Distributional Effects of Optimal Commodity Taxes with Minimum Income Programs: micro-simulations for Brazil

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Abstract

Commodity taxes play an important role in Brazil and raise around 60% of the total tax revenue. This heavy reliance renders commodity taxation one of the main tools available to the government for raising revenue and securing redistribution. In fact, Brazilian income inequity is one of the highest in the world: the wealthiest 1% of population, equivalent to 1.6 million people, earn together as much as the 50% poorest, around 80 million.

The purpose of this paper is a partial equilibrium numerical simulation of the distributional effects of optimal commodity taxation combined with minimum income transfers made by the government to households. The approach used to measure households welfare is a money metric indirect utility or ´equivalent income` [King (1983)], that underlies the Almost Ideal Demand System parameters. We plug it into the equivalent variation measure to evaluate the equity effects specified in terms of the equivalent income. The data source is a 1995/1996 national household expenditure survey, though estimated parameters come from a sample comprising a 1987/88 wave as well.

We find that our proposed minimum income programs combined with selectiveness in commodity tax structure would be useful as redistribution income instrument among households in Brazil. These results can provide some valuable contribution in the context of the increasing discussion about minimum income programs in Brazil associated with demographic characteristics such as education and family size.

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1. Introduction

The Brazilian tax system as a whole is extremely complex and generates production and consumption distortions. Commodity taxes play an important role in the country and raise around 60% of the total tax revenue. This heavy reliance renders commodity taxation a subject of considerable policy importance and one of the main tools available to the government for raising revenue and securing redistribution. In fact, Brazilian income inequity is one of the highest in the world: 1% of the wealthiest, equivalent to 1.6 million people, earn together as much as the 50% poorest, around 80 million. Moreover, absolute poverty reaches around one third of the population with a standard of living under basic necessities. Therefore, an analysis of optimal commodity taxes combined with income transfers in Brazil and its impact in income distribution is of utmost importance.

There has been an increasing debate on the use of minimum income programs as a consistent social policy measure to cope with this problem. In particular, the *Bolsa-Escola* is a good example of a cash transfer program targeted to low-income families with children. This program, where eligibility is conditioned to school frequency by the dependents at school age, has shown good results both in terms of focus and coverage in the cities of Brasilia, Campinas, Belem and Belo Horizonte. As from April of 2001, the federal government has been implementing 'Bolsa-Escola', covering nearly 98% of the 5,561 municipalities in the country.

It should be noted that, besides 'Bolsa-Escola', there are other cash transfer programs in Brazil that varies from the eligibility criteria to the target population. Some of them are the following: *i*) Pensions, for which entitlement is based on contributions made to the social security system; *ii*) Unemployment Benefit, as long as the worker has not resigned nor been laid off for fair reasons; *iii*) a family allowance paid for all children less than 14 years old or disabled of any age to employees and temporary workers who earn less than near two minimum wages; *iv*) 'Bolsa Alimentação' which is a transfer targeted to pregnant women and to children aged from 6 months to 6 years. [1]

Optimal commodity tax systems elicit the conflict between efficiency and equity concerns in the design of commodity taxes that raise required revenue and obtain given distribution objectives, at the lowest cost in terms of efficiency. Optimal tax models can be solved under alternative assumptions regarding: the government's concern with inequality; household preferences; required government revenue level; and constraints on its ability to tax.

The purpose of this paper is to examine the distributional effects of optimal commodity taxation combined with minimum income programs in Brazil. Our analysis is restricted to a partial equilibrium treatment and focuses on the effects of alternative optimal commodity tax systems, combined with income transfers, on the economic welfare of different income classes of household. We extend our previous work (see Asano, Barbosa and Fiuza [forthcoming]) by allowing for an income transfer to be made by the government according to households' demographic characteristics such as the number of children at school age in lower income households (following 'Bolsa-Escola' features). Our benchmark is a more generalized program in which the government combines an optimal commodity taxation system and a uniform lump sum income transfer made only to the lower income households.

The approach used to measure household's welfare is a money metric indirect utility, in some contexts also referred to as 'equivalent income' and introduced by King (1983). Welfare

[1] Most of these programs still remain after the new Federal government was established in office in January 2003. Recent announcements released by the press indicate that there will be some changes towards unifying the various cash transfer programs, but the debate has not settled yet.

effects simulations are based on the equivalent variation concept specified in terms of the equivalent income that underlies the Almost Ideal Demand System parameters (Almost Ideal Demand System, by Deaton and Muellbauer, 1980). The data source is a 1995/1996 national household expenditure survey, though estimated parameters come from a sample comprising a 1987/88 wave as well.

The analysis of the extent to which distributional goals can be reached in Brazil through commodity taxes, within an optimal taxation framework, has already been considered in Siqueira (1997). Her model employed the equivalent measure of consumer surplus to estimate the effects of alternative tax structures on the welfare of households. The tax structures varied from a system with two rates of value added tax (VAT), in addition to zero rate on food, combined with excise duties on alcoholic beverages and tobacco to a tax system with a proportional value added tax on all goods. She also considered the case that in addition to an optimal commodity tax structure the government made a uniform lump sum payment to all households. Siqueira's results indicated that a tax system based on two or three rates of VAT, plus some food subsidies and/or direct income support for certain household groups, and supplemented by excise on luxury goods, could effectively improve social welfare and advance the objective of greater equity. The household demand pattern in Siqueira's model was a Linear Expenditure System (LES) and the data source was ENDEF (Estudo Nacional de Despesas Familiares), a comprehensive survey undertaken from August 1974 to August 1975 in all metropolitan and urban areas, and rural areas in the Southern, Southeastern and Northeastern regions.

Sah (1983) considered the use of commodity taxation and subsidies in order to improve the welfare of the worst-off individual, based on U.K. data. He obtained an upper limit in terms of the maximum budget share of the worst-off as a ratio of the minimum average share in the economy. The results point out to inadequacy of commodity taxation as a redistributive instrument. Nevertheless, in the Indian case, Majumder (1988), contrary to Ray (1986), found out that the possibility of commodity taxes acting as a major source of redistribution cannot be ruled out. Creedy (1999) presented an empirical analysis of the welfare effects of several indirect tax reforms in Australia. Emphasis was placed on the implications for selected household types. When looking at all households combined, the results suggested that redistribution through possible tax reforms is small. Creedy argues that these results conceal differences between different household types. Comparisons among several types of households show that the largest welfare losses are experienced by low total expenditure couples with one child while the smallest losses accrue to high total expenditure couples with two children and low total expenditure single person retired households.[2]

The paper is organized as follows: in the next section we introduce the approach to measure the welfare impacts of the alternative tax systems. We also present the demand specification of the model with the empirical results regarding mean shares and elasticities from the AIDS estimation. Section III presents optimal commodity tax structure when the only tax policy instrument available to the government is commodity taxation. It also shows optimal commodity tax structures combined with different income transfer schemes and presents our methodology to simulate the welfare impacts on households under these programs. Section IV describes the data used for the simulations. The results regarding the impact on household welfare are discussed in section V and we sum up with the concluding remarks of section VI.

[2]Although some of these studies do use an optimal commodity tax framework, none of them applied the same methodology as ours.

2. The Model

2.1 Welfare Changes Measure

The method of measuring the welfare and distributional effects on different households of alternative commodity tax reforms uses the Hicksian concept of the 'equivalent variation'. This is defined using the expenditure function, $E(p,U)$, which represents the minimum amount of income required to achieve a given utility level U at prices p. The equivalent variation, EV, is:

$$EV = E(p^0, U^1) - E(p^0, U^0) \qquad (2.1)$$

We assume that there are H households in the economy indexed by h. Savings is not included in the model, so income and total expenditure are treated as synonymous. In the pre-reform position household h faces a vector of prices p^0. The term $E(p^0,U^0)$ is the total expenditure before the price change, denoted by y_0. After the reform the household faces a new price vector p^1. Suppose that the price vector changes from p^0 to p^1, and that U^1 represents the post-change utility. The equivalent variation is, therefore, the amount the household would be willing to pay, in the new situation, to avoid the price change.

Following King (1983), we use a money metric measure known as 'equivalent income'. This is defined as the value of income, y_e, that at some reference set of prices, p_r, gives the same utility function as the actual income level. In terms of the indirect utility function, y_e is therefore defined by $V(p_r, y_e) = V(p, y)$. If we use the expenditure function we have $y_e = E(p_r, V(p, y))$. When pre-change prices, p^0, are used as reference prices p_r the equivalent income is given by $E(p^0,U^1)$.

2.2 Demand Specification

We assume that the preferences and household demand patterns are based on the Almost Ideal Demand System – AIDS, proposed by Deaton & Muellbauer (1980). This system has desirable properties and provides a flexible approximation to the consumer preference structure. The AIDS expenditure function is given by:

$$\log E(U,p) = \log a(p) + U\ \beta_0 \prod p_i^{\beta_i} \qquad (2.2)$$

where U is the utility index, and:

$$\log a(\mathbf{p}) = \alpha_0 + \sum_i \alpha_i \log p_i + \tfrac{1}{2}\sum_i \sum_j \gamma^*_{ij} \log p_i . \log p_j \qquad (2.3)$$

The linear homogeneity of the expenditure function with respect to the price vector requires the following constraints:

$$\sum_i \alpha_i = 1, \qquad \sum_i \gamma^*_{ij} = \sum_j \gamma^*_{ij} = \sum_i \beta_i = 0 \qquad (2.4)$$

By applying Shephard's lemma to (2.2), we obtain the share equations:

$$w_i^h = \alpha_i + \sum_j \gamma_{ij} \log p_j + \beta_i \log (y^h/P) \qquad i = 1,.., n. \qquad (2.5)$$

where w_i^h is the expenditure share of good i for individual h; p_j is the price of good j (j=1,..,n); y^h is total expenditure. Hereafter, we drop superscript h, for the sake of simplicity in exposition. The price index is a non-linear price function represented by P:

$$\log P = \log a(\mathbf{p}) \qquad (2.6)$$

Under (2.4), adding up constraints and homogeneity of the demand functions, corresponding to (2.5), are all satisfied. The expenditure function in (2.2) represents the minimal amount of income necessary to achieve a given level of utility U at prices p. The parameter α_0 can be interpreted as the subsistence expenditure when all prices are normalized to one.

The model defined by equations (2.5) and (2.6) is the Almost Ideal Demand System - AIDS (Deaton and Muellbauer [1980]). Also, the AIDS expenditure elasticities are given by:

$$\eta_i = 1 + \beta_i / w_i \qquad (2.7)$$

It follows that if β_i is negative the ith group is a necessity, and if β_i is positive it is a luxury. Inverting the expenditure function, we obtain the AIDS indirect utility function:

$$v(\mathbf{p}, Y) = \frac{\log(Y) - \log a(\mathbf{p})}{\beta_0 \prod_i p_i^{\beta_i}} \qquad (2.8)$$

The value of the AIDS indirect utility function lies between 0 and 1, and its monotonic transformation can be used as a welfare measure.

The AIDS parameters, used in our indirect utility function, were estimated by Asano and Fiuza (2001). The model incorporates demographic variables into the share equations, in the following form:

$$w_i^h = \alpha_i + \sum_j \gamma_{ij} \log p_j + \beta_i \log(Y^h / P) + \sum_k \omega_{ik} Z_k^h \qquad i = 1,..,n. \qquad (2.9)$$

where Z_k's ($k = 1,..,K$) are demographic variables, such as family size, education of the household heads, etc. Underlying to this extension is an adaptation of the subsistence level to incorporate demographic variables:

$$\log a^h(\mathbf{p}) = \alpha_0 + \sum_i \alpha_i \log p_i + \frac{1}{2} \sum_i \sum_j \gamma_{ij} \log p_i \log p_j + \sum_j \sum_k \omega_{jk} Z_k^h \log p_j \qquad (2.10)$$

The AIDS form of equivalent income is given by:

$$\log y_e = \alpha_0 + \sum_i \alpha_i \log p_{ri} + \frac{1}{2}\sum_i \sum_j \gamma_{ij} \log p_{ri} \log p_{rj} + \sum_j \sum_k \omega_{jk} Z_k^h \log p_{rj}$$
$$+ \beta_0 \prod_i \left(\frac{p_{ri}}{p_i}\right)^{\beta_i} \left\{\log y - \alpha_0 - \sum_i \alpha_i \log p_i + \frac{1}{2}\sum_i \sum_j \gamma_{ij} \log p_i \log p_j + \sum_j \sum_k \omega_{jk} Z_k^h \log p_j\right\}$$

(2.11)

2.3 Shares and Elasticities

The analysis of the impact of different tax systems on household's welfare requires considerable information about the preferences and demand patterns of households. This section provides some useful information about the mean budget shares and the (expenditure) elasticities for sample used in the AIDS estimation.[3]

Table I presents the mean expenditure and own price elasticities for 1996. Total expenditure elasticities (a proxy for income elasticities) indicate that food and housing are the only necessities in Brazilian utility functions, whereas furnishings, clothing, transportation, health care and personal expenses are found to be luxuries. The own-price elasticities are found to be significantly negative. Among them, those for food, housing and furnishings are significantly less than one (own-price inelastic), while clothing, transportation and communication, health care and personal expenses display own-price elasticities around 1.

[3] See section 4 for more information about the data sources used in AIDS estimation and in welfare simulations.

Table I

Mean Expenditure and Price Elasticities, 1996

Expd.	**Food**	**Hous**	**Furn**	**Clth**	**Tran**	**Hlth**	**Pers Exp**
Shares	0.311	0.142	0.065	0.063	0.185	0.080	0.156
Elasticity	0.712	0.818	1.316	1.184	1.270	1.097	1.164
(s.e.)	(0.030)	(0.043)	(0.104)	(0.122)	(0.069)	(0.068)	(0.055)

Price Elasticities

	Food	**Hous**	**Furn**	**Clth**	**Tran**	**Hlth**	**Pers Exp**
Food	-0.558	0.129	0.029	0.002	0.259	0.024	0.116
(t-value)	(-4.284)	-2.622	(0.723)	(0.019)	-3.841	(0.322)	-2.131
Hous	0.283	-0.778	0.057	0.092	0.114	0.189	0.043
(t-value)	-3.131	(-11.539)	-1.428	-1.682	-1.496	-3.715	(0.877)
Furn	0.137	0.124	-0.688	0.034	0.053	0.080	0.260
(t-value)	(0.726)	-1.270	(-6.332)	(0.294)	(0.335)	(0.783)	-2.369
Clth	0.008	0.208	0.036	-1.112	0.475	-0.010	0.396
(t-value)	(0.019)	-1.146	(0.293)	(-1.932)	-2.150	(-0.026)	-1.546
Tran	0.435	0.087	0.019	0.162	-0.967	0.087	0.176
(t-value)	-3.819	-1.368	(0.336)	-2.361	(-6.747)	-1.380	-2.506
Hlth	0.092	0.337	0.065	-0.008	0.203	-1.004	0.315
(t-value)	(0.343)	-2.423	(0.830)	(-0.026)	-1.556	(-3.581)	-2.088
Pers Exp	0.232	0.040	0.109	0.160	0.209	0.161	-0.910
(t-value)	-2.445	(0.872)	-2.841	-2.996	-2.825	-3.047	(-13.653)

Source: Asano e Fiuza (2001).

3. Optimal Commodity Tax Systems and Income Transfers

Optimal tax models feature the maximization of a social welfare function, subject to a balanced government budget requirement. The trade-off between equity and efficiency is taken into account by introducing the government's aversion to inequality into the social welfare function.

This section presents alternative tax structures based on optimal commodity taxes and uniform income transfers calculated in Asano, Barbosa and Fiuza [forthcoming]. We present an extension of these optimal commodity tax structures in which we allow for a per capita payment to be made by the government only to the lower income households. The case which optimal commodity taxation is combined with a minimum income program directed to low-income households with children of age from 6 to 15 enrolled in public elementary schools ('Bolsa-Escola') is also presented.

3.1 Optimal Tax Rates and Uniform Transfers

Table II presents three cases of optimal commodity tax structures for seven groups of commodities. They are: 1.FOOD; 2.HOUS (Housing); 3.FURN (furnishings); 4.CLOTH (clothing);

5.TRANS (transportation and communication); 6.HLTH (health and personal care) and 7.PERS_EXP (personal expenses, education and reading).

The tax rates and lump sum subsidies are presented for two different levels of inequality aversion (ε = 0.25 and ε = 2.00). This approach explicitly allows for the introduction of alternative value judgments from the government. Needless to say that for high levels of ε (in our case when ε = 2.00), the government has a stronger commitment to equity. We assume that the government revenue corresponds to 10% of the consumer's total expenditure.

Table II
OPTIMAL TAX RATES (%) AND UNIFORM LUMP SUM TRANSFERS

COMMODITY	CASE I		CASE II		CASE III	
GROUP	ε = 0.25	ε = 2.00	ε = 0.25	ε = 2.00	ε = 0.25	ε = 2.00
1. FOOD	12.2%	-29%	174.29%	301,77%	21.12%	-18.44%
2. HOUSING	11.5%	-10%	124.11%	215,85%	18.48%	1.43%
3. FURN	8.1%	27.3%	29.07%	20.62%	10.22%	22.04%
4. CLOTH	10.2%	35.9%	50.47%	73.47%	13.53%	34.29%
5. TRANS	11.4%	53.1%	57.83%	95.29%	15.16%	50.67%
6. HLTH	10.8%	36.8%	60.68%	96.74%	14.76%	36.71%
7.PERS_EXP	10.9%	53%	50.09%	78.99%	14.28%	50.14%
LUMP SUM TRANSFER In R$ Sep 1996	-	-	1762.87	2971.56	127.19	124.19

Note: in Case III, lump sum transfers are constrained with a binding ceiling equivalent to 50% of the minimum observed income in 1996 (source: Asano, Barbosa and Fiuza [forthcoming]).

Case I presents tax rates based on the assumption that the only tax policy instrument available to the government is consumption goods and services taxation. When ε = 0.25, the optimal commodity tax structure shows a movement towards uniformity.[4] However, for ε = 2.00, when redistribution objectives are higher, there is a selectiveness in tax rates. In particular, food and housing groups are subsidized and the tax rates for the other groups increase significantly.

Case II reports tax rates for the situation when the government, in addition to commodity taxes, sets an optimal uniform per-capita lump sum payment to all households. This payment works as a universal benefit uniform to all households. The main results for this case are the strikingly high levels of commodity tax rates and optimal lump sum subsidies for all levels of inequality aversion parameters.

In Case III we show optimal tax rates combined with a constraint in the optimal lump sum transfer (obtained in the last case). The constraint is equal to 50% of the minimum observed income (we call it as 'bonus rate' = 0.5). The results show higher tax rates (and lower subsidies) than Case I and lower values of lumps sum transfers (than case II), which remains stable for both values of inequality aversion ε = 0.25 and ε = 2.00.

[4] When ε is near zero, there is no concern for inequality. In this situation, a uniform rate of tax on all goods is equivalent to a tax on labor alone. This corresponds to the conventional prescription if there is a completely inelastic factor, this should bear all the tax (Atkinson and Stiglitz, 1972). Therefore, as Asano, Barbosa and Fiuza [forthcoming] assumed that labor supply is completely inelastic, the optimal commodity tax rate structure is uniform.

3.2 Transfers to the Lower Income Households

We also extend our analysis by allowing for a per capita payment to be made by the government only to the lower income households. This income transfer is also a universal benefit but, different from case III, it is restricted only to the poorer households. We assume that this minimum income policy guarantees that each household gets 50% of the minimum wage per capita. So if the household already earns that income or more, he gets no transfer. This exercise was based on the minimum wage value of September 1996, which was R$112.00 per month.

Table III
OPTIMAL TAX RATES (%) AND TRANSFERS TO LOWER INCOME HOUSEHOLDS (CASE IV)

COMMODITY GROUP	ε = 0.25	ε = 2.00
1. FOOD	11.01%	-23.51%
2. HOUSING	10.57%	-4.08%
3. FURN	7.73%	25.69%
4. CLOTH	9.65%	30.47%
5. TRANS	10.84%	35.40%
6. HLTH	10.25%	30.78%
7.PERS_EXP	10.39%	38.76%
TRANSFERS (PER-CAPITA)* In R$ Sep 1996	R$ 672.00	R$ 672.00

*half of the minimum wage per year.

The commodity tax structure shown in Table III is quite similar to Cases I and III presented in Table II. For low value of inequality aversion parameter (ε = 0.25), the commodity groups that are more price inelastic, food and housing, high tax rates in comparison to the situation when there is a stronger commitment to redistribution objectives (ε = 2.00). In this case, both items are subsidized. As regards the other commodities, there is a significant increase in their tax rates when the inequality aversion increases.

One important feature to stress in the results presented in table III is that even when the minimum income policy is introduced, a subsidy for food and housing is needed to improve welfare. Therefore, we conclude that introduction of transfers to lower households may still gives some room to commodity taxation as a redistribution instrument. This subject is analyzed in section 4.

3.3. Optimal Commodity Tax Rates combined with 'Bolsa-Escola'

The 'Bolsa-Escola federal' program was introduced in 2001 by the federal government. It came out as an unfolding of a previous federal minimum income program – Programa de Garantia de Renda Mínima (PGRM), which lasted two years (1998/2000 period). The target population of 'Bolsa-Escola Federal' low-income households with children of age from 6 to 15 enrolled in public elementary schools. The eligibility criteria of 'Bolsa-Escola federal' is the students' minimum school attendance of 85% and that households must have a per-capita income of maximum 50% of minimum wage. The income benefits are R$ 15.00 per child, with a constraint to R$45.00 per household.

Following the characteristics of 'Bolsa-Escola federal', we also extend our analysis by allowing for a per capita payment to be made by the government only to the lower income households with children of age from 6 to 15. The income transfer is equal to R$15.00 per child and it is constrained to R$45.00 per household. This program is a more specific minimum income policy than the one presented in section 3.2 (case IV), in the sense that the latter has a larger target population than this one. Optimal commodity tax structures in this case are quite similar to the ones obtained in case IV presented in table III, for both values of inequality aversion parameter ($\varepsilon = 0.25$ and $\varepsilon = 2.00$). Table IV displays the optimal tax rates for the case in which income benefits are associated to 'Bolsa-Escola' program (case V).

Table IV
OPTIMAL TAX RATES (%) AND 'BOLSA-ESCOLA'
(CASE V)

COMMODITY GROUP	ε = 0.25	ε = 2.00
1. FOOD	12.26%	-28.68%
2. HOUSING	11.56%	-9.80%
3. FURN	8.06%	26.76%
4. CLOTH	10.15%	35.47%
5. TRANS	11.40%	52.65%
6. HLTH	10.83%	36.47%
7.PERS_EXP	10.90%	52.53%
TRANSFERS (PER-CHILD)* In R$ Sep 1996	R$ 145.20	R$ 145.20

*this value, R$145.20, represents the income benefit per year in 2001, R$ 180.00, adjusted for inflation to September,1996.

We choose to increase the benefit value of 'Bolsa-Escola' in order to have a higher distributional impact. Therefore, we increase the income benefits regarding 'Bolsa-Escola Federal' to R$ 22,50 and R$30.00 per child, in R$ 2001 terms (1.5 and 2 of the federal value benefit, respectively). This increase in the income transfer generated an optimal commodity tax rates structure quite similar to the previous 'Bolsa-Escola' case presented in table IV. Optimal commodity tax rates for the higher benefits values are presented in table V.

Table V
OPTIMAL TAX RATES (%) AND CONSTRAINED 'BOLSA-ESCOLA'
(CASE VI)

COMMODITY GROUP	ε = 0.25	ε = 2.00	ε = 0.25	ε = 2.00
	1.5 X FEDERAL VALUE		2 X FEDERAL VALUE	
1. FOOD	12.30%	-28.52%	12.32%	-28.05%
2. HOUSING	11.58%	-9.68%	11.59%	-9.35%
3. FURN	8.05%	26.49%	8.44%	25.75%
4. CLOTH	10.15%	35.29%	10.14%	34.77%
5. TRANS	11.39%	52.39%	11.39%	51.64%
6. HLTH	10.83%	36.32%	10.82%	35.91%
7.PERS_EXP	10.89%	52.28%	10.88%	51.57%
TRANSFERS (PER-CHILD)* In R$ Sep 1996	R$ 217.80	R$ 217.80	R$ 290.40	R$ 290.40

*all values represent the income benefit per year in 2001, adjusted for inflation to September,1996.

4.Data

The AIDS parameters are obtained from Asano and Fiuza (2001). The estimation of the demand system was based on family-level expenditure data for seven consumption categories and their corresponding price indexes: food; housing; furnishings; clothing; transportation and communication; health and personal care and personal expenses, education and reading.

The data sources for expenditures are two waves of national expenditure surveys conducted in 1987/88 and 1995/96, and sources for price indexes are the monthly national survey consumer prices. Corresponding price indexes were constructed in a way to allow a comparison of prices both across periods and regions. The regions surveyed are the metropolitan areas of São Paulo, Rio de Janeiro, Porto Alegre, Belo Horizonte, Recife, Belém, Fortaleza, Salvador and Curitiba, besides the cities of Brasilia-DF and Goiânia.

In the present study we assume that the tax structure is common to all individuals. We also restrict our initial analysis to Sao Paulo households. The welfare analysis associated with the alternative optimal commodity tax structures presented in previous sections is simulated for 587 household observations sampled from a population of more than 8,200,000 individuals.[5] The household sample is disaggregated in 40 per-capita expenditure classes (2.5 percent quantiles). Therefore, equivalent variations are calculated for each of these 40 total expenditure classes.

5. Results

Given the estimates of AIDS parameters and the equivalent variation calculation we present the results regarding welfare effects on consumers for the specified optimal tax structures combined with the different income transfers schemes It is important to point out that positive values of EV (or EV/y_0) mean a gain in household's welfare from the tax change. Figures I, II, III, IV and V report the welfare effects for all the five cases regarding the alternative tax systems, presenting the EV/y_0 ratio, for $\varepsilon = 0.25$ and $\varepsilon = 2.00$.

One important feature presented in all figures is that, except for case II, the ratio EV/y_0 remains quite stable along household expenditure classes (quantiles), for $\varepsilon = 0.25$. This is an expected result because as it is shown in tables II and III of section 3 and table IV of section 4 there is a movement towards uniformity in commodity tax rates for low values of inequality aversion parameter (specifically, in cases I, IV and V). Therefore an equal proportional increase in all prices has no redistribution effect since there is an equal proportional reduction in real incomes for all households.

As our main concern is on the distributional impact on households welfare we focus on the equivalent variations ratios for the higher value of inequality aversion, $\varepsilon = 2.00$. It can be seen in all figures that the ratio EV/y_0 is positive for the lowest expenditure quantiles, a result that presents a welfare improvement through the optimal tax systems for these expenditure classes.

Figure I presents the equivalent variation rates based on an optimal tax structure without income transfers to households (case I). We can see in this figure that the welfare gain for the lowest expenditure quantiles (less than 5% of original expenditure) is the lowest among all cases. Therefore, the inclusion of a minimum income policy associated with income transfers is extremely important for the welfare improvement of lower income households. Except for figure I, all figures represents a combination of optimal commodity taxation with some kind of minimum program policy.

[5] This population correspond to households earning from 1 to 40 minimum wages (total household income).

The results in Figure II, regarding case II – optimal tax rates and unconstrained optimal lump sum, show a highest welfare gain for the lower income households among all the alternative tax-benefit systems. The highest EV/y_0 ratio is near 400% of original expenditure. However, the higher income households incur the highest losses (a negative EV/y_0 ratio) in comparison to the other figures. As it is shown in table I (section 3), the optimal lump sum transfers obtained in this case are extremely high. Although commodity tax rates are also high and present a regressive nature in its structure, the strikingly high levels of optimal transfers can be the main explanation for such a remarkably welfare gain in comparison to the others tax systems.

Figure III presents the EV/y_0 ratios regarding case III – optimal tax rates combined with a constraint in the optimal lump sum transfer. The results shown in figure III are similar in structure to those presented in figure II. However, as we are constraining income transfers to all households, welfare gains are lower than those shown in figure II. The highest gain accruing to low income households corresponds to a figure slightly above 40% of the original expenditure.

Figure IV show the results based on the minimum income policy that guarantees a per-capita income for the lower households. The highest welfare gain for this program is close to the one obtained in figure III (more than 40% of original expenditure). However, the very low expenditure quantiles present a welfare gain less than this rate.

The results for the school stipend program ('Bolsa-Escola') are presented in Figure V. We note that there are fewer households who effectively benefit from this program as compared to the other minimum income programs we have shown. This is explained by the fact that the population eligible for the 'Bolsa-Escola' is smaller than the other three minimum income programs.[6] This fact appears also in figure IV, the minimum income policy that guarantees 50% of minimum wage to the lower income households. In the last case, the minimum program also restricts the target population. The results shown in Figure VI are quite similar to the ones in Figure I, where no transfer is made. As regards the household welfare impact with the increase in the income benefit (we double it), we found an increase in the EV/y_0 ratios, which indicates an improvement in welfare gain for the lower income households. This result is presented in Figure VI.

7. Concluding Remarks

The purpose of this paper is to examine the distributional effects of optimal commodity taxation combined with cash transfer programs in Brazil. Our analysis is restricted to a partial equilibrium treatment and focuses on the effects of alternative optimal commodity tax-benefit systems on the economic welfare of households in different income strata.

Preferences and household demand patterns used in our welfare impact simulations are based on a complete demand system estimated with a flexible functional form, the Almost Ideal Demand System (by Deaton and Muellbauer [1980]). Preference parameters estimates are consistent with microeconomic demand theory and allow for an accurate evaluation of the simulated gain and losses of households welfare. As stressed by Creedy (1999, p.56): "the fundamental requirement of any detailed analysis of welfare changes is a suitable consumer demand model, along with empirical estimates of the required demand functions."

[6] It is worth reminding that the main targets of this kind of program may be outside our restricted population, since we have performed a lower bound income truncation for the sake of the demand estimation and we are simulating results only for São Paulo, the wealthiest State of Brazil, so the coverage of the program in the real world is expected to be much higher. On the other hand, extending the simulation to the households with total income below one minimum wage will not take into account the difference on consumption behavior (self-consumption, donations, etc), which are heavily present in these segments.

Our results show that under the proposed optimal commodity tax systems combined with minimum income programs the welfare gains on low income households are higher in comparison to the situation in which the government gives no income transfers to households. These results indicate that minimum income programs combined with selectiveness in commodity tax structure (with subsidies in food and housing) would be useful as redistribution instrument among households.

More specifically, the 'Bolsa-Escola' simulations can be of help in the debate on the need of a general expansion of education to reduce poverty and inequality in Brazil. Barros, Henriques and Mendonça (2000) found out that 40% of overall inequality in the Brazilian personal distribution of income could be ascribed to education. In a recent study, Ferreira and Leite (2002) present some results of a micro-simulation exercise for the State of Ceará. They suggest that broad-based policies aimed at increasing educational attainment would have substantial impacts on poverty reduction, but muted effects on inequality.

Some final remarks should be stressed. Our results focus on detailed comparisons of the equivalent variations resulting from alternative optimal tax-benefit systems. No attempt was made to produce an overall summary measure. Social evaluations of the tax-benefits systems are certainly a useful extension and can be made using a specified social welfare function, expressed in terms of the distribution of equivalent incomes. The inclusion of labor supply in our model would be also desirable to examine the labor supply responses of individuals, as well as the impact of the alternative reforms on the households' welfare.

Nevertheless, we believe that our empirical findings provide a valuable contribution in the context of the increasing discussion about minimum income programs and the current tax policy debate in Brazil, where distributive goals have a great importance in the agenda.

Figures

Figure I

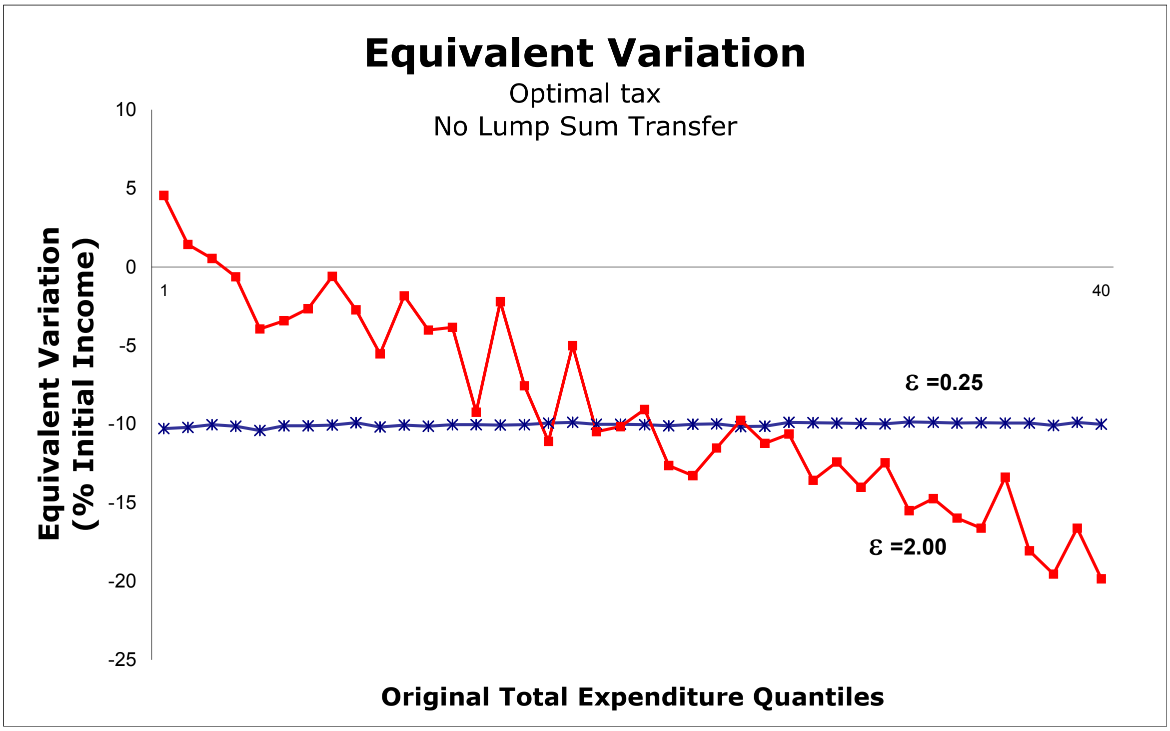


Figure II

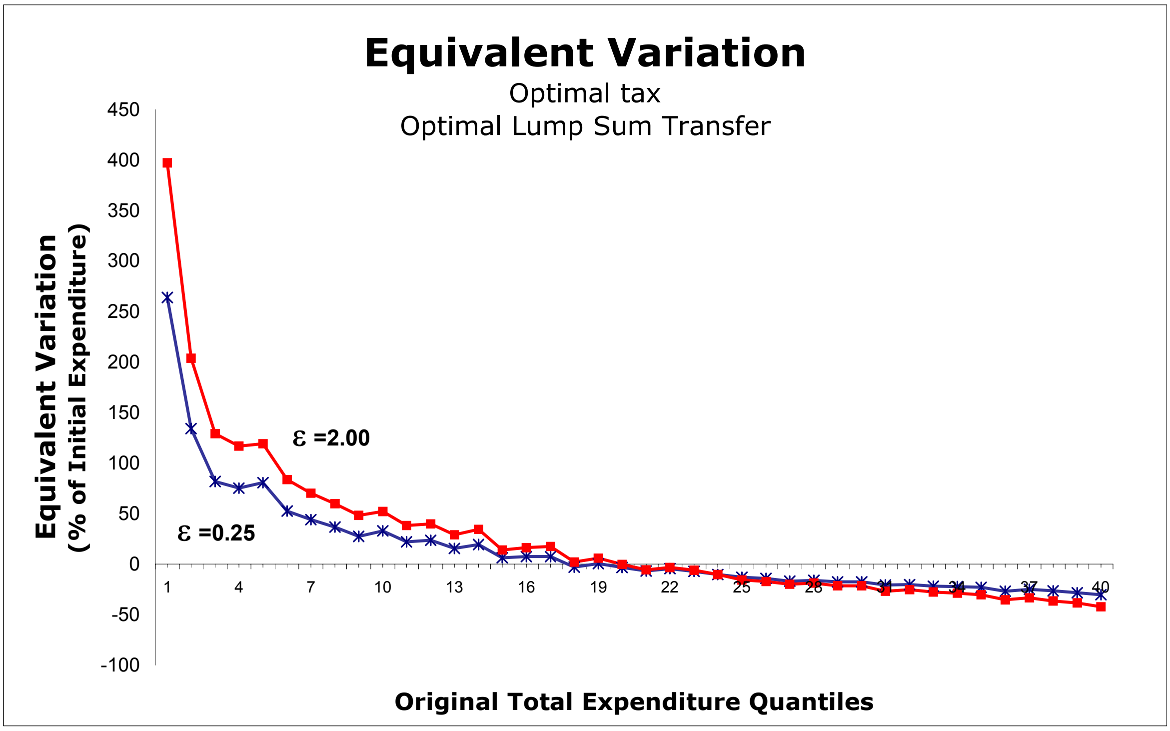


Figure III

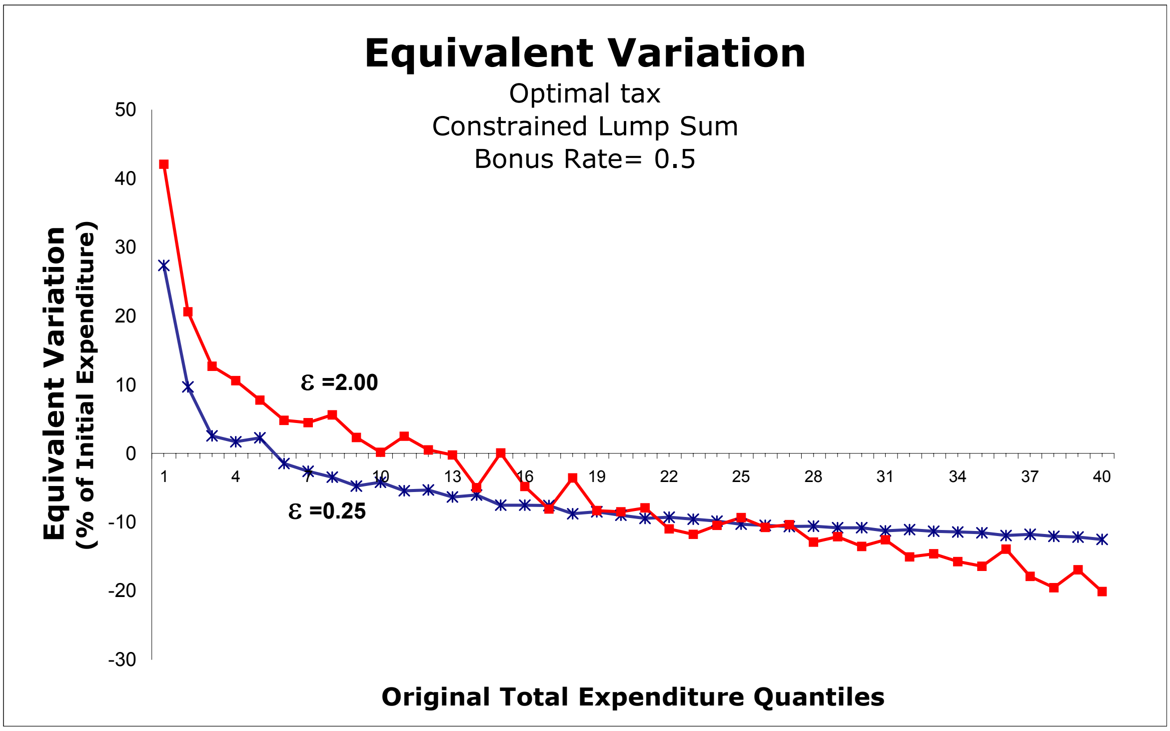


Figure IV

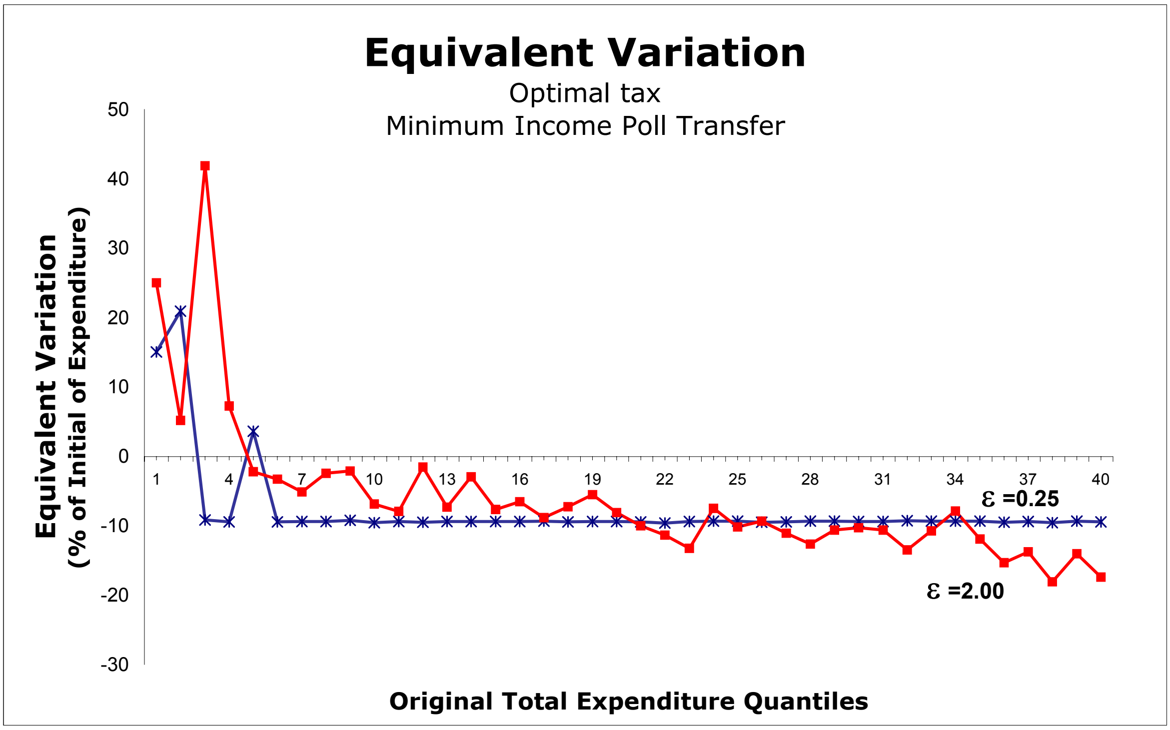


Figure V

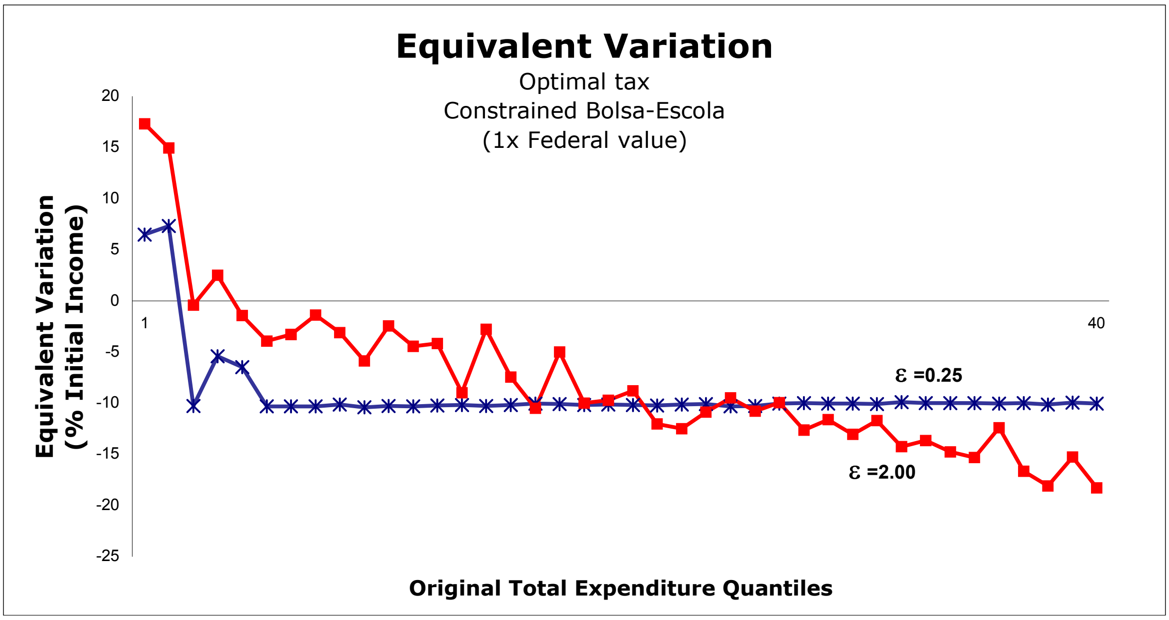
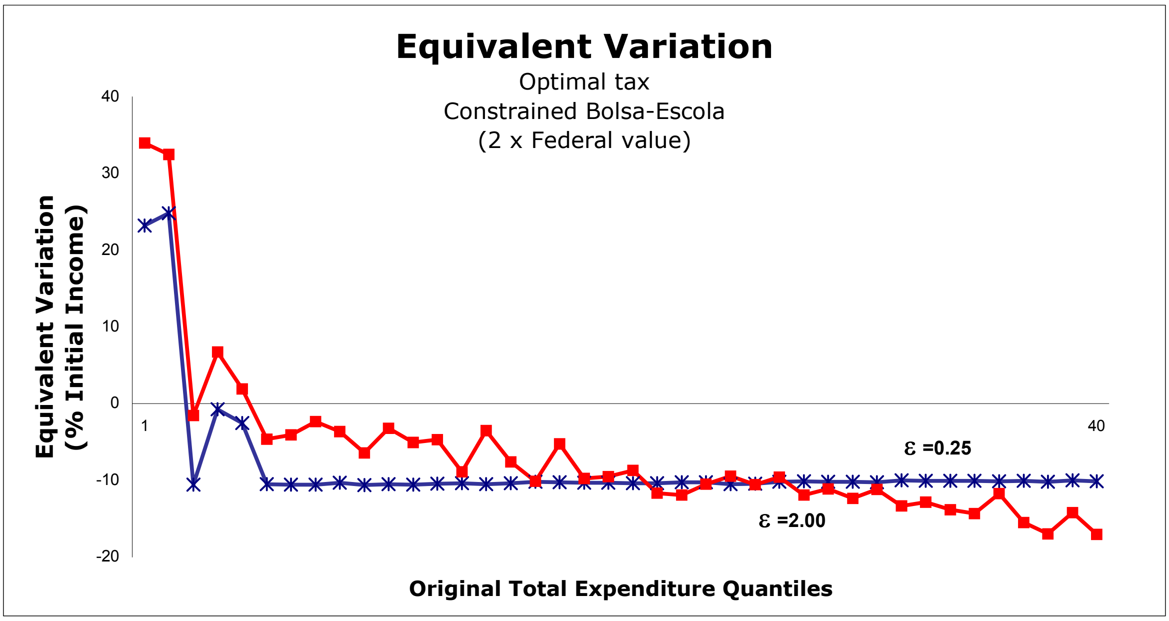


Figure VI



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