The contribution of government transfer programs to inequality.

A net-benefit approach.[*]

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Resumen

La contribución a la desigualdad de los programas de transferencias del gobierno es usualmente determinada analizando en qué medida los beneficios pagados se focalizan en familias de bajos ingresos. Varios analistas han encontrado que los beneficiarios de algunas transferencias claves del gobierno son en su mayoría hogares de ingreso medio y alto, contribuyendo así a una mayor desigualdad. En el presente trabajo se discute el hecho de que el impacto de estos programas en la desigualdad debería ser evaluado considerando los beneficios recibidos *netos de los impuestos* pagados por los hogares para financiar los programas, puesto que los hogares de mayores ingresos reciben beneficios por un monto mayor pero también pagan impuestos más altos. Este enfoque es ilustrado estimando el impacto de cuatro programas de transferencias del gobierno en la desigualdad en Uruguay y demostramos que las conclusiones son diferentes dependiendo de si se utiliza beneficios brutos o netos en la estimación.

Palabras clave: Transferencias, desigualdad, redistribución.

JEL: D31, H55, I38

Abstract

The contribution of government transfer programs to inequality is often assessed by analyzing to what extent the benefits paid go to lower income families. Several analysts have found that some key government transfers actually go mostly to middle and high income families and thus contribute to greater inequality. We argue in this paper that the impact of these programs on inequality should be evaluated considering the benefits received *net of the taxes* paid by households to finance the programs, since higher income households receive higher benefits but they also pay higher taxes. We illustrate this approach by estimating the impact of four government programs on inequality in Uruguay and show that the conclusions are different depending on whether we use gross or net benefits in the estimation.

Key words: Transfers, inequality, redistribution.

1. Introduction

It is often argued that some government transfer programs lead to greater inequality because high income families receive a disproportionately large percentage of the benefits (Feldstein, 1974, Browning and Browning, 1994, Mazza, 1999, Perry et al., 2006). This is usually the case of contributory programs like unemployment insurance and contributory pensions, because the individual benefit is linked to the contribution wage. Better paid workers are entitled to higher unemployment benefits and higher pensions. Similar results have been reported for public spending on higher education in Latin America. But analysis of the incidence of public expenditure on different groups of the population according to distribution of income tells only half of the story about the contribution of public programs to inequality. We argue that the assessment of the contribution of government programs to inequality should consider benefits paid *net of taxes collected to finance these programs*. If the same households that receive higher unemployment benefits, for example, tend to make the biggest contributions to finance the unemployment insurance program, then the program may actually contribute to reducing *disposable income* inequality even if better paid workers receive higher unemployment benefits.

This idea can be illustrated using the inequality decomposition index proposed by Shorrocks (1982a and b). The contribution of the sources of income k to inequality is measured regressing the sources of income k on total income across individuals. The coefficient of total income in this regression is the contribution of the sources of income k to inequality. Hence, the sources of income that have a positive coefficient in these regressions contribute to increasing inequality and the sources that have a negative

coefficient contribute to reducing inequality. Now consider a government transfer program that pays benefits and collects taxes that are both positively correlated to total income across households (Figure 1). If the contribution to inequality is measured considering only gross benefits, this program increases inequality. But the program represented in this figure reduces inequality if its contribution to inequality is assessed considering net benefits.

Insert Figure 1

Notice that the program assumed in Figure 1 is also regressive in tax collection, i.e. “rich” households pay a lower share of their income as taxes than poor households. Hence, the program seems to be regressive when evaluated by looking separately at either benefits or taxes. Nevertheless, this program reduces disposable income inequality.

After this brief introduction, the paper continues as follows. In section 2 we present the methodology in detail. In section 3 we present results for several government transfer programs in the case of Uruguay. Section 4 concludes with some final remarks.

2. The methodology

In order to empirically assess the impact of government transfer programs on inequality, we computed the inequality decomposition index proposed by Shorrocks (1982a and b). We treated these programs as separate sources of income. Household surveys provide direct data on benefits received by different individuals from government programs, but they do not provide information on taxes paid by individuals to finance these programs. Because of

the lack of micro-data on direct and indirect contributions, we had to make some assumptions to compute *net* transfers.

Let y_{ik} be the income of household i $(i = 1,...,n)$ from sources of income k $(k = 1,...,K)$. Total income of household i is $y_i = \sum_k y_{ik}$. The distribution of total income can be represented by $y = (y_1,..., y_n)$ and the distribution of factor k income by $y_k = (y_{1k},..., y_{nk})$. Let $s_k(I)$ be the proportional contribution of income k to total income inequality measured with index I, so that $\sum_k s_k(I) = 1$. Shorrocks (1982b) proposed the following rule to decompose the contribution of each and every source of income to total income inequality:

$$s_k(I) = \frac{\text{cov}(y_k, y)}{Var(y)} = \rho(y_k, y)\frac{SD(y_k)}{SD(y)}$$

where $\text{cov}(y_k, y)$ is the covariance and $\rho(y_k, y)$ is the coefficient of correlation between factor k income and total income; $Var(y)$ is the variance of total income; and $SD(y_k)$ and $SD(y)$ are the standard deviations of factor k income and total income, respectively. Notice that the contribution of sources of income k to total inequality is just the slope coefficient of the regression of y_k on y. Shorrocks (1982b) showed that this is the only decomposition rule for any inequality measure that complies with a set of desirable properties.

Let us say that the last income source K corresponds to the government transfer program whose contribution to inequality we want to evaluate. In this last column of the matrix of

income we compute the net transfer the government program pays to each and every household.[1] Since column *K* of the matrix of income registers both benefits received and contributions and taxes paid to finance the program, the income registered in other columns must be measured *before taxes* paid to finance the transfer program.

For the transfer program to be complete, the records in column *K* of the income matrix must add up to zero: someone else must pay for net benefits received by any household. Formally,

$$\sum_i y_{iK} = 0 \qquad \textbf{(1)}$$

We used micro-data from households and expenditure surveys and some aggregate data from administrative records of social security programs in Uruguay to build the matrix with elements y_{ik}. The National Institute of Statistics household survey provides individual data on several sources of income, including benefits paid by some social protection programs, but it does not provide information on contributions and taxes paid to finance the program. We know from the social security institutions that these programs are financed with a complex mix of payroll and general taxes. Among the latter, indirect taxes are by far the biggest factor, with value added tax accounting for a significant share of the whole package. Thus we distinguish payroll taxes a_{ik} and indirect taxes t_{ik} collected to finance the transfer program.

[1] We talk about "the" transfer program to simplify the presentation, but it should be clear that the same principles apply to more than one transfer program.

Labor earnings in the household survey are reported *after payroll taxes* (y_{ik}'). Therefore we added payroll taxes to get *pre*-tax labor earnings:

$$y_{ik} = y_{ik}' + a_{ik} \; ; \; k \neq K \qquad \textbf{(2)}$$

Naturally, a_{ik} must be zero if the source of income *k* is non-labor income. Given that other social security revenues are mostly indirect taxes, we did not need to add other taxes to the survey's reported income to get pre-tax income. Hence, taxes satisfy the following condition:

$$t_{ik} = 0 \; \forall k \neq K; \; t_{iK} = t_i \geq 0 \qquad \textbf{(3)}$$

and the transfer program column was computed as:

$$y_{iK} = b_i - t_i - a_i \qquad \textbf{(4)}$$

where b_i stands for the benefit received by household *i* from the transfer program and a_i stands for total payroll taxes paid by household *i* to finance the program $\left(a_i = \sum_k a_{ik}\right)$.

Equations (2) and (4) determine the matrix of income organized to assess the contribution of the transfer program to inequality, but we do not have direct data on some of the variables involved. The household survey does provide the *after payroll tax* earnings (y_{ik}')

and the benefits paid by the transfer programs (b_i), but it does not provide direct data on payroll taxes (a_{ik}) or indirect taxes paid to finance the transfer programs (t_i). We know from (1) that total taxes paid to finance the program must be equal to total benefits paid by the program, but we need information on *individual* contributions. The social security institutions provide *aggregate* information on their sources of financing which can be used to determine the shares of payroll and indirect taxes in funding the programs we are evaluating. Let α_K be the share in total spending of government transfer program *K* financed with payroll taxes. Estimated individual payroll taxes and indirect taxes should satisfy the following conditions:

$$\sum_i a_i = \alpha_K \sum_i b_i \quad ; \quad \sum_i t_i = (1-\alpha_K)\sum_i b_i \qquad \textbf{(5)}$$

In order to "distribute" these aggregates among individuals, we assumed that (i) payroll taxes are proportional to labor income, provided the individual does contribute to social security (assumption A1), and (ii) indirect taxes are proportional to total expenditure of the household (assumption A2). More specifically, we made the following assumptions:

(A1) Individual payroll taxes:

$$a_{ik} = \begin{cases} ay_{ik}'\,;\, a>0 \;\; if \;\; i \in C \;\; and \;\; k \in LI \\ 0 \qquad otherwise \end{cases}$$

where *C* stands for the subset of workers who declared to the household survey that they do pay payroll taxes and *LI* stands for the subset of income sources that correspond to labor income. Notice that the rate of payroll taxes *a* is a weighted average of the rates paid by different categories of workers, in accordance with their answers to the household survey. Also notice that this rate multiplies *post-tax* labor income, which is not the ordinary way of presenting the rates of payroll taxes in social security legislation.[2]

(A2) Indirect taxes:

$$t_i = t * ex_i = t * \beta_0 * \left(\sum_k y_{ik}' \right)^{\beta_1} \qquad \textbf{(6)}$$

where ex_i stands for the total expenditure of household *i*. Because value added tax in Uruguay is high, we assumed that households pay indirect taxes in proportion *t* of their total expenditure. But there is no information on expenditure in the household survey. So we approximated household expenditure as a (possibly non-linear) function of income, using information from the expenditure survey of the National Institute of Statistics.[3]

The tax rates *a* and *t* can now be computed combining equations (5) and assumptions (A1) and (A2):

[2] We chose this notation to avoid the distinction between employee and employer contributions, a distinction we are not interested in. Total payroll tax rates on post-tax labor income can be computed using ordinary legal tax rates such as: (employer rate + employee rate)/(1-employee rate). The tax rate *a* is a weighted average of these transformed tax rates.

[3] Other assumptions are of course possible and we did some sensitivity analyses, assuming for example that indirect taxes are proportional to total income rather than to total expenditure. As might have been expected, government programs look more progressive because taxes look less regressive with this alternative assumption, but the qualitative results did not change. These results are available on request from the authors.

$$a = \alpha_K \sum_i b_i \Big/ \left(\sum_{i \in C} \sum_{k \in LI} y_{ik}' \right)$$
$$t = (1 - \alpha_K) \sum_i b_i \Big/ \left(\beta_0 \sum_i \left(\sum_k y_{ik}' \right)^{\beta_1} \right) \quad \textbf{(7)}$$

Using these tax rates and assumptions (A1) and (A2), we computed individual tax payments a_{ik} and t_i. We then computed individual income y_{ik} using these estimated individual tax payments in equations (2) and (4).

3. Results

We report the estimated decomposition of inequality in Table 1.[4] The left panel was computed using *gross* benefits and the right panel was computed using *net* benefits for the income sources corresponding to four government transfer programs: unemployment insurance, pensions, family allowances and a grouped set of "other" government programs.[5]

Insert Table 1

The estimated contribution of these programs to inequality is very different depending on whether gross or net benefits are used. The four government programs would have contributed to *reducing* inequality in 2005 if their contribution were evaluated using benefits net of taxes paid to finance the programs. But three of the programs would have contributed to *increasing* inequality if only gross benefits were considered in the computation. Only family allowances would have contributed to reducing inequality

[4] For the sake of brevity, we only report the estimations for 2005, but we have similar results for 2001-2004.
[5] The "other" government programs include: donations, subsidies, scholarships, accident compensation, divorce contributions and family subsidy.

according to the gross-benefits measure. In the four cases, the contribution to inequality is smaller when net rather than gross benefits are used.

These different results are driven by different correlation coefficients of net and gross benefits to total income. While net benefits are negatively correlated to total income in the four programs considered in this study, gross benefits are positively correlated to total income in three of them (Table 1, columns 2 and 5). Family allowances is the only program that presents a negative correlation of gross benefits to total income. In all programs, the correlations to total income are more negative when net rather than gross benefits are used.

4. Concluding Remarks

According to these results, assessing the impact of government programs on inequality looking only at the benefits they pay could be misleading, because taxes also count and the families that receive higher benefits also tend to pay more taxes. We showed a real world case in which both expenditures and taxes looked regressive when analyzed separately, and yet the programs reduced inequality when both sides of the balance were incorporated into the analysis at the same time.

The idea that government's contribution to inequality depends on both expenditure and taxes is of course not new. In the words of Perry et al. (2006, p 96), "The overall impact of the government budget depends on the combined effect of taxes and expenditure." And indeed, this point is usually well taken care of in studies that compare pre- and post-transfer incom e inequality (see for instance Beblo and Knaus, 2001; Atkinson, 2004, Perry et al.,

2006). However this same point is often overlooked in the analysis of individual government programs. The usual claim that some programs are "regressive" because they spend more on high than on low income households is just one example of this practice. One possible explanation for this usual shortcut to a one-sided approach to the evaluation of individual programs is the difficulty involved in estimating how these programs are financed. But as we have shown in this paper, this shortcut can be rather misleading. We propose instead to make simple assumptions to approximate benefits net of taxes, and to use them to assess the contribution of government programs to inequality using the framework of inequality decomposition developed by Shorrocks (1982a).

Lindert et al. (2005) share with us concern for deducting contributions made to finance social insurance programs to evaluate their redistributive impact. But their approach departs from ours in that they only net out social insurance contributions. They do not extend this reasoning to other public programs nor do they compute all sources of financing for the programs for which they estimate net benefits. In their view, the public transfers nature of social insurance stems from the fact that these programs often spend more than they collect through social security contributions, and have thus to be partially financed out of general taxes. Accordingly, these authors assess the redistributive impact of these programs looking just at "the portion of benefits that is financed by general tax revenues due to deficits in the pension system" (Lindert, et al. 2005, p 105). Such an approach is not only partial, but it also inevitably gets tangled up with the not-very-meaningful controversies about how the deficits of social security and other government programs should be computed.[6] We

[6] One example is the claim that not all the assistance of the central government to social security should be computed as "actual" deficit in Brazil, because part of it accounts for the employer contribution that the

advocate a more comprehensive approach that takes into account *all taxes* collected to finance the programs, for the impact of a government program on inequality depends not only on the taxes that are conventionally defined to finance that specific program but on all the sources of income that the government makes use of to finance the program.

Several authors have convincingly argued that fiscal policies should ideally be assessed considering life-time rather than just current income and transfers (Auerbach et al., 1999; Harding et al., 2002; Mason et al., 2005). Estimating life-time income is not an easy task though, particularly when only cross-section data is available. Using life-time income to analyze redistribution is particularly complicated for it requires performing microsimulations. Also, the dynamic estimations are sensitive to the choice of the discount rate and there is no simple rule to choose among different rates. We did not do detailed dynamic microsimulations to illustrate the importance of looking at net benefits when assessing the contribution of transfer programs to inequality, but it goes without saying that the same point illustrated here with a static example fully applies in a life-time framework. If anything, we expect this point to be more crucial in a dynamic than in a static perspective, because households that receive larger transfers in some periods of their lives tend to be the same that pay more taxes in other periods.

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government has to pay for public employees. The literature on social security is full of endless discussions like this. Furthermore, if the very concept of total fiscal deficit could be ill defined, as Auerbach et al. (1999) among others have argued, the definition of the deficit of one agency of the government is even more so.

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Figure 1: The Contribution of Government Transfer Programs to Inequality

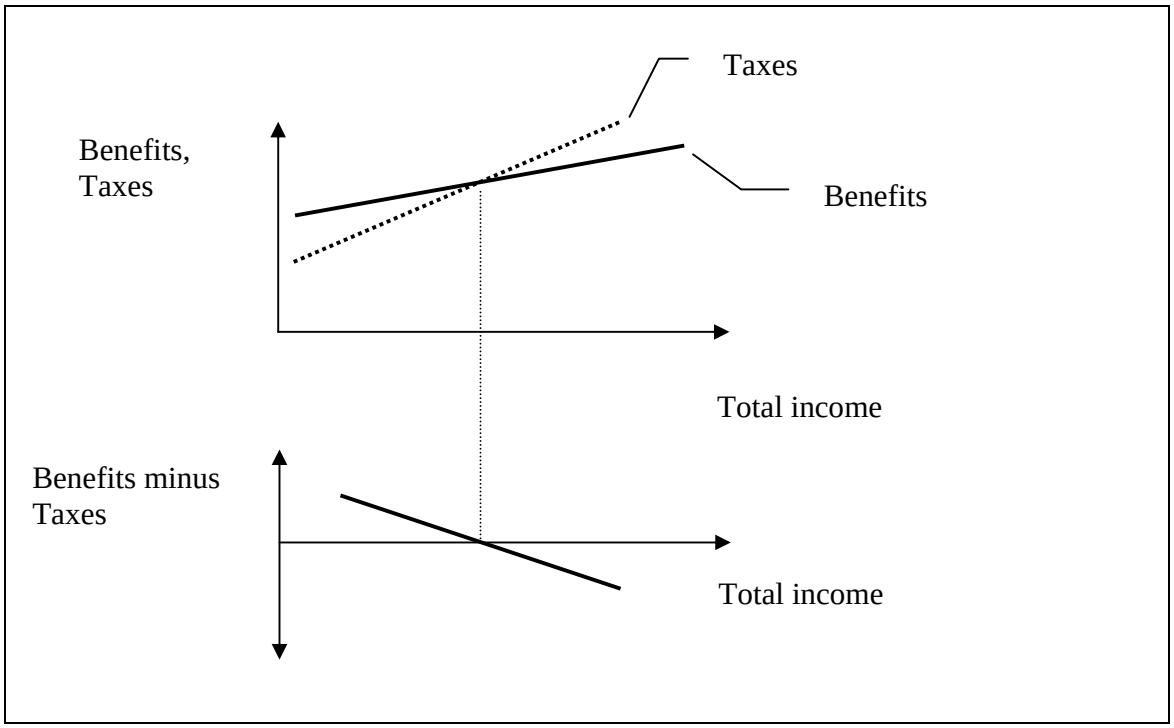

Table 1: The Contribution of Several Sources of Income to Total Inequality (2005)

Sources of Income	Estimation 1: Gross Benefits			Estimation 2: Net Benefits		
	Contribution to Inequality [a/] (in percent)	Correlation Coefficients	Ratio of Standard Deviations	Contribution to Inequality [a/] (in percent)	Correlation Coefficients	Ratio of Standard Deviations
Labor Income, dependent formal workers	2.77	0.16	0.17	4.04	0.16	0.26
Labor Income, dependent informal workers	-0.02	0.00	0.04	-0.02	0.00	0.04
Labor Income, self employed	3.41	0.26	0.13	3.54	0.25	0.14
Unemployment Insurance	0.00	0.00	0.01	-0.06	-0.06	0.01
Pensions	1.52	0.12	0.13	-3.96	-0.25	0.16
Family Allowances	-0.02	-0.09	0.00	-0.13	-0.42	0.00
Other Government Transfers [b/]	0.12	0.03	0.04	-1.34	-0.27	0.05
Other Sources of Income [c/]	92.21	0.97	0.95	97.92	0.98	1.00
TOTAL	**100.00**	**1.00**	**1.00**	**100.00**	**1.00**	**1.00**

Notes: a/ The contribution of the income source (y_k) to total income (y) inequality is the slope in the regression of y_k on y. See Shorrocks (1982b)
b/ Donations, subsidies, scholarships, accident compensation, divorce contributions, family subsidy.
c/ Interests, rents, profits, severance payments, remittances from abroad, other sources of income.

Source: Own computations on the household survey