational costs. In this study, we adopt a method for evaluating programs using the idea of social rate of return (SRR). In calculating SRR, we use a social welfare function that specifies normative judgments by assigning weights to different individuals. The concept of SRR is explained in detail in Section 4.

Targeting is a means to improve program efficiency so that program objectives are achieved with minimum cost. There are two distinct issues in designing targeted programs—first is identifying the genuine beneficiaries who are the most needy, and second is deciding on how much transfers should be given to them so that their minimum basic needs are adequately met. Accordingly, targeting efficiency is judged by two kinds of targeting methods that are derived from (i) beneficiary incidence and (ii) benefit incidence. We provide a brief review of these targeting methods in Sections 2 and 3.

Ravallion (2009), however, concluded that the standard measures to evaluate targeting performance are uninformative, or even deceptive, about the impacts of programs on poverty and the cost effectiveness in reducing poverty. He arrived at this conclusion without exploring their welfare interpretation. This paper shows that all targeting measures proposed in the literature have a meaningful interpretation in terms of the SRR.

The conditional cash transfer (CCT) programs that originated in Latin America are now becoming an extremely popular social policy tool because of their ability to enhance both the income of the poor in the short run and their human capital in the long run. These programs provide transfers to poor beneficiaries, but the amount they receive are conditional on meeting targets in school attendance and healthcare checkups. The main objective of these programs is to reduce extreme poverty in the short run and to break the intergenerational poverty cycle, through investment in human capital in the long run.

In 2003, the federal government in Brazil created the *Bolsa Familia* Program with the objective of organizing and unifying four existing federal programs: *Bolsa Escola*, *Bolsa Alimentacao*, *Auxilio Gas* and *Cartao Alimentacao*. This program has now become the world's largest with around 45 million beneficiaries in 2012. The popularity of CCT programs in Latin America has become widespread, and almost 64 countries around the globe have now adopted similar programs.

Patterned after the CCT schemes in Latin American and some African countries, the Philippines' CCT program was launched in 2008 and has now become the fourth largest in the world with about 20 million beneficiaries in 2013. The *Pantawid Pamilyang Pilipino* Program (4Ps) is the Philippines' largest social protection program.

The *Bolsa Familia* is the world's largest social welfare program and has been regarded as highly successful, while the 4Ps is relatively new but has expanded rapidly in a short period. Since the two programs follow different methodologies in identifying beneficiaries, policy makers would be interested to know their relative targeting performance. This paper provides a comparative

evaluation of the two programs using the new idea of SRR developed in the paper. The evaluation is based on household surveys obtained from the two countries.

Brazil conducts an annual national household survey called *Pesquisa Nacional por Amostra de Domicílio* (PNAD), making it possible to analyze the progress of *Bolsa Familia* over the period 2001 to 2012. The Philippines has the multi-purpose annual national household survey called Annual Poverty Indicators Survey (APIS). However, detailed information about 4Ps is recorded only in the 2011 and 2013 APIS. Hence, the paper's analysis of the 4Ps is based on the most recently available APIS for 2011 and 2013.

2. Beneficiary Incidence

Safety net programs are designed to target certain types of individuals, families or households. For instance, the old age pension is targeted to the elderly who are 65 years and older. Conditional cash transfer programs are designed to give cash transfers to families with children who fulfill certain conditions. Meanwhile, unemployment benefits are given to those who are unable to find employment. Programs have both direct and indirect beneficiaries. Although programs are designed to provide direct benefits—cash or in-kind—to certain types of individuals within households, all household members indirectly benefit from them. That is, if a household is enrolled in a program, then all individuals belonging to that household are assumed to be beneficiaries of the program. This assumption is commonly used to evaluate programs and is therefore adopted in this study.

Suppose N is the total population of individuals, and among them N_p are the poor, then the headcount ratio of poverty is given by

$$H = \frac{N_p}{N}.$$

Suppose that N_b are the individuals who benefit from the program, then the probability of selecting a beneficiary from the population is given by

$$B = \frac{N_b}{N}.$$

If we had perfect information about the poor, then all beneficiaries of the program will be poor. However, this is not the case in practice. Suppose among N_b beneficiaries, N_{bp} are poor and the remaining $(N_b - N_{bp})$ are the non-poor beneficiaries. The probability of selecting a beneficiary among the poor is given by

$$B_p = \frac{N_{bp}}{N_p}.$$

Similarly, the probability of selecting a beneficiary among the non-poor is given by

$$B_n = \frac{(N_b - N_{bp})}{(N - N_p)}$$

Then we have the relationship:

$$B = HB_p + (1 - H)B_n.$$

The following two indicators—exclusion error and leakage—are commonly used in the literature to evaluate targeting efficiency. Let us define exclusion error as the proportion of poor who are non-beneficiaries of the program. It is expressed as

$$E = 1 - B_p.$$

Similarly, we define the leakage of beneficiary as the proportion of all beneficiaries who are not selected from the poor:

$$L = \frac{B - HB_P}{B}.$$

An error of exclusion leaves out the poor from the program, thereby making it ineffective in reducing poverty. Leakage represents the program resources that are provided to the non-poor who are unintended beneficiaries. Exclusion error and leakage are related such that

$$L = 1 - \frac{H}{B}(1 - E). \quad (1)$$

If the probability of selecting a beneficiary is equal to the headcount ratio of poverty ($B = H$), then leakage is equal to exclusion error ($L = E$). If $B < H$, $L < E$ and similarly, if $B > H$, then $L > E$. While both errors are undesirable, they may not be simultaneously reduced. If beneficiaries are increased as the program expands, then we can reduce the exclusion error, but the leakage increases. A reduction in one error may cause the other to increase. There is no simple formula to evaluate how well-targeted a program is. There might be a trade-off between the two errors; therefore, some normative judgment is required in evaluating the program.

The costs of any targeted program depend on what proportion of beneficiaries are included in the program: the larger the B, the greater the cost of the program will be. As governments face budget constraints, there is always a tendency to design programs that will have B as small as possible. Thus, governments are generally more concerned with high leakage than exclusion error. This is why most programs in developing countries have high exclusion error and low leakage.

China's Minimum Livelihood Guarantee Scheme, popularly known as *Di Bao,* is one of the largest social protection programs in the developing world. According to Ravallion (2009), the program covered 22 million people which represent 6% of urban residents. According to the *Di Bao* poverty line, 7.7% of the total population has been identified as poor.

While the main objective of the program is to reduce poverty, only 29% of the poor are beneficiaries. This means that 71% of the poor are excluded from the program. This figure does

not suggest, however, that *Di Bao* can be considered as an outlier in targeting performance internationally, as pointed out by Ravallion (2009). The percentage of beneficiaries among the non-poor is only a measly 1.83%. The program, therefore, has high exclusion error but low leakage rate. Thus, the program performs well in terms of coverage and also has lower cost, but it excludes a large number of eligible beneficiaries. This is a usual pattern in many developing countries; governments get more political mileage out of larger coverage, which they try to achieve with minimum cost. Consequently, they end up with programs that have large exclusion error.

3. Benefit Incidence

There are two criteria that need to be considered in the design of a safety net program: (i) identifying the beneficiaries and (ii) determining the benefits to be given to each beneficiary. The benefit incidence is concerned with how the total transfers are distributed among the poor and the non-poor. Targeting efficiency should be judged on the basis of both of these criteria.

Suppose B is the average number of beneficiaries in the population and β is the average transfers given to each beneficiary, then the average benefits per person in the population will be given by $\bar{b} = \beta B$. Similarly, if β_p and β_n are the average transfers given to each beneficiary among the poor and the non-poor, respectively, then $\bar{b}_p = \beta_p B_p$ and $\bar{b}_n = \beta_n B_n$ are the average benefits per person among the poor and the non-poor, respectively. We then have the relationship:

$$\bar{b} = H\bar{b}_p + (1 - H)\bar{b}_n$$

which can also be written as

$$\beta B = H\beta_p B_p + (1 - H)\beta_n B_n.$$

Leakage of benefits is the most important targeting indicator. It is defined as the proportion of total transfers going to the non-poor:

$$l = \frac{\beta B - H\beta_p B_p}{\beta B}. \quad (2)$$

Recall that L is the proportion of the total number of beneficiaries selected from the non-poor. The relationships between l and L is shown by

$$l = L + \frac{HB_p}{\beta B}(\beta - \beta_p) \quad (3)$$

which implies that if $l > (<)L$, then $\beta > (<)\beta_p$. That is, if the leakage of benefits is higher (lower) than the leakage of beneficiaries, the benefits per beneficiary will be higher among the non-poor (poor). This suggests that the targeting efficiency should be judged on two accounts: (i) how beneficiaries are distributed among the poor and the non-poor and (ii) how much of the benefits are given to the poor and non-poor beneficiaries. If the poor and non-poor beneficiaries receive exactly the same benefits, the leakage of benefits will be exactly the same as the leakage of beneficiaries.

Given the negative correlation between household size and household welfare level, larger households are generally poorer than smaller households. If the program is pro-poor, which is a minimum requirement of a social protection program, more larger-sized households will be selected as beneficiaries. If the program gives exactly the same level of benefits to all poor and non-poor beneficiary households, the per capita benefits received by the poor beneficiaries will be lower than those received by the non-poor beneficiaries mainly because of the poor households' larger size. Benefit analysis is generally based on per capita household income. This implies that the benefits per beneficiary among the poor will be lower than that among the non-poor. This leads to higher leakage of benefits, even if the program is well-targeted at the beneficiaries. Thus in the design of a program, the determination of benefits per beneficiary should account for the household size.

4. Social Rate of Return

Social rate of return (SRR) is defined as the social welfare generated by a program as a percentage of the cost of the program. To measure the social rate of return, we need to specify a social welfare function that can be measured in money metric. For instance, we should be able to say how much, as measured in a country's currency, the increase in social welfare is so that we can compare it with the cost of the program measured in the same currency. Obviously, a social welfare program should outweigh social welfare than its cost.

Suppose there are *n* persons in a society whose incomes are given by a vector:

$$\tilde{x} = (x_1, x_2, \ldots\ldots\ldots\ldots\ldots, x_n).$$

Then, a general social welfare function is defined as

$$W = W(\tilde{x}).$$

The minimum requirements of a social welfare function are: (i) it should be non-decreasing in its arguments and (ii) it should be quasi-concave.[1]

When a social program is introduced, incomes of different persons in society are increased but not by the same amount. Suppose the distribution of program benefits is defined by the vector:

$$\tilde{b} = (b_1, b_2, \ldots\ldots\ldots\ldots\ldots, b_n).$$

In this vector, if $b_i > 0$ then *i*th individual is a beneficiary; otherwise, the individual is a non-beneficiary. To calculate the SRR, we have to determine how much the program increases social welfare. Suppose $W(\tilde{x})$ is the social welfare without the program, then the usual procedure of estimating the contribution of the program to social welfare is given by

$$\Delta W = W\left(\tilde{x} + \tilde{b}\right) - W(\tilde{x}).$$

[1] A social welfare function is quasi-concave if $min[W(x), W(y)] \leq W(\rho x + (1-\rho)y)$ for any ρ with $0 < \rho < 1$ and for any two vectors *x* and *y* in the domain of *W*.

In this procedure, the impact is measured by the post-transfer minus pre-transfer social welfare function. However, this assumes that the program does not have any impact on other sources of income. When a program is put in place, some people may change their behaviors. For instance, beneficiaries may have reduced incentive to work or they may cease to receive private transfers that they were receiving in absence of the program. So the program may change the distribution of income.

Suppose that with the introduction of the program, initial income distribution $\tilde{x}$ changes to $\tilde{x}^*$ defined by

$$\tilde{x}^* = (x_1^*, x_2^*, \ldots\ldots\ldots\ldots\ldots\ldots, x_n^*)$$

then $(\tilde{x}^* + \tilde{b})$ is the observed distribution of income after the program is implemented and $\tilde{x}$ is the counterfactual distribution of income—the distribution of income if the program had not existed. The net impact of the program on social welfare will be given by

$$\Delta W^* = W\left(\tilde{x}^* + \tilde{b}\right) - W(\tilde{x})$$

which can be decomposed into two components: (i) direct impact of transfers on social welfare and (ii) indirect impact due to change of individuals' behavior. The two components can be separated using Shapley (1953) decomposition:

$$\Delta W^* = \frac{[W(\tilde{x}^*+\tilde{b}) - W(\tilde{x}^*) + W(\tilde{x}+\tilde{b}) - W(\tilde{x})]}{2} + \frac{[W(\tilde{x}^*+\tilde{b}) - W(\tilde{x}+\tilde{b}) + W(\tilde{x}^*) - W(\tilde{x})]}{2} \qquad (4)$$

The first term on the right-hand side of equation (4) measures the direct impact of transfers on social welfare, while the second term is the indirect impact due to change in behavior.

To measure the impact of a program on social welfare, we need to make some simplifying assumptions. A social welfare function is defined as decomposable by components if

$$W(x+y) = W(x) + W(y) \tag{5}$$

for any vectors $\boldsymbol{x}$ and $\boldsymbol{y}$. Applying this definition on (4) gives

$$\Delta W^* = \left[W\left(\tilde{b}\right)\right] + \left[W(\tilde{x}^*) - W(\tilde{x})\right] \tag{6}$$

The first term on the right hand side of (6) is the direct impact, which can be easily estimated if we know the vector of program benefits (obtained from benefit analysis) and social welfare function. The second term on the right hand side of (6) is the indirect impact, which cannot be easily estimated because we do not know $\tilde{x}$, which is the counterfactual distribution of income. The post-transfer income distribution given by $(\tilde{x}^* + \tilde{b})$ is known from the household surveys that provide information on incomes from different sources including transfers from the program.

The direct impact of the program will be positive because social welfare will always increase when transfers are made to households. The indirect impact – which may be referred to as the behavioral impact – can be negative or positive. For instance, if the program leads to disincentives to work, then some people may become worse off with the program given that the loss of employment income is offset by the transfer they receive from the program.

It is hard to measure the indirect effects using household surveys. Many impact evaluation studies have attempted to capture the indirect impacts. According to World Bank's *The State of Social Safety Nets 2015*, as many as 86 impact evaluation studies focusing on social safety nets have been conducted between 2010 and 2015. These studies confirm the positive, significant impact of safety net programs on school attendance, health, nutrition, and food security. Program evaluations in Brazil, Chile, Honduras, Mexico, Nicaragua, and the Philippines show that the disincentive to labor market participation has been insignificant. The World Bank report does not mention any study conducted to measure the indirect impact of programs on income distribution. Impact evaluations are generally carried out after the program has been implemented for a few years. Hence, it becomes almost impossible to measure the income distribution just before the

program is implemented or the counterfactual income distribution. Thus, we estimate SRRs based on social welfare functions derived from direct impacts of the program.

Calculating the SRR requires the program costs. There are two types of costs associated with running a program. One is the amount of money that is transferred to households, denoted by T, and the other is the administrative cost of the program, denoted by A. The total cost of the program is given by $C = T + A$.

Administrative costs vary from one program to another and even for similar programs implemented in different countries. They also depend on how well the targeting method is applied. Programs are mostly means-tested, suggesting that they require detailed information on households' economic situation. Collecting such information is associated with costs. As such, the more information we collect, the less likelihood of leakage of resources to unintended beneficiaries will be. Costs are also incurred in delivering program transfers to households. Electronic transfers have become a common method of delivering transfers directly to households, thereby reducing administrative costs. Suppose the administrative cost is $\in$ % of the total transfers delivered to the beneficiary households, then the total program cost will be given by $C = (1+\in)T$.

Like any investment, when capital is invested in a social program, there should be some social returns. The social returns can be measured by how much the program contributes to social welfare. Suppose the term $(\tilde{x}^* + \tilde{b})$ is the observed distribution of income after the program has been implemented, generating the total social welfare in the society equal to $W(\tilde{x}^* + \tilde{b})$. Using the decomposability assumption of social welfare functions defined in (5), we obtain:

$$W\left(\tilde{x}^* + \tilde{b}\right) = W_1(\tilde{x}^*) + W_2(\tilde{b})$$

which shows that the total post-transfer social welfare in the society is equal to sum of two components: (i) contribution to social welfare by all income sources other than transfers from the program and (ii) contribution to social welfare by the program. The percentage contribution of the program to total social welfare is given by

$$R = \frac{100 \times W_2(\tilde{b})}{W(\tilde{x}^* + \tilde{b})}$$

The program generates social welfare that can be expressed in monetary terms. Such social welfare is called money metric social welfare. The SRR is obtained using the money metric social welfare contributed by the program as a percentage of the program cost. Suppose $W_2(\tilde{b})$ is the money metric social welfare contributed by the program, then the SRR is defined as

$$SRR = \frac{W_2(\tilde{b})}{(1+\epsilon)T} - 1. \quad (7)$$

This is a simple ratio of social welfare generated by the program to the total program cost minus 1. Suppose the cost of the program is $100 million and the increase in social welfare is $160 million, then the SRR is 60%. A negative SRR can occur for two reasons. One, the program is giving more benefits to the rich compared to the poor – that is, the program has high leakage. Another reason is that the administrative cost of the program is so high that it takes away the benefits intended for targeted beneficiaries.

In calculating the SRR, it is not necessary to know the social welfare based on the counterfactual distribution of income. Instead, what is required is the contribution of the program to the current level of social welfare, after the program has already been implemented.

5. Operationalizing Social Rate of Return

To make the idea of the social rate of return operational, we have to specify a social welfare function that meets the following conditions: (i) non-decreasing in its arguments, (ii) quasi-concave, (iii) measurable in money metric terms, and (iv) decomposable by components. Two social welfare functions satisfy these conditions: the poverty social welfare function and Sen's Gini social welfare function. In this section, we discuss how we can make the idea of the SRR operational using these social welfare functions.

5.1. *Poverty Social Welfare Function*

The idea of shared prosperity proposed by the World Bank focuses on the mean income of the poorest 40% of the population. Since safety nets programs are intended to help the extremely poor in society, we specify the social welfare function focusing on the poorest 20% of the population. This social welfare function will be referred to as the poverty social welfare function.

More formally, suppose y is the post-transfer income of an individual defined by

$$y = x^* + b \tag{8}$$

where x^* is the income from all sources other than transfers from the program and b refers to the transfers received from the program. If $f(y)$ is the probability density function of y and z is the income defined by

$$0.2 = \int_0^z f(y)dy$$

then the poverty social welfare function is defined as

$$W(y) = \frac{\int_0^z yf(y)dy}{\int_0^z f(y)dy} \tag{9}$$

which shows that the poverty social welfare function is a weighted average of individual incomes. It is a money-metric social welfare function decomposable by components.

Substituting (8) into (9) yields

$$W(y) = W_1(x^*) + W_2(b)$$

where

$$W_2(b) = \frac{\int_0^z bf(y)dy}{\int_0^z f(y)\,dy}$$

is the contribution of the program to the total social welfare, noting that $W_2(b) = \bar{b}_p$ is the average transfers received by the poor. The average transfers per person going to the whole population is given by $\bar{b} = \int_0^\infty bf(y)dy$. If the administrative cost is $\in$ % of the total amount of transfers delivered to the beneficiary households, then the average cost of the program to the society is given by $(1+\in)\bar{b}$. Given that the contribution of the program to the average social welfare is $\bar{b}_p$, the *SRR* is defined as

$$SRR = \frac{\bar{b}_p}{(1+\in)\bar{b}} - 1 \qquad (10)$$

Hypothetically, the average transfer cost of the program is \$50 per person and the administrative cost is 10% of the transfers delivered to beneficiary households. In this case, the average cost of the program to the society is \$55. If the poor receive an average transfer of \$100, which is deemed the average social welfare per person generated by the program, then \$1 spent on the program will yield \$1.82 of social welfare and thus, the *SRR* is 82%.

The *SRR* in (10) can also be written as

$$SRR = \frac{\beta_p B_p}{(1+\epsilon)\beta B} - 1 \qquad (11)$$

where β_p is the average transfers given to the poor beneficiaries and β is the average transfer given to all beneficiaries in the population. Suppose all beneficiaries, whether poor or non-poor, are given equal transfers ($\beta = \beta_p$) then the *SRR* in (11) is given by

$$(SRR)_e = \frac{B_p}{(1+\in)B} - 1 \qquad (12)$$

Using (11) and (12), the relationship between the two SRRs can be expressed as

$$SRR = (SRR)_e + \frac{B_p(\beta_p - \beta)}{(1+\epsilon)\beta B}$$

which shows that the *SRR* will be higher (lower) than $(SRR)_e$ when the poor (non-poor) beneficiaries receive on average higher (lower) benefits per capita than the non-poor. Targeting performance is affected by two factors: (i) selection of beneficiaries and (ii) distribution of benefits. In evaluating safety nets programs, we should calculate SRRs to separate the impact of each factor.

How are the measures of targeting performance presented in Sections 2 and 3 related to SRRs? Ravallion (2009) concluded that the standard measures used to evaluate targeting performance are uninformative, or even deceptive, about the impacts of programs on poverty and the cost effectiveness in reducing poverty. He arrived at such a conclusion because he did not explore the welfare interpretation of standard targeting measures. We show below that the measures of targeting are closely related to the SRRs in (11) and (12), which are derived from a social welfare function focused on the poorest 20% and takes into account its cost effectiveness in reducing poverty.

The leakage of benefits defined in (2) is the most important targeting indicator. It is related to the SRR through the following:

$$SRR = \frac{(1-l)}{0.2(1+\varepsilon)} - 1 \qquad (13)$$

which shows that for a fixed administrative cost, the SRR is a monotonically decreasing function of leakage; the larger (smaller) the leakage, the smaller (larger) the SRR. The leakage is not independent of the administrative cost and there is even a trade-off between the two. Reducing the leakage requires more resources spent on identifying beneficiaries. To this end, policy makers would be interested to know whether they should channel more resources toward

administering the program in order to reduce leakage. Policy makers should aim at achieving higher SRRs and, by implication, improving a program's targeting performance.

The trade-off between the leakage and the administrative cost can be calculated from the total differentiation of (13) as

$$d(SRR) = -\frac{dl}{0.2(1+\epsilon)} - \frac{(1-l)d\epsilon}{0.2(1+\epsilon)^2}$$

which yields the trade-off between the two as

$$\frac{d\varepsilon}{dl} = -\frac{(1+\epsilon)}{(1+l)}$$

This equation informs how much the administrative cost should be increased to reduce the leakage while keeping the SRR unchanged. For example, suppose 50% of the program benefits go to the non-poor, and the administrative cost is 10% of the benefits delivered to beneficiary households. The trade-off between the leakage and the administrative cost is -2.2, which means that to reduce leakage by 1 percentage point the administrative cost should increase by 2.2 percentage points. Policy makers should devote more (less) resources to improving targeting efficiency if the reduction of leakage by 1 percentage point increases the administrative cost by less (more) than 2.2 percentage points, in which case the SRR will increase (decrease).

5.2. *Gini Social Welfare Function*

The poverty social welfare function focuses on the poorest 20% of population. It gives equal weight to incomes of all individuals belonging to the bottom 20% and zero weight to all those belonging to the top 80%. Hence, the evaluation of programs completely excludes a large proportion of population. Suppose the poverty line at the 20th percentile is \$100 per month, then all those having a monthly income of more than \$100 are excluded from such evaluation. This means that if a poor person earns even one extra dollar, society has no concern for such a person even if his poverty situation remains almost unchanged.

Although safety nets programs are introduced to help the poor and the vulnerable population, they can also play a role in reducing inequality. Any social program designed to target only the poor can create disincentives to work because one additional dollar earned can completely disqualify a person from benefiting from the program. As an alternative, we can have a social welfare function that gives the highest weight to the poorest person and the weight declines monotonically as the person's income increases. The Gini social welfare function has a monotonically decreasing weight and, at the same time, is decomposable by components.

Suppose y is the post-transfer income of an individual and is assumed to be randomly distributed with probability density function $f(x)$, then the Gini social welfare function is defined as

$$W(\tilde{y}) = 2\int_0^\infty y[1 - F(y)]f(y)dy \tag{14}$$

where $F(y)$ is the probability distribution function. This social welfare function is a weighted average of individual incomes with weights declining monotonically as income rises. It captures the sense of relative deprivation of a person by taking into account the number of persons who are richer. Following Sen (1974), $W(\tilde{y})$ in (14) can be written as

$$W(\tilde{y}) = \mu_y(1 - G_y)$$

where μ_y and G_y are the mean and the Gini index of the post-transfer income distribution, respectively.

$W(\tilde{y})$ is the total social welfare of the society, while $W(\tilde{b})$ is the social welfare contributed by the program:

$$W(\tilde{b}) = 2\int_0^\infty b(y)[1 - F(y)]f(y)dy \tag{15}$$

where $b(y)$ is the transfer received by an individual with income y. Following Kakwani (1980), the concentration index of program benefits can be written as

$$C_b = \frac{2}{\bar{b}} \int_0^{\infty} b(y) \left[F(y) - \frac{1}{2} \right] f(y) dy$$

which when substituted in (15) gives

$$W(\tilde{b}) = \bar{b}(1 - C_b)$$

where $\bar{b}$ is the average program transfers delivered to the population or also the average transfer cost of the program.

The percentage contribution of the program to total social welfare is given by

$$R = \frac{100 \times \bar{b}(1 - C_b)}{\mu_y(1 - G_y)}$$

which measures the extent to which the program contributes to total welfare of the society.

If the administrative cost is $\in$ % of the total amount of transfers delivered to households, then the average cost of the program to the society is given by $(1+\in)\bar{b}$. The SRR is then obtained by comparing the social welfare contributed by the program measured in money metric with the total program cost. Thus, we have

$$SRR = \frac{(1-C_b)}{(1+\in)} - 1 \qquad (16)$$

The concentration index can be either negative or positive. A negative value means that transfers from the program decrease as income increases; that is, the poorer the person is, the greater the benefits are. Similarly, a positive value of concentration index implies that the richer the person is, the greater the benefits are. Suppose that the concentration index is -0.40 and the

administrative cost is 10% of the transfers delivered to beneficiary households, then the SRR calculated using (16) is 27.3%. This means that a dollar spent on the program will generate social welfare worth $1.27. If the program does not make any distinction between the poor and the rich and makes equal transfers to everyone, then the concentration index will be zero. Under this scenario, the cost of targeting the poor will be negligible, in which case the SRR will be almost equal to zero.[2]

6. Contribution to Poverty and Inequality

Policy makers are often interested in knowing how much social programs affect poverty and inequality. This section provides a methodology to quantitatively measure such impacts. In equation (5), we defined a decomposable social welfare function by components and from which it, was possible to capture the contribution of a program to social welfare. The same idea can be applied to capture the contribution of a program to total inequality or poverty.

Suppose $\theta(\tilde{x}^* + \tilde{b})$ is a measure of inequality or poverty based on the observed distribution of income after the program has been implemented. If this measure is decomposable by components, we can write it as

$$\theta\left(\tilde{x}^* + \tilde{b}\right) = \theta_1(\tilde{x}^*) + \theta_2(\tilde{b})$$

The second term in this equation is the contribution of the program to total inequality or poverty. The percentage contribution of the program to total inequality or poverty is then given by

$$R_{(inequality\ or\ poverty)} = \frac{100 \times \theta_2(\tilde{b})}{\theta(\tilde{x}^* + \tilde{b})}$$

As is well known, the Gini index is decomposable by income components (Kakwani 1980). This decomposition is defined by

[2] A high administrative cost is incurred when the program targets specific groups such as the poor and vulnerable.

$$G_y = \frac{\mu_x C_x}{\mu_y} + \frac{\bar{b} C_b}{\mu_y}$$

where μ_y and G_y are the mean and the Gini index of the post-program distribution, respectively; μ_x and C_x are the mean and concentration index of the pre-program distribution, respectively, when the individuals are arranged in ascending order of their post-program income; and C_b is the concentration index of the benefits accruing to individuals. The percentage contribution of the program to total inequality is then given by

$$R_{(inequlity)} = \frac{\bar{b} C_b}{\mu_y G_y} \tag{17}$$

The impact of the program on inequality depends on two factors. The first is the contribution of the program to the total household income – that is captured by $\frac{\bar{b}}{\mu_y}$. If this contribution is relatively small, the impact of the program on inequality will be small. The second is the equity of program, which is measured by the concentration index of benefits relative to the Gini index. The negative (positive) value of concentration index implies that the program reduces (increases) inequality.

To measure the impact on poverty, we need to find a poverty measure that is decomposable by components. Among all poverty measures, the only one that is decomposable by components is the poverty gap ratio when the percentage of poor is kept fixed. Suppose the percentage of poor is set at 20% and z is the corresponding poverty line, the poverty gap ratio is given by

$$PG = \frac{0.2(z - \mu_p)}{z} \tag{18}$$

where μ_p is the mean income of the poor in the post-program income distribution. Suppose μ_p^* is the mean income of the poor in the pre-program income distribution, then we have

$$\mu_p = \mu_p^* + \bar{b}_p$$

where $\bar{b}_p$ refers to the mean program benefits accruing to the poor. Substituting this equation in (18) gives the decomposition

$$\frac{0.2(z-\mu_p)}{z} = \frac{0.2\left(z-\mu_p^*\right)}{z} - \frac{0.2\bar{b}_p}{z}$$

which gives the percentage contribution of the program to poverty as

$$R_{(poverty\ gap)} = -\frac{\bar{b}_p}{(z-\mu_p)} \tag{19}$$

which shows that the percentage contribution of the program to poverty reduction is proportional to program benefits as percentage of the poverty gap – that is, the extent to which the program contributes to a reduction in the poverty gap. For example, suppose the poverty line is $100 and the mean income of the poor is $70, so the poverty gap is $30. If the average of the program benefits accruing to the poor is $10, then the percentage contribution of the program to reducing poverty will be 33.3%.

7. Brazil's *Bolsa Familia* Program

The *Bolsa Familia* Program (BFP) is Brazil's flagship social protection program and has become the most renowned CCT program in the world. This is a cash transfer program, in which payment of the transfer is made conditional upon certain behaviors of the beneficiaries, such as school attendance of their children or regular health center visits. The program initially started at the municipal level in mid-1990s, but the federal government gradually espoused a series of CCT programs in the late 1990s. By mid-2003, Brazil had four CCT programs, each with its own implementing agency, its own financing schemes, and its own benefits and eligibility level (Soares 2012). As noted by Soares (2012), the federal government was transferring different amounts to different families; one family could receive transfers from all four programs and a neighboring family, living in identical circumstances, could receive nothing.

The chaos in running these programs ended in late 2003 when the federal government created the *Bolsa Familia* Program with the objective of unifying four existing CCT programs. In addition, it also incorporated an unconditional targeted transfer program run by the Mine and Energy Ministry.

In any discussion of targeted programs, the identification of genuine beneficiaries is key to the success of a program. Many developing countries use a proxy means test to identify beneficiaries. Brazil has developed a system of the Single Registry, which is a rolling census of the poor people. It enrolls families whose per capita income is less than half the minimum wage or whose total income is less than three minimum wages. The beneficiaries of *Bolsa Familia* are selected on the basis of information obtained from the Registry. The information in the Registry is collected by the municipalities using a standardized questionnaire. All families who are enrolled in the Registry, however, are not automatically selected in the program.

7.1. *Coverage*

The *Bolsa Familia* is not an entitlement; the number of beneficiaries depends largely on budget constraints. Therefore, eligible families may apply, but they may be denied the benefits. Although the direct beneficiaries of *Bolsa Familia* are the children within a household, all members of the household indirectly benefit from the program. If a household is enrolled in a program, then all individuals who belong to that household are assumed to be beneficiaries of the program. The rationale behind this is that the entire household benefits from the program. This definition is commonly adopted in measuring the coverage of programs. Table 1 shows the coverage of *Bolsa Familia.*

The government's target in 2003 was to cover 11.2 million families and this figure was based on the number of poor identified in the 2001 PNAD. The coverage expanded gradually and it was only three years later in 2006 that the mark of 11 million families was reached (Soares 2012). Thereafter, the coverage of the program expanded rapidly. By 2012, almost a quarter of the Brazilian population was covered by the program, reaching 45.87 million beneficiaries. The number of beneficiaries increased at a rate of 2.65 million per year between 2001 and 2012. In terms of coverage, *Bolsa Familia* is now the largest CCT program in the world.

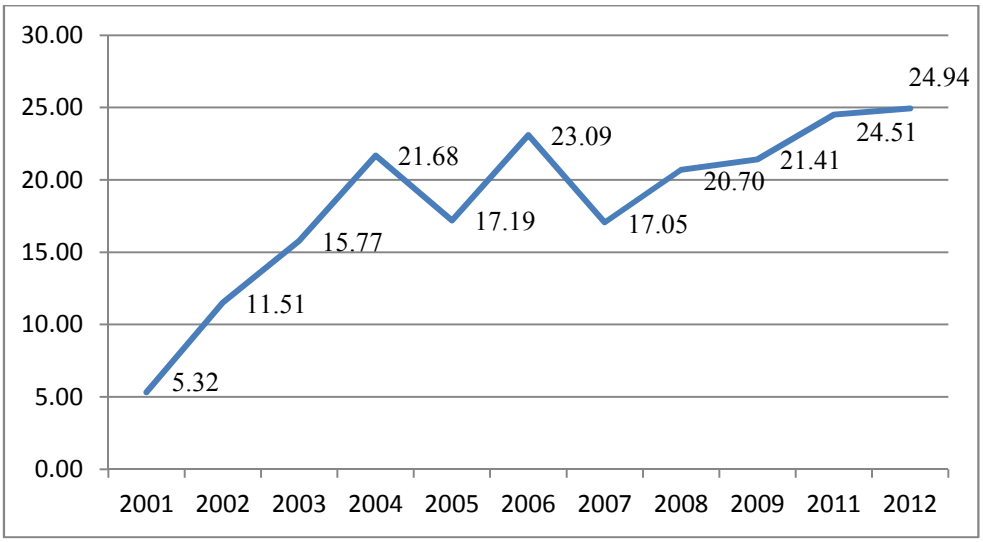
Table 1. Coverage of *Bolsa Familia* Program in Brazil, 2001-2012

Year	Percentage of beneficiaries (%)	Number of beneficiaries (millions)

2001	5.32	8.83
2002	11.51	19.43
2003	15.77	26.98
2004	21.68	37.45
2005	17.19	30.26
2006	23.09	40.94
2007	17.05	30.38
2008	20.70	37.12
2009	21.41	38.74
2011	24.51	44.12
2012	24.94	45.87
Growth rate (annual)	1.37	2.65

Source: Authors' calculations.

Figure 1. Percentage of beneficiaries of *Bolsa Familia* Program in Brazil, 2001–2012



7.2. *Transfers per Beneficiary*

Since its inception, *Bolsa Familia* has had two eligibility levels: one for the extremely poor and the other for the poor. In 2009, a family was defined as extremely poor if its per capita monthly income was less than R$70, and as poor if its per capita monthly income was less than R$140. The transfers had two components: a basic benefit of R$68, a variable benefit of R$22 to R$66

for children, and R$33 to R$66 for adolescents. The basic benefit was only given to extremely poor families. The poor families are entitled to variable benefits according to the number of children they have. As pointed out by Soares (2012), from 2003 to 2008, each family received one benefit per child aged below15 years, with a maximum of three per family. Since July 2008, the variable benefits were extended to include up to two teenagers aged 15 and 16. In 2011, the limit on the number of children was raised from three to five.

One important aspect of *Bolsa Familia* is that the mother collects the benefits in the first instance, but in case she is not present in the household, the father or another adult can collect the benefits. The benefit levels were adjusted four times in 2007, 2008, 2009 and 2011. These adjustments lead to an increase in real benefits for all beneficiaries of the program. Initially, the entitlement to the program is for two years, which is then reviewed. The reviewing process is carried out by municipalities who try to keep their Registry updated.

To make an international comparison of social welfare programs, we need to convert transfers in local currency to a common international currency. This can be done using the recently available 2011 purchasing power parity (PPP) conversion rates. Table 2 and Figure 2 present the transfers per beneficiary from *Bolsa Familia* in 2011 PPP. In 2001, the transfer per beneficiary was $5.92 per month in 2011 PPP, which increased to $22.48 per month in 2012, increasing at a rate of $1.38 annually. The benefits increased at an annual rate of about 11%. Thus, along with a rapid increase in coverage, *Bolsa Familia* also substantially increased the average transfers to beneficiaries. Accordingly, the transfer cost as a share of gross domestic product (GDP) also increased from 0.04% in 2001 to 0.43% in 2012.

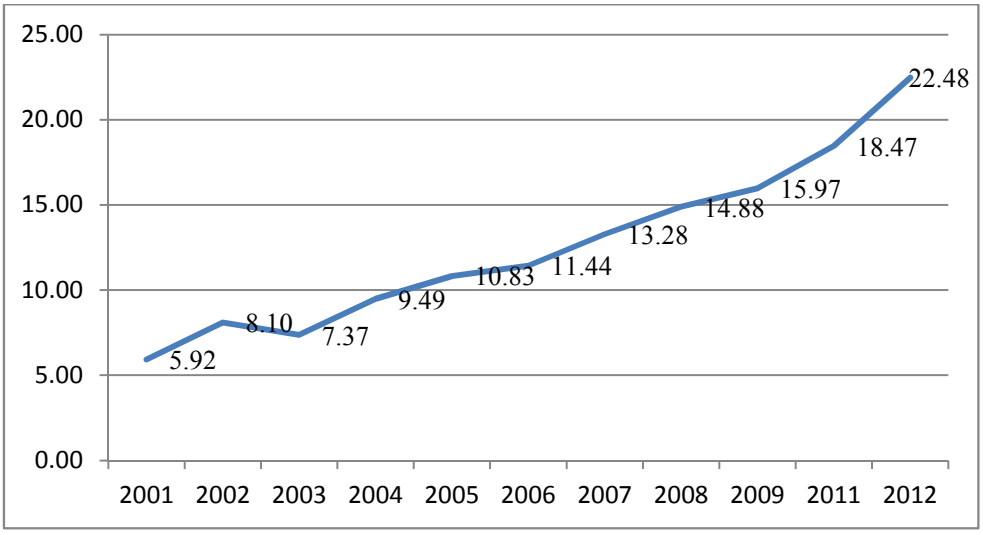
Table 2. Transfers per beneficiary of *Bolsa Familia* in Brazil, 2001-2012

Year	Transfer per beneficiary ($ in 2011 PPP)	Program cost as share of GDP (%)
2001	5.92	0.04
2002	8.10	0.12
2003	7.37	0.14
2004	9.49	0.24

2005	10.83	0.20
2006	11.44	0.27
2007	13.28	0.22
2008	14.88	0.28
2009	15.97	0.31
2011	18.47	0.36
2012	22.48	0.43
Growth rate (annual)	1.38	0.03

Note: PPP = purchasing power parity; GDP = gross domestic product.
Source: Authors' calculations.

Figure 2. Transfer per beneficiary in 2011 PPP of *Bolsa Familia* in Brazil, 2001–2012



7.3. *Beneficiary Incidence Analysis*

The beneficiary incidence analysis relates to how beneficiaries of the program are distributed among the poor and the non-poor. To perform this analysis, we need to define the poor and the non-poor, and there are two ways to do this. First, we can identify them in income space, which defines a fixed poverty line and anyone whose income is less than the poverty line is poor. Second, we can identify the poor and the non-poor using people's space, which defines a fixed proportion people in the population who are poor. In this study, we define poor in the people's space as those who belong to the poorest 20% of the population when arranged by per capita

household income. Table 3 presents the percentage of beneficiaries and benefits per beneficiary among the poor and the non-poor.

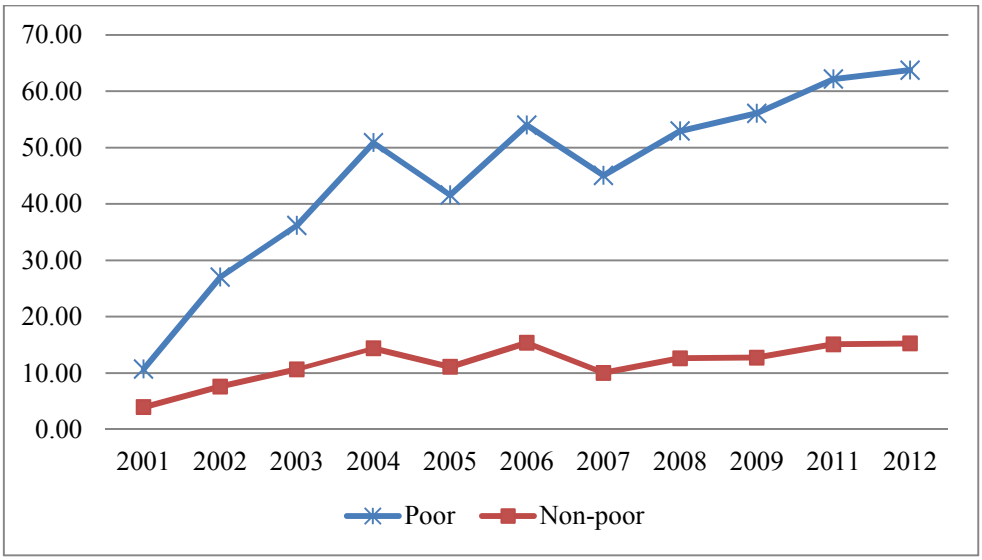
The percentage of beneficiaries among the poor has increased at an annual rate of 3.92 percentage points, whereas among the non-poor the increase is only 0.73 percentage points. Thus, while *Bolsa Familia* has expanded rapidly, it has also become better targeted over the decade. In 2012, the probability of being selected in the program among the poor increased to 63.75%, whereas, among the non-poor, it increased to 15.24%. Since the gap in percentage of beneficiaries among the poor and the non-poor has widened, it implies that targeting efficiency has improved.

Table 3. Percentage of beneficiary and benefits per beneficiary among poor and non-poor of *Bolsa Familia* in Brazil, 2001–2012

Year	% of beneficiaries		Benefits per beneficiary	
	Poor	Non-poor	Poor	Non-poor
2001	10.73	3.96	6.21	5.84
2002	27.03	7.63	7.46	8.26
2003	36.18	10.67	6.70	7.53
2004	50.85	14.39	9.57	9.47
2005	41.59	11.09	10.84	10.83
2006	53.97	15.36	12.04	11.29
2007	45.05	10.05	14.05	13.08
2008	52.93	12.64	15.40	14.75
2009	56.07	12.75	16.40	15.86
2011	62.16	15.10	19.01	18.34
2012	63.75	15.24	22.60	22.45
Growth rate (annual)	3.92	0.73	1.45	1.36

Source: Authors' calculations.

Figure 3: Percentage of beneficiaries among poor and non-poor of *Bolsa Familia* in Brazil, 2001-2012



7.4. Exclusion Error and Leakage

The exclusion error is the percentage of beneficiaries among the poor that are excluded from the program. This is an important indicator because it informs what percentage of eligible persons is excluded from the program. It is a measure of horizontal inequity, which is created when individuals in the same economic circumstances are not treated equally. Table 4 provides trends in exclusion error.

The results show that the exclusion error has declined at an annual rate of 3.92 percentage points during 2001–2012, signifying a substantial improvement in identifying the beneficiaries. In 2001, almost 90% of the poor were excluded from the program, but the corresponding figure declined to about 36% in 2012.

Leakage is defined as the percentage of all beneficiaries who are not poor (or not eligible for the program). Therefore, the leakage measures the resources going to unintended beneficiaries of the program. In 2001, almost 60% of all beneficiaries were selected from the non-poor and by 2012, slightly less than 50% were unintended beneficiaries. The leakage of beneficiaries declined at an annual rate of 0.71 percentage points during 2001–2012.

Leakage can also be defined in terms of the percentage of total benefits going to the non-poor. This indicator measures the percentage of actual resources in monetary terms that are going to unintended beneficiaries. Albeit the leakage declined at an annual rate of about 1 percentage point during 2001–2012, the actual leakage of resources remained high at about 48% in 2012.

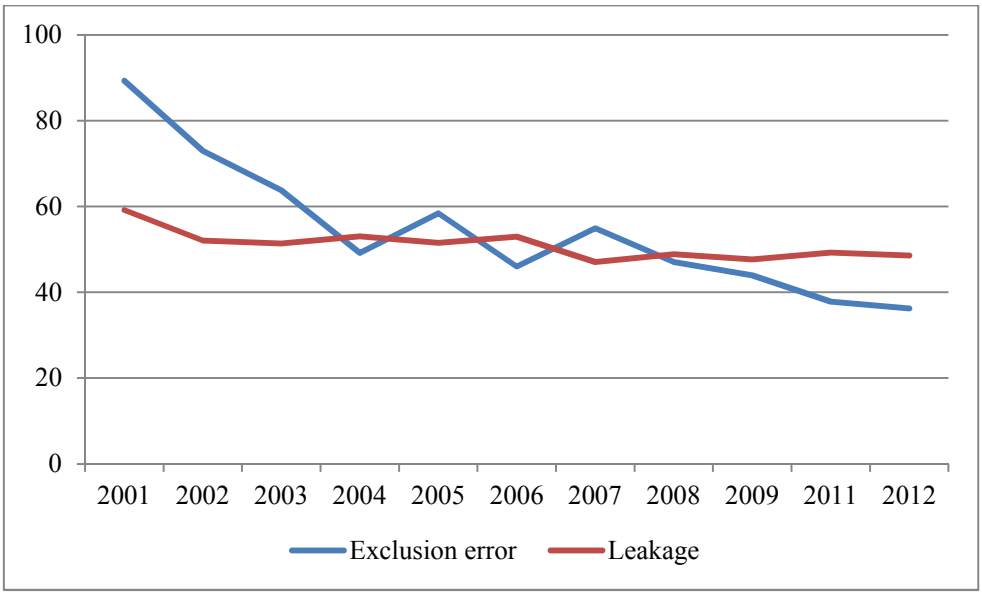
Although the World Bank (2015), in its recently released *The State of Social Safety Nets 2015* report, gave *Bolsa Familia* high marks, saying it is one of the "largest and best-targeted social safety net programs in the world", the empirical analysis presented here suggests that there is still much scope to further improve its targeting.

Table 4. Exclusion error and leakage of *Bolsa Familia* in Brazil, 2001-2012

Year	Beneficiaries		Benefits
	Exclusion error	Leakage	Leakage
2001	89.27	59.19	57.14
2002	72.97	52.02	55.85
2003	63.82	51.34	55.72
2004	49.15	53.06	52.68
2005	58.41	51.53	51.49
2006	46.03	52.93	50.47
2007	54.95	47.08	44.00
2008	47.07	48.84	47.08
2009	43.93	47.63	46.21
2011	37.84	49.25	47.79
2012	36.25	48.54	48.26
Growth rate (annual)	-3.92	-0.71	-0.99

Source: Authors' calculations.

Figure 4. Exclusion error and leakage of *Bolsa Familia* in Brazil, 2001–2012



7.5. Social Rate of Return for *Bolsa Familia*

We presented above the methodology of calculating SRRs using two types of social welfare function. One is the poverty social welfare function, which focuses on the poorest 20% of population, and the other is the Gini social welfare function, which focuses on inequality measured by the Gini index.

In calculating SRRs, we need to know the total cost of the program that consists of transfer and administrative costs. The transfer cost can be obtained from household surveys, whereas the administrative cost needs to be collected from relevant governments' statistics.

The calculation of administrative cost for *Bolsa Familia* is a gigantic task. Although the Ministry of Social Development (MSD) is responsible for the program, municipalities play the key role in running it. They collect the information on who is poor or eligible for the program. The actual payments to families are made by the *Caixa Economica*, Brazil's federal bank. It processes the information collected by municipalities on per capita income and decides how much each particular family will receive. It also prints automated teller machine cards and sends them to each family. Table 5 provides the details of administrative and operational costs of *Bolsa Família* Program provided by the MSD.

Table 5. Administrative and operational costs of *Bolsa Familia* Program in Brazil, 2012

Budget category	Cost
Improvement of the dissemination of information from the BFP and Single Registry	Real 12,519 million
National System for Identification and Selection of Target Groups for the Social Programs of the Federal Government – Single Registry	Real 25,002 million
Service of Support for Decentralized Management of the *Bolsa Família* Program (IGD)	Real 603,972 million
Operationalization of the Income Transfer Actions and of the Single Registry for Social Programs of the Federal Government – MDS (Contract with Caixa)	Real 272,467 million
Income Transfer Directly to Families in Poverty and Extreme Poverty conditions (Law No. 108.36, from 2004) – (Benefit)	Real 23,997,460 million

Source: Brazil's Ministry of Social Development.

The total administrative and operational cost, excluding transfers to families, is equal to Real 913,960 million, which is 3.8% of the total transfers going directly to families. The social rates of return were calculated using these costs.

The social rate of return makes a distinction between equal benefits and actual benefits. The fairness of the program requires that poorer beneficiaries receive more benefits than richer beneficiaries. If the program gives richer beneficiaries more transfers than poorer beneficiaries, then we can say that the program violates vertical equity in benefits. The vertical equity (inequity) entails gains (losses) in the SRR. The vertical equity can be measured by the difference in the SRR computed from actual benefits and from equal benefits. Table 6 presents the four kinds of SRRs based on two social welfare functions, with equal benefits and actual benefits.

A number of observations can be made from the SRRs presented in Table 6. The SRR for the actual benefits from the poverty social welfare function is around 147.51% in 2012, suggesting

that for every Real spent, the program generates the social welfare of Real 2.4751, resulting in the SRR of 147.51%.

The SRR from the poverty social welfare function is always higher than that from the Gini social welfare function. This is somewhat expected because while *Bolsa Familia* was designed to reduce poverty, inequality reduction was a byproduct rather than by design. Thus, the impact of the program on the poverty social welfare is expected to be higher than that on the Gini social welfare.

The SRRs have an increasing trend over the 2001–2012 period. This means that the program's impact on poverty and inequality has outweighed the program cost. For instance, the SRR for the actual benefits based on the poverty social welfare has increased at an annual rate of 5.25 percentage points. Similarly, the SRR based on the Gini social welfare has also improved, but at a slower rate of 1.99 percentage points per annum. The increasing trend in SRRs implies that the program has become increasingly more efficient in reducing poverty and inequality.

Table 6. Social rates of return of *Bolsa Familia* in Brazil, 2001-2012

Year	Poverty social welfare		Gini social welfare	
	Equal benefits	Actual benefits	Equal benefits	Actual benefits
2001	94.39	104.11	25.45	26.57
2002	126.30	108.23	34.32	25.55
2003	121.01	101.12	38.95	28.11
2004	125.94	127.81	40.64	38.56
2005	133.10	133.30	42.01	39.93
2006	125.24	137.05	41.81	43.07
2007	154.57	169.39	46.13	48.38
2008	146.37	154.87	45.25	46.04
2009	152.24	159.04	47.10	47.13
2011	144.33	151.36	46.45	46.99
2012	146.20	147.51	46.04	42.72
Growth rate (annual)	3.94	5.25	1.54	1.99

Source: Authors' calculations.

Figures 5 and 6 depict SRRs based on poverty and Gini social welfare functions, respectively. As noted, the vertical inequity in benefits occurs when the SRR computed from actual benefits is lower than that from equal benefits. For both social welfare functions, the SRR computed from actual benefits is lower than that from equal benefits until 2005 and from then on the SRR from actual benefits becomes higher. Thus, the program after 2005 has become vertically equitable, giving more benefits to the poor than to the rich.

Figure 5. Social rates of return of *Bolsa Familia* based on poverty social welfare, 2001–2012

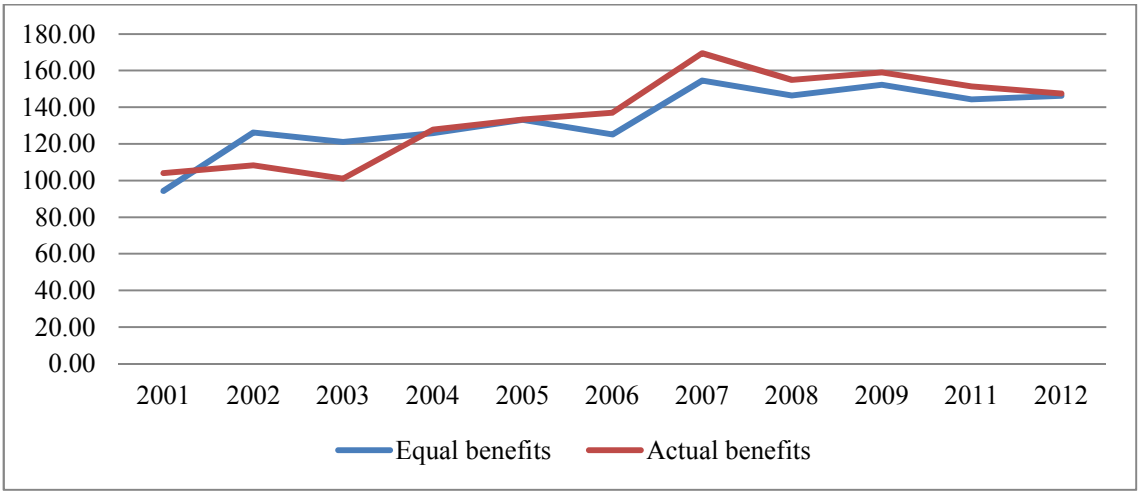
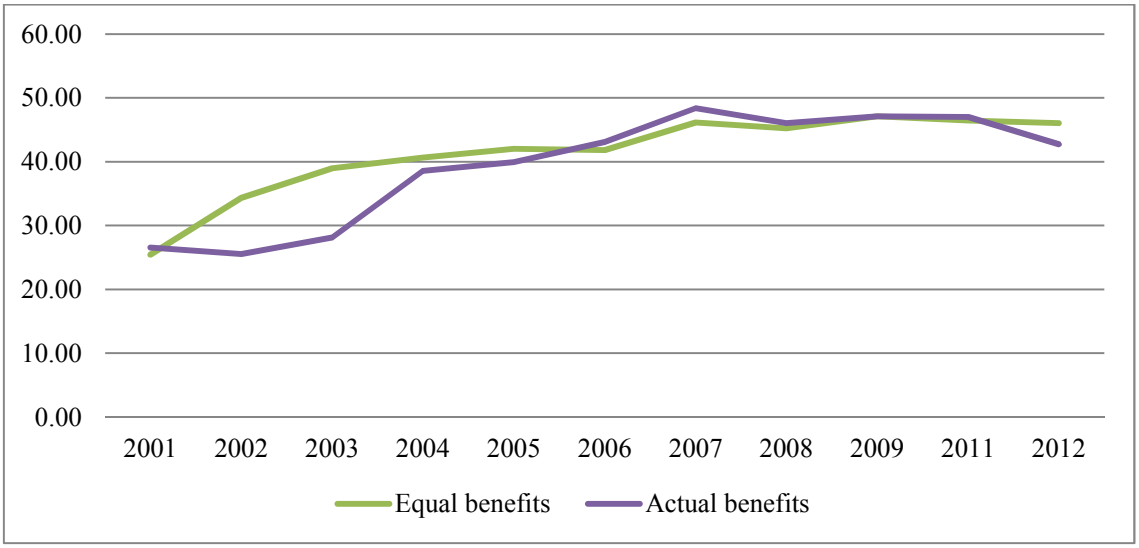


Figure 6. Social rates of return of *Bolsa Familia* based on Gini social welfare, 2001–2012



7.6. Impact of the Program on Poverty and Inequality

The *Bolsa Familia* has twin objectives: (i) to reduce poverty and (ii) to improve human capital by providing incentives for beneficiary families to send their children to school. Although the program is designed to reduce poverty, it also reduces inequality as a byproduct. Table 7 and Figure 7 present the contribution of the program to the reduction in poverty – as measured by the poverty gap ratio – and inequality – as measured by the Gini index.

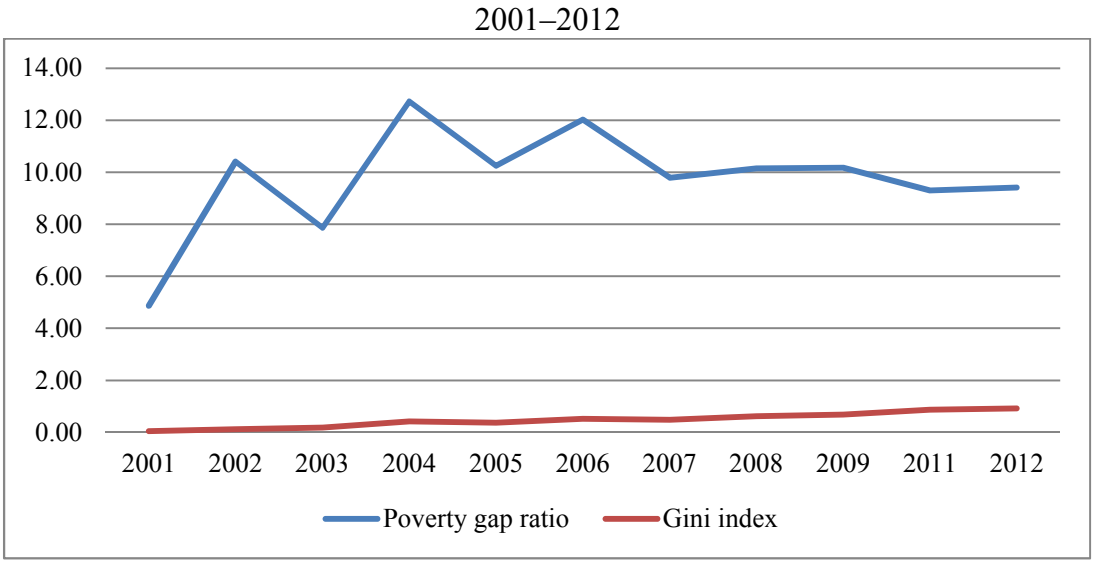
The impact of the program is much larger on poverty than on inequality. This is somewhat expected because the program is targeted to the poor. The program contributed to the reduction in poverty by 0.15 percentage points annually during 2001–2012. On inequality, the program reduced it at an annual rate of only 0.08 percentage points for the 12-year period. Such reductions indicate: (i) the program has expanded rapidly in terms of total number of beneficiaries and benefit size per beneficiary; and (ii) the program's targeting efficiency has improved over time.

Table 7. Percentage reduction in poverty and inequality contributed by *Bolsa Familia,* 2001-2012

Year	Poverty gap ratio	Gini index
2001	4.86	0.04
2002	10.42	0.12
2003	7.87	0.18
2004	12.72	0.42
2005	10.24	0.37
2006	12.02	0.52
2007	9.78	0.49
2008	10.15	0.62
2009	10.17	0.68
2011	9.30	0.87
2012	9.42	0.92
Growth rate (annual)	0.15	0.08

Source: Authors' calculations.

Figure 7. Percentage reduction in poverty and inequality due to *Bolsa Familia* in Brazil,



7.7. Conditionality

The conditionality of *Bolsa Familia* requires that in order to receive benefits, families must send their children to school and get their health check-ups and vaccines on time. In this section, we measure the impact of the program only on school attendance.

In order to do so, we need to control for all the factors that impact school attendance, except either being in the program or not in the program. It is widely known that children from poor families have lower probability of attending school because they are likely to work in the labor market. However, not all children from poor families are selected in the program even if they are eligible. This thus provides a counterfactual that controls for the poverty status of families. The target group consists of children who are eligible for the program and also enrolled in the program, whereas the control group is composed of children that are eligible for but are not enrolled in the program.

Table 8 shows that children in the target group have higher school attendance than those in the control group. Thus, the program does contribute to higher school attendance among children from poor families.

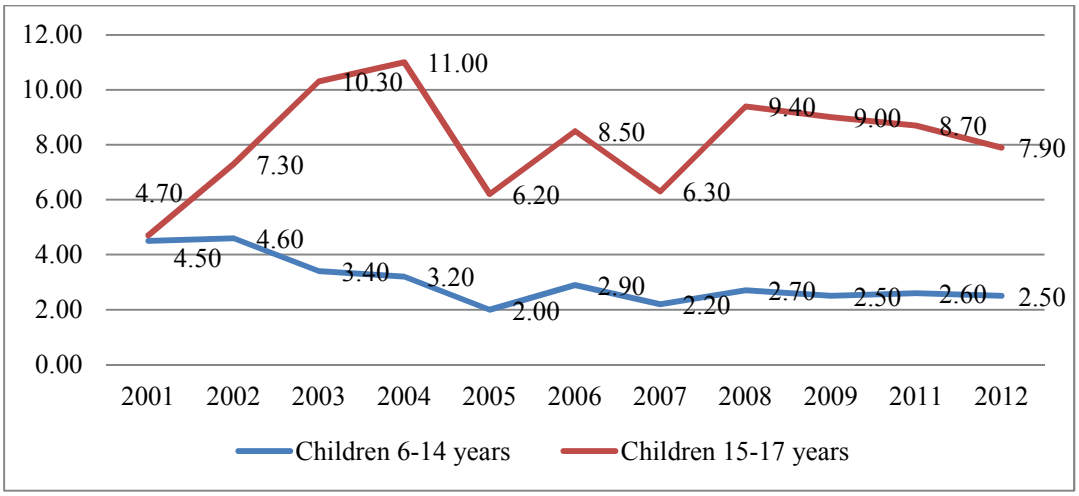
The difference in school attendance between children in the target group and the control group measures the program's impact on school attendance. Figure 8 shows that the impact of the program on school attendance among children in the age group 15-17 years is much larger, varying between 4.70 and11 percentage points. Among children in the age group 6-14 years, the program impact varies from 2.50 to 4.50 percentage points. The impact is higher among the older children because they are more likely to work in the labor market if their families were not enrolled in the program. The program provides incentives for the beneficiary families to send their children to school rather than work in the labor market.

Table 8. Percentage of children attending school with and without *Bolsa Familia*, 2001-2012

Year	Children 6-14 years		Children 15-17 years	
	Control group	Target group	Control group	Target group
2001	91.70	96.20	71.60	76.30
2002	91.60	96.20	72.50	79.80
2003	92.20	95.60	70.30	80.60
2004	92.20	95.40	67.70	78.70
2005	93.80	95.80	71.80	78.00
2006	93.50	96.40	69.30	77.80
2007	94.70	96.90	74.00	80.30
2008	94.90	97.60	73.90	83.30
2009	95.10	97.60	76.10	85.10
2011	95.80	98.40	76.20	84.90
2012	95.90	98.40	76.90	84.80
Growth rate (annual)	0.44	0.27	0.62	0.74

Source: Authors' calculations.

Figure 8. Impact of *Bolsa Familia* on school attendance in Brazil, 2001-2012



8. *Pantawid Pamilyang Pilipino* Program

The *Pantawid Pamilyang Pilipino* Program is the Philippine government's largest social protection program. It was launched in 2008 covering only about 6,000 households, but it rapidly expanded to three million families by 2012. It is popularly known as 4Ps.

The 4Ps is a conditional cash transfer program similar to Brazil's *Bolsa Familia*. The main objective of the program is to provide cash to families in extreme poverty in exchange for some education and health care commitments. It targets extremely poor families who have children up to 14 years old. The program has two components: education and health. Under the health component, the program provides PhP500 per month to each beneficiary family to cover their health and nutritional expenses (Reyes, Tabuga, Mina and Asis 2015). Under the educational component, the program targets children 6-14 years old, providing PhP300 per month per child for 10 months in one school year. A beneficiary family receives payments for a maximum of three children.

The *Bolsa Familia* and 4Ps differ with respect to the selection of beneficiary families. The *Bolsa Familia* selects the beneficiary families on the basis of their income. The municipalities in Brazil have developed an elaborate process of verifying families' income, which is then fed into a system of the Single Registry. The beneficiaries of *Bolsa Familia* are selected on the basis of

information obtained from the Registry. The identification of beneficiary families in the 4Ps is done using the National Household Targeting System for Poverty Reduction. This system employs a proxy means test (PMT) to identify the poor families. The PMT is now commonly used to design social protection programs in many developing countries.

Developing countries with a large informal sector do not have a proper system of measuring and verifying families' incomes. A proxy means test is used to identify beneficiaries based on easily identifiable variables that accurately predict a household to be poor. A nationally representative household survey makes it possible to design such a PMT. The PMT for the 4Ps was developed using the 2006 Family Income and Expenditure Survey. The proxy variables used to predict the poverty situation of families included ownership of assets, type of housing, education and employment status of household head, and access to water and sanitation.

9. Comparison of *Bolsa Familia* and 4Ps

Table 9 presents a comparison between Brazil's *Bolsa Familia* and the Philippines' 4Ps. Brazil is a much bigger country with a population of about 184 million in 2012, whereas the Philippine population is about half of Brazil's population. The *Bolsa Familia* covers almost a quarter of the population with around 46 million beneficiaries. The 4Ps covered only 8.77% of the population in 2011, but expanded rapidly within two years, covering almost 21% in 2013. The total number of beneficiaries in 2013 was 20.48 million, making the 4Ps the fourth largest CCT program in the world.

As noted earlier, the exclusion error measures the extent to which the poor are excluded from the program. The *Bolsa Familia* had an exclusion error of 36.25% in 2012. The 4Ps excluded more than 76% of the poor from the program in 2011, but within two years, the exclusion error was reduced to 49.08%. This remarkable reduction occurred due to the rapid expansion of the program.

During the phase of the program's expansion, the exclusion error tends to decline while the leakage of beneficiaries tends to increase. The rapid expansion of the 4Ps led to an increase in

leakage of beneficiaries from 45.33% in 2011 to 52.20% in 2013. The *Bolsa Familia* program, on the other hand, expanded more slowly but steadily during 2001–2012. The leakage of beneficiaries decreased at an annual rate of 0.71 percentage points instead of showing an increase. Thus, a rapid expansion of program in a short period, as happened in the case of 4Ps, can result in a large increase in leakage leading to a greater waste of resources going to unintended beneficiaries.

The rapid expansion of any social program within a short period comes at a cost. The implementation of a social program is highly complex and requires appropriate social infrastructure. A gradual expansion is desirable because it provides time to learn about the many complexities of the program and also to incorporate lessons learned during implementation.

Table 9. Comparison of *Bolsa Familia* and 4Ps

Indicators	*Bolsa Familia*	4Ps	
	2012	2011	2013
Population	183.88	95.80	97.64
% of beneficiaries in population	24.94	8.77	20.97
Number of beneficiaries (millions)	45.87	8.40	20.48
% of beneficiaries among poor	63.75	23.97	50.92
Exclusion error	36.25	76.03	49.08
Leakage of beneficiaries to non-poor	48.54	45.33	52.20
Per capita monthly income (in 2011 PPP)	560.71	204.76	243.65
Per capita monthly benefits per beneficiary (in 2011 PPP)	22.60	6.67	6.75
Per capita monthly benefits per beneficiary among poor (in 2011 PPP)	22.48	5.92	7.14
Leakage of benefits to non-poor (%)	48.26	51.50	49.45
Inequity in benefits per beneficiary (%)	-0.27	6.17	-2.74
SRR based on poverty social welfare function	147.50	96.08	130.70
SRR based on Gini social welfare function	42.72	22.16	38.00
Impact of program on poverty gap ratio	-9.42	-7.75	-17.41
Impact of program on Gini index	-0.92	-0.30	-0.64
% of children 6-14 attending school in	95.90	91.70	94.97

control group			
% of children 6-14 attending school in target group	98.40	95.76	96.41

Source: Authors' calculations.

The Philippines' per capita household income in 2011 was $204.76 in 2011 PPP, which increased to $243.65 in 2013, whereas Brazil's per capita income was $560.71 in 2012. Brazil, therefore, has a much higher average standard of living and can afford to pay higher transfers to the beneficiaries. The *Bolsa Familia* paid an average per capita monthly benefit of $22.60 (in 2011 PPP) to each beneficiary family in 2012. In comparison, the 4Ps paid the average benefits of only $6.67 in 2011 and $6.75 in 2013. Thus, compared to the 4Ps, the *Bolsa Familia* should have a much greater impact on reducing absolute poverty. In this study, we measure the impact of the program on relative poverty as our concern is with those belonging to the poorest 20% of the population. Therefore, it is not possible to say a priori which of the two programs will have a greater impact on poverty reduction.

The leakage of benefits measures the proportion of actual resources going to the unintended beneficiaries. The *Bolsa Familia* generated the leakage of 48.26% in 2012, whereas the corresponding figure for 4Ps was 51.50% in 2011 and 49.5% in 2013. The reduction in the leakage of benefits in the 4Ps is explained by a larger increase in benefits going to the poor beneficiary families. As seen in Table 9, inequity in benefits per beneficiary decreased from 6.17% in 2011 to -2.74% in 2013. This implies that the benefits transferred to families became more equitable, benefiting poor families more than non-poor ones.

To calculate the SRRs for the 4Ps, we need to know the administrative cost as the share of transfers to beneficiaries. Table 10 presents these costs in detail. While the total transfers to beneficiaries increased from PhP21,194 million in 2011 to PhP39,450 million in 2012, the administrative cost declined from PhP4,056 million in 2011 to PhP3,997 million in 2012. Thus, the administrative cost as the share of transfers to beneficiaries decreased from 23.67% in 2011 to 11.27% in 2012. Thus, the program has become more cost-effective in delivering transfers to the beneficiaries. Since the administrative cost for 2013 was not available, we used the 2012 administrative cost as a share of transfers in calculating the SRR for 2013.

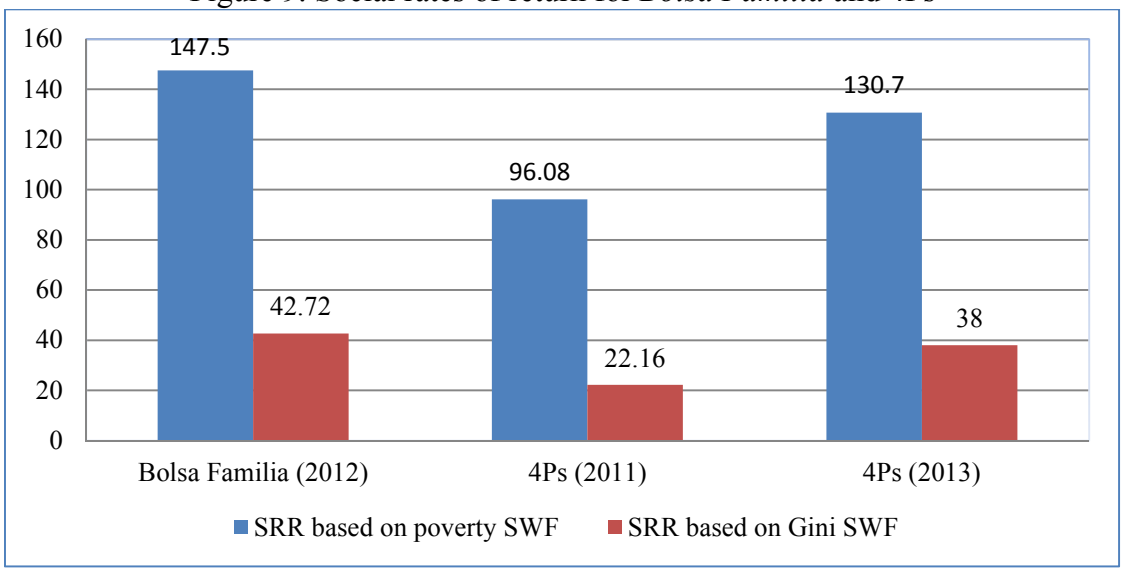
Table 10. Annual budget of the Philippines' 4Ps for 2011 and 2012 (in PhP million)

Budget category	2011	2012
Cash transfers to beneficiaries	17,138	35,453
Implementation support	4,056	3,997
Trainings	1,625	703
Salaries and allowances for 1800 new personnel	716	1,877
Bank Service Fee	171	346
Information, education, and advocacy material	649	252
Capital outlay	218	133
Monitoring, evaluation and administrative support	677	686
Administrative and operational cost as percentage of transfers to beneficiaries (%)	23.67	11.27

Source: Department of Social Welfare and Development.

As shown in Figure 9, *Bolsa Familia* has much higher SRRs than the 4Ps. There are two reasons for this. One is that *Bolsa Familia* is a better-targeted program. The other reason is that the administrative cost for *Bolsa Familia* is much lower than that for the 4Ps. The 4Ps has made impressive progress in improving its targeting efficiency and, at the same time, has been able to substantially reduce its administrative cost of delivering transfers to beneficiary families. It is commendable that both of these improvements have been achieved within two years.

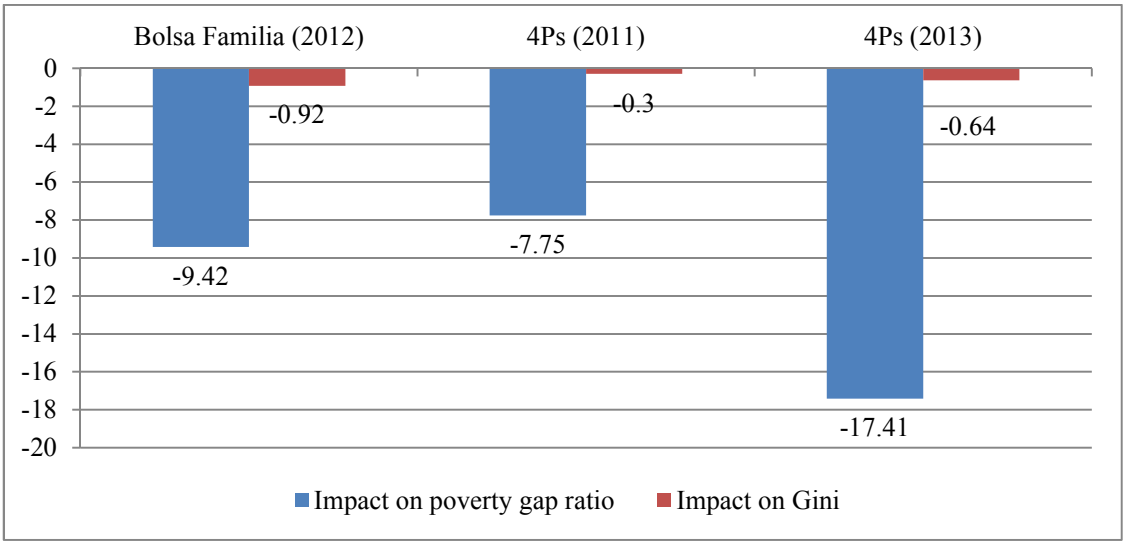
Figure 9. Social rates of return for *Bolsa Familia* and 4Ps



Note: SRR = social rate of return; SWF = social welfare function.

As illustrated in Figure 10, both *Bolsa Familia* and the 4Ps contribute to the reduction in the poverty gap much more than they contribute to the reduction in the Gini index. The 4Ps has contributed a 17.41% reduction in the poverty gap in 2013. Such large contribution to poverty reduction in 2013 happened because of two reasons: (i) the shortfall in incomes of the poor has reduced and (ii) the transfers to families have become highly equitable.

Figure 10. Impact of *Bolsa Familia* and 4Ps on poverty gap and Gini index



10. Conclusion

Safety net programs such as CCT programs have become popular mechanisms for developing countries to reduce poverty and increase social welfare. With these programs becoming widespread around the world, it is crucial—especially for policy makers—to evaluate whether the intended objectives for these programs are met. This paper adopted a method for evaluating programs that uses the concept of social rate of return (SRR), defined as the social welfare generated by a program as percentage of the cost of the program. Empirical analysis was conducted on two existing CCT programs: Brazil's *Bolsa Familia* Program and Philippines' *Pantawid Pamilyang Pilipino* Program or 4Ps. Data for *Bolsa Familia* covered the period 2001-2012 and data for 4Ps covered only the years 2011 and 2013.

In terms of coverage, the number of beneficiaries of Brazil's *Bolsa Familia* has increased at a rate of 2.65 million per year from 2001 to 2012, and as of 2012 it has reached 45.87 million beneficiaries, making it the largest CCT program in the world. Meanwhile, 4Ps covered only 8.4 million beneficiaries (8.77% of the population) in 2011 but the program rapidly expanded in two years, reaching 20.48 million (21% of the population) in 2013, making it the fourth largest CCT program in the world.

Findings also indicate that *Bolsa Familia* has become better targeted throughout the years, with the percentage of beneficiaries among the poor increasing at an annual rate of 3.92 percentage points, reaching 63.75% in 2012, compared to only 15.24% among the non-poor. This means that exclusion error—the extent to which the poor are excluded from the program—has also been declining. Leakage of benefits, which is the proportion of total transfers going to the non-poor, has been slowly declining but actual leakage remained high at about 48% in 2012.

The 4Ps, meanwhile, excluded more than 76% of the poor in 2011 but with the rapid expansion of the program, the exclusion error reduced to 49.08% in 2013. This rapid expansion, however, led to an increase in leakage of beneficiaries from 45.33% in 2011 to 52.20% in 2013. Hence, rapidly expanding the program in a short period may lead to higher increases in leakage, leading more resources to be transferred to unintended beneficiaries. It is more desirable, therefore, that programs gradually expand to provide time to learn more about the program and to apply these lessons in the implementation.

Brazil has greater standard of living compared to the Philippines and could therefore afford to provide greater benefits to CCT beneficiaries. *Bolsa Familia's* average benefit of $22.60 (in 2011 PPP) to each beneficiary household per month in 2012 is much greater than 4Ps' $6.67 in 2011 and $6.75 in 2013. Total administrative and operational cost as share of total transfers is lower in *Bolsa Familia* (3.8%) than in 4Ps (23.67% in 2011 and 11.27% in 2012), suggesting that *Bolsa Familia* is more cost effective in delivering transfers than 4Ps.

The paper used two types of social welfare function to calculate SRR—poverty social welfare function, which focuses on the poorest 20%, and the Gini social welfare function, which focuses on inequality. Findings reveal an increasing trend in both SRRs of *Bolsa Familia* from 2001-2012 and in SRRs of 4Ps from 2011 to 2013, which suggests that the programs have become more efficient in reducing poverty and inequality. However, *Bolsa Familia*'s SRRs were higher than the 4Ps'. This is mainly because *Bolsa Familia* is a better targeted program than 4Ps and the administrative and operational cost for *Bolsa Familia* is much lower than 4Ps. Nevertheless, 4Ps was able to improve its targeting efficiency and reduce its administrative cost of delivering transfers within a short period of time.

Bolsa Familia and 4Ps contributions to the reduction in poverty gap are greater than their contributions to the reduction in inequality. *Bolsa Familia* contributed 9.42% reduction in poverty gap in 2012 while 4Ps contribution increased from 7.75% in 2011 to 17.41% in 2013. The large impact of 4Ps on poverty reduction in 2013 occurred because of the poor's higher income and because transfers to families have become more equitable.

This paper was able to show how social rate of return can be used to evaluate safety net programs. Using two types of social welfare function, the poverty social welfare function and the Gini social welfare function, and other targeting efficiency measures, the study provides evidence that CCT programs help in reducing poverty and improving social welfare by increasing income and enhancing human capital among the poor.

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