Documentos de Trabajo

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Documento No. 09/11
Junio 2011

ISSN 0797-7484

Distributive impacts of alternative tax structures. The case of Uruguay[1]

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Resumen

El presente artículo analiza el impacto distributivo de ciertas variaciones en el sistema tributario uruguayo, en un marco de micro-simulaciones aritméticas basadas en la combinación de datos provenientes de encuestas de hogares y de gastos. Por el lado de los impuestos indirectos, se consideran dos alternativas que implican la misma reducción en los ingresos fiscales: una reducción general de 2 puntos en la tasa básica del IVA, y una reducción selectiva del IVA aplicada a determinados bienes que forman parte del consumo de la población de bajos ingresos. En relación a los impuestos directos, se considera el efecto de aumentar el mínimo no imponible del componente laboral del impuesto a la renta. En primer lugar se analiza por separado el impacto de cada uno de estos cambios, y luego se simula un escenario común combinando los cambios en los impuestos directos e indirectos. Los resultados indican que en Uruguay la redistribución a través de las modificaciones consideradas en los impuestos directos e indirectos es limitada.

Palabras claves: redistribución fiscal, desigualdad en los ingresos, impuestos

Abstract

This article considers the distributional impact of different changes in Uruguayan tax system, using a static micro-simulation framework based on the combination of data from household and expenditure surveys. On the indirect taxes side, we consider two alternatives that imply the same reduction in tax revenue: a general reduction of 2 points in the VAT basic rate, and a selective reduction in the VAT rate applied to specific goods that make up a large share of consumption of low income population. In relation to direct taxes, we consider the effects of increasing the upper limit of the tax free zone of the labor component of the dual income tax. We analyze separately the impact of each of these changes, and we also simulate a joint scenario including changes in direct and indirect taxes. Our results indicate that redistribution through the analyzed modifications in direct and indirect taxes in Uruguay is limited.

JEL classification codes: D31, H23, H20
Keywords: fiscal redistribution, income inequality, taxes

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[1] This article was written as part of the project Fiscal Schemes for Inclusive Development, financed by UNDP and IRDC. We are greatful for useful comments and suggestions received from Guillermo Alves, Andrea Vigorito, Samuel Freije-Rodríguez, Luis Felipe López Calva, Amedeo Spadaro and Carlos Urzúa, as well as from researchers of other teams in the project, and participants of XXV Jornadas de Economía del Banco Central del Uruguay and XV Reunión Anual de LACEA (Medellín, Colombia).
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1. Introduction

The redistributive action of the state is undertaken through taxes and spending. A usual concern among economists is the association between these actions of the state and their redistributive effects. The effects of this Robin Hood role of the state, aiming to reduce welfare disparities, will depend both on the progressivity of the tax system and on the degree to which social benefits go to the less well off. But extensive empirical research concludes that most of the redistribution is accounted for by spending rather than by taxation (see Esping Andersen and Miles, 2009).

Despite the fact that redistribution through taxes is limited, the tax system has a role to play in terms of achieving higher equality, and knowledge about how tax reforms may potentially affect income distribution is central for policy makers. On theoretical grounds, properties derived from the theory of optimal taxation indicate that direct income taxation should be preferred to indirect taxes as instruments to achieve redistribution.

The analysis of the performance of Latin American fiscal systems from the perspective of redistribution presented in Goñi *et al* (2008) highlights that, contrary to industrial countries, in most Latin American countries the fiscal system does not significantly reduce inequality. The main explanation for this is driven by two facts. On the one side, transfers, which are the bulk of redistribution in European countries, have a limited effect in redistribution in the region. On the other side, redistribution is severely constrained by the region's low levels of tax collection.[2] The authors argue that the region's low income tax receipt is associated with narrow tax bases (due to evasion, informality and low levels of income) rather than tax rates. They conclude that even significant increases in the progressivity of Latin America's tax systems are like to have modest effects on the distribution of income, as the priority to reduce inequality is the overall volume of tax revenue.[3]

In Uruguay, recent changes in the tax system, under the reform implemented in 2007, enhanced progressivity through the tax system, mainly due to the creation of a dual

[2] As an example, they argue that whereas direct taxation lowers the Gini coefficient of household income by an average 5 percentage points for fifteen European countries, the average decline in the Gini for Latin American countries due to direct taxes is around 1 percentage point.

[3] In the case of Chile, the analysis presented by Engel et al (1997), shows that before and after tax Gini coefficients go from 0.4889 to 0.4929, suggesting that the redistributive role of taxes is limited.

income tax, and to a lesser extent through the reduction in the VAT rate (see Instituto de Economía, 2006; Amarante *et al*, 2007; Llambí *et al*, 2008). New modifications are at present being discussed. In the public discussion, achieving higher equality was highlighted as one of the objectives. This article aims at providing new evidence on the redistributive impacts of alternative modifications in the actual tax system.

2. Uruguayan tax system

2.1 The actual system

The Uruguayan tax system relies mainly on indirect taxes: the VAT accounts for 55% of tax collection, whereas IMESI (an excise tax) represents almost 10% of total tax revenue (Table 1). The recently implemented dual personal income tax (IRPF) represents 11 % of the tax revenue whereas the corporate income tax (IRAE) accounts for 14% of it.

Table 1. Tax revenue in Uruguay in 2008

	Millions of dollars	% of total tax revenue
Indirect taxes	*3626*	*64,28*
VAT	3113	55,18
IMESI	513	9,1
Direct taxes	*2015*	*35,72*
IRPF	647	11,47
IRAE	785	13,91
Other direct taxes	583	10,34
TOTAL (gross)	*5641*	*100*

Source: DGI, Boletín 2008

Most of the sales are taxed by the basic VAT rate of 22%. A rate of 10% applies to certain basic goods and services such as basic food (bread, meat, chicken, etc), medicines and transportation. In turn, the IMESI applies to a few goods; the rates vary from 4% (as in the case of sugar) to 81.5% (spirits). Finally, a series of goods and services are zero-rated (for example milk, water, books). The main principle behind the assignation of different rates schedule is whether the good is considered essential or luxury.

On the direct taxes side, the Uruguayan tax system consists of a dual personal income tax (*Impuesto a la Renta de las Personas Físicas*, IRPF) that combines a progressive tax schedule for labor income with a low flat tax rate on capital income. This

dual system was installed in 2007, when an important tax reform was undertaken, seeking to create a more efficient and equitable tax system. Its dual structure responds the plight of small open economies that are unable to trace non-domestic sourced income in the face of increased capital mobility across countries. A low flat tax on capital income was chosen to reduce the risk of tax evasion from residents with capital investments abroad (World Bank, 2008).

The tax of the labor income component consists of six marginal income tax rates ranging from zero in the first bracket to 25 percent in the 6th bracket (table 2).

Table 2. Tax schedule for the labor income component of the IRPF

Anual rent		Rate
Less than 84 BPC	Less than 8878 US$	0%
Between 84 BPC and 120 BPC	Between 8878 and 12683 US$	10%
Between 120 BPC and 180 BPC	Between 12683 and 19025 US$	15%
Between 180 BPC and 600 BPC	Between 19025 and 63415 US$	20%
Between 600 BPC and 1200 BPC	Between 63415 and 126831 US$	22%
More than 1200 BPC	More than 126831 US$	25%

Taxes on capital vary from 3 to 12%, depending on the source of capital income (table 3). Rental and lease income above a certain threshold (around 3000 dollars per year) is taxed at 12%.

Table 3. Tax rates for the capital income component of the IRPF

Concept	Rate
Interests for deposits in domestic currency and *Unidades indexadas*, more than a year, and for debentures and other public debt titles	3%
Interests for bank deposits, one year or less, in domestic currency	5%
Profits or utilities from IRAE contributors	7%
Other capital rents (rents, leases)	12%

The tax system also includes a tax on pensions, the IASS (Impuesto de Asistencia a la Seguridad Social), whose marginal rates are presented in table 4.[4] In this paper, we consider that the IRPF has three components: the labor tax, the capital tax and the pension tax.

Table 4. Tax schedule for pensions (IASS)

Anual rent		Rate
Less than 96 BPC	Less than 10146 US$	0%
Between 96 BPC and 180 BPC	Between 10146 and 19025 US$	10%
Between 180 BPC and 600 BPC	Between 19025 and 63414 US$	20%
More than 600 BPC	More than 63414 US$	25%

Some deductions can be made, including: (a) a proportion of the social security contributions, (b) health expenditures corresponding to children younger than 18, up to 6,5 BPC by year and child, (c) health expenditures of pensioners, up to 120 BPC by year, (d) a proportion of a tax that finances public tertiary education. Deductions can also be made from capital income, for the following concepts: bad debts, real estate taxes, and commissions for renting. The latter are not consider in our simulations. Additionally, some capital rents such as donations to public entities are exempt.

2.2 Alternative schemes

We evaluate the distributional effects of different modifications of the tax system. First of all, we consider the impact of modifications in indirect taxation. We analyze two different scenarios. The alternative scenario 1 consists on a reduction of the basic rate from 22% to 20%. This reform is very costly in fiscal terms, as it implies a reduction of the VAT collection of 16,1%, and a decline of total tax revenues of 8,9% (table 5).

Alternatively, in scenario 2 we simulate the elimination of the VAT for a consumption basket composed by goods intensively consumed by the poor. In order to choose this basket, we calculate the participation of 52 baskets in the spending of the whole population (w_i^* , where i is the basket) and in the spending of the first decile of the

[4] In the original tax reform, pensions were taxed by the labor component of the IRPF. Pension preceptors argued that this was not constitutional, taking legal actions. As a result of judicial resolutions favourable to pensioners, the IRPF on pensions was derogated, and a new tax, the IASS, was installed in July 2008.

per capita household income distribution (w_i). We calculated the distance $d = w_i^* - w_i$, and we selected those baskets with the highest value of d, until we reach a fiscal cost level similar to the one in scenario 1. This so-called basket of the poor is composed by food items that are taxed with the minimum VAT rate.

On the direct taxes side, we considered an increase in the upper limit of the tax free zone of the labor component of the dual income tax (from 80 to 100 BPC). We did not consider the potential effects of changes in the tax burden on capital income, as our simulations are based on information from household surveys, which tend to significantly underestimate this source of income (see Amarante *et al*, 2007). The consequent changes of fiscal cost are in each scenario are presented in Table 5.

Table 5. Fiscal cost of alternative tax modifications

Tax system modification	Change in total tax revenue (in %)
(1) Reduction of 2 points of VAT	-8,9
(2) Elimination of VAT for specific goods	-8,5
(3) Increase in upper limit of IRPF (labor) free zone	-1,7
Joint scenarios	
(4) Combination of scenarios (1) and (3)	-10,6
(5) Combination of scenarios (2) and (3)	-10,3

3. Methods and data

3.1 *Data*

Theoretically, we would need a data base that informs the pre-tax income of individuals and their spending. With this information we should be able to calculate the per capita direct and indirect taxes paid by the households, and so to perform the inequality and progressivity analysis.

In order to calculate the amount of direct taxes paid by each individual we use the income information reported by the Household Survey (HS) collected by the Institute of Statistics (INE) in Uruguay in 2008. The HS reports information about characteristics of the household and its members (sex, age, relationship, etc.), labor attachment of

individuals and their income by source. It inquires the after tax income received the month before the interview. Some sources of income are reported at the person level but other ones are reported at the household level.

Specifically, the HS informs the labor income and transfers of every member of the household. Using the schedules of social contribution rates and IRPF, we estimate for each individual the pre-tax labor income and pensions, and the amount of tax paid.[5] Notice that in the analysis of inequality and progressivity, we assigned to each individual the per capita labor income and tax payments of the household.

In order to estimate the per capita indirect taxes paid by the households, we combined the information of the HS with information of the Expenditure Survey (ES), collected throughout November 2005 and October 2006 by the INE.[6] The ES reports the expenditure of the household and inquires about many of the characteristics informed by the HS.

To combine both data sets, we followed three steps. First, we classified the household spending on the base of the combination of three criterions: the standard classification used by the INE that basically identifies the type of good or service by purpose; the tax structure of 2006 and the tax structure of 2008. We obtained 52 consumption baskets.

The second step consisted on predicting the 52 consumption baskets of the HS. For each household we proceeded to impute a consumption basket based on a multiple regression on variables reported by the ES and the HS. More specifically, to perform the match we used the command "uvis" of the Software STATA 11. We assumed that the household spending on each basket depends on: the household income; the size of the household; the average years of schooling of the adults of the household; a deprivation index; the total hours worked in the labor market by all the members of the household; the participation of age-groups by sex in the household (we considered ten-age groups); a set

[5] In the case of the workers, we took into account the specific social security and health contributions that correspond to the individual occupational group. Besides, in the case of workers and pensionists, we considered the personal tax conditions.

[6] The HS 2006 had sample size of 85316 households, whereas the ES sample was of 7043 households. Both surveys are representative at the national level.

of regional dummies. The first five variables were introduced as a polynomial of degree three in order to have a more parsimonious functional form.

Finally, we assign to each individual the per capita spending of his household. Thus, the indirect tax amount paid by each individual is the per capita indirect tax paid by his household.

3.2 Consistency

Our simulation exercise is based on data reported by households, which usually present some shortcomings that are worth considering. On the side of expenditure, one major shortcoming is that we are considering that all consumption is undertaken in legal or formal markets, and so is levied by taxes.[7] We are not making any adjustments due to informal consumption. Nevertheless, we can evaluate the goodness of our exercise by comparing tax revenue from indirect taxes coming from the ES with administrative data. This comparison shows that the indirect tax revenue estimated using the ES, as well as the estimation based on the combination of this survey with the HS is relatively consistent with the information by the Tax Office (DGI), assuming a tax evasion of 20,6% (table 6).

On the side of the HS, the problem stemming from evasion is also present. The HS allows identifying those workers who contribute to the social security system. In this article we assume that these formal workers are the ones that also pay taxes.[8] Our simulation exercise makes the reasonable assumption that a tax reform does not change the contributory status. It must be stressed that existing studies for Uruguay indicate that the HS captures very well income from wages, salaries and pensions (Mendive and Fuentes 1996, Arim and Vigorito 2006). As discussed before, it presents serious problems for capturing capital income, both rental income and interest income from bank deposits (Amarante *et al*, 2007), and that is why simulations on the capital component of IRPF were not performed. The comparison of our estimations of tax revenue with the information from administrative records shows that we tend to overestimate direct taxes (table 6). Nevertheless, global results are adequate and validate the data used for the micro-simulations.

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[7] Other minor concern refers to the under reporting of consumption of certain goods, such as alcohol, cigarettes, etc.

[8] In 2008 67% of workers made contributions to the social security system.

Table 6. Consistency between estimated tax revenues and administrative data (in millon $). 2008

	IVA	IRPF (labor + iass)
Expenditure Survey (2005-2006)/ Household survey (2008) (2)	60.431	14.273
DGI (3)	67.958	12.940
(2)/(3)	0,89	1,1

Note: IASS was implemented in mid 2008

Source: based on HS, ES and DGI

3.3 Micro-simulations

We present an arithmetical micro-simulation that basically consists of calculating, for each individual, the total amount of direct and indirect taxes paid before and after the change in the tax system. In our model, the effect of an increase in the indirect tax rate on good *i* for individual *j* is to reduce the "real" disposable income of *j* by an amount equal to the change in the final price caused by the tax times the consumption of good *i* by that individual. On the same token, the effect of a reform of the income tax is the generated change in the real disposable income. This arithmetical model allows considering how each individual and household are affected by the policy change, identifying winners and losers and assessing overall impact on population welfare. With this purpose, inequality and progressivity indexes are calculated before and after the reform. This technique has the advantage of allowing considering the heterogeneity of economic agents observed in micro data, as well as evaluating the aggregate financial costs or benefits of any reform (Bourguignon and Spadaro, 2006).

As our analysis is based on a static model, it does not incorporate changes in individual behavior in response to changes in the tax system. So we are estimating first order changes in tax incidence. This is one obvious shortcoming of this exercise, as we are assuming that the population does not change its labor market attachment or its consumption pattern as a result of the modification of the tax system.[9]

Some other simplifying assumptions undertaken in this exercise deserve to be clarified:

[9] Bourguignon and Spadaro (2006) argue that ignoring behavioral responses may not be so restrictive. The estimation of first round effects may be a good approximation of the final welfare effect if changes are small enough and individuals operate in perfect markets.

-markets are assumed to be competitive and so the burden of indirect taxes falls entirely on consumers

-direct taxes are paid by the taxed factors, except in the case of workers who do not contribute to the social security system, who are supposed not to pay the labor income tax

-the household survey does not indicate the currency of bank deposits in the case of interest. In our simulation exercise, all interests from tax deposits are taxed at 12%, assuming that they are in foreign currency (approximately 86 % of deposits in the Uruguayan financial system are foreign currency deposits)

To carry out our simulations, we define the following income variables:

(0) Ypre: Original income before taxes including labor income (wages, salaries, self employment income), pensions and capital income. Contributions to the social security and income tax are included in Ypre.

(1a) Ypost true VAT=Ypre-ITt

(1b) Ypost true IRPF=Ypre-IRPFt

(1c) Ypost true total=Ypre-VATt-IRPFt

where the subindex t indicates the "true" variable and IT denotes the indirect taxes (IT=VAT+IMESI).

For simulations of changes in indirect taxes, we define:

(2) Ypost sim1=Ypre-ITs

where the subindex s indicates the simulated variable. The analysis of the redistributive impact of the actual VAT is done by comparing (1a) and (0). The effect of the proposed tax reform (indirect taxes) is reflected by comparing (1a) with (2).

For simulations of changes in direct taxes, we define:

(3) Ypost sim2=Ypre-IRPFs

The analysis of the redistributive impact of the actual income tax is done by comparing (3) and (0). The effect of the potential tax reform (direct taxes) is reflected by comparing (3) with (1b).

For simulations of changes in both direct and indirect taxes, we define:

(4) Ypost sim3=Ypre-IRPFs-ITs

The analysis of the redistributive impact of the actual VAT and income tax is done by comparing (4) and (0). The effect of the tax reform (direct and indirect) is reflected by comparing (4) with (1c).

3.4 Progressivity and distributional impact

The literature about the effect of taxes on income inequality distinguishes between measuring the progressivity of a certain tax, and assessing its distributional impact. A tax is said to be progressive when its payments are an increasing proportion of the ability to pay, whereas it is regressive when payments are a decreasing proportion of the ability to pay. Evaluating the progressivity of a tax implies comparing its concentration curve with the pre-tax income distribution. On the other hand, the indexes of redistribution assess the distributional impact basically comparing income distribution pre and post taxes. If households were identical in their composition and taxes were determined only on the basis of income, the concepts of progressivity and re-distributional impact of a certain tax would coincide, and a progressive tax would imply an improvement in the distribution of income pre and post tax. But households are heterogeneous and so progressivity and distributional impact can differ. This is due to reordering of households that takes place after a tax is introduced.

In this article, we consider two progressivity indexes, the Kakwani index (1977) and the Suits (1977) index. The Kakwani index is calculated by comparing Lorenz curve of pre-tax income and the tax concentration curve.[10] It is defined as two times the area comprised between the concentration curve of the tax ($C_T(p)$), and the Lorenz curve of

[10] The concentration curve of a tax plots the cumulative percent of tax burden on the vertical axis against the cumulative percent of population on the horizontal axis.

the initial income distribution ($L_x(p)$). It is then equivalent to the difference between the Gini coefficient and the concentration index (or pseudo-Gini index) (G_X-C_T):

$$K = 2\int_0^1 [C_T(p) - L_x(p)]dp \Rightarrow K = G_X - C_T$$

If the tax rate is proportional to income for all households, then $C_T(p) = L_x(p)$ and the Kakwani index is zero. If the tax is progressive (tax payments increase with income), then $C_T(p) > L_x(p)$ and the Kakwani index is positive, whereas if tax payments are decreasing with income, the Kakwani index is negative, indicating that the tax is regressive. The value of the Kakwani index depends on the level of inequality prevailing in the pre-tax distribution. It takes the value $G_X - 1$ if the tax is totally regressive, and $G_X + 1$ if it is totally progressive. [11]

Another well known progressivity index is the Suits (1977) index, which is an adaptation of the Gini index. Suits proposed a figure similar to the Lorenz curve, but plotting the cumulative percent of tax burden on the vertical axis, against the cumulative percent of income on the horizontal axis. In this way, he is comparing a relative concentration curve with a 45 degree line. The index can then be formulated as:

$$S = 2\int_0^1 (i - C_F(i))di$$

If the tax is proportional, the concentration curve coincides with the 45 degree line and the Suits index is zero. If the tax is progressive, the Suits index will be positive, whereas if it is regressive, the concentration curve will be above the 45 degree line and the Suits index will be negative. If only the poorest person paid taxes, the Suits index would be -1, whereas if only the richest person paid all the tax, the Suits index would be 1.

The Kakwani and Suits index are similar in design, but there are some differences between them. Whereas the Kakwani index integrates with respect to population, the Suits index integrates with respect to income. Formby *et al* (1981) showed that both indexes

[11] If only the poorest household paid taxes, then the pseudo-Gini index would be 1, and the Kakwani index would be $G_X - 1$, its minimum possible value. If only the richest household paid taxes, the psedu-Gini index would be -1, and the Kakwani index would be $G_X + 1$.

differ by a weighting factor equal to the slope of the Lorenz curve, and this may result in conflicting evolutions of both indexes in time or in cross sectional comparisons.

The most well known index to analyse the net redistributive impact of a tax is the redistribution index proposed by Reynolds-Smolenky (1977), which compares the Gini index of pre-tax with the Gini index of post-tax income.[12]

$$RS = 2\int_0^1 \left[L^*_{X+T}(p) - L_x(p)\right]dp \Rightarrow RS = G_X - G_{X+T}$$

The RS reformulated index can be decomposed on two terms:

$$RS = \frac{t}{1+t}K - R$$

The first term is the Kakwani index weighted by t/(1+t) where t is the average tax; the second term is the re-ranking effect. The formula indicates that the redistributive effect depends positively on progressivity but negatively on re-ranking, and that it is monotonically increasing in the average tax rate. [13] [14]

4. Results

Before considering the distributive impacts of the different tax reforms, we analyze the overall effect of the actual tax system on income distribution. With this purpose, we compare pre tax income with post tax income, separating the effect of IT and direct taxes, and in the case of direct taxes, considering the role of the capital, labor and pensions components of IRPF separately.

The ratio of IT to income is decreasing by percentile as shown in Figure 1. Along the first decile, this ratio decreases sharply from 0.56 in the 1st percentile to 0.21 at the 8th percentile. From this percentile on, the ratio declines gradually taking the value 0.11 at the

[12] This index is also known as RS reformulated, to differentiate it from the RS that prevails when there is no reordering among households. In this case, $RS = G_X - C_{X+T} = (t/1+t).K$. See Lambert (2001) for this discussion.

[13] $\partial RS / \partial t > 0$

[14] Note that if taxes do not imply reranking, *K* and *RS* index are only differentiated by a function of the average tax rate, and are equivalent in qualitative terms.

median of the distribution and 0.09 at percentile 95. The fact that the IT burden on household income decreases with income indicates that IT are regressive both in absolute and relative terms. In the Figure 1 we also illustrate the IRPF burden. It is null up to the 35th percentile and for higher incomes, it increases gradually and reaches the value 0.09 at the 97th percentile.

In table 7 we present four measures of inequality of the per capita income of the househods before and after taxes. All them indicate that IT are regressive and the IRPF (and each component separately) is progressive.

However, as a whole, the total effect of the present Uruguayan tax system on inequality is mixed, depending on the index considered (table 7). Both the Gini index and the Generalized Entrophy (GE) index with parameter 1 (Theil index) indicate that the tax system is progressive as a whole, contributing to more equality. On the contraty, the GE index with parameter 0 (mean log deviation) and the ratio 90/10 indicate a regressive effect. This is explained by the fact that the GE (0) gives more weight to distances in the lower tail, as well as the ratio that directly considers distances among tails. As the Gini and the GE (1) give similar weights across the distribution, these indexes are more sensitive to changes around the mode. The regressive impact of the indirect taxes in the lower tail is then amplified by the former measures and drives the unequalizing result.

Table 7. Distributive impact of the Uruguayan tax system

	Gini coefficient	GE 0	GE 1	Ratio 90/10
Pre tax income	0,518	0,501	0,521	12,514
Post tax income (only VAT)	0,530	0,547	0,551	14,142
Post tax income (only IRPF labor)	0,508	0,480	0,499	11,940
Post tax income (only IRPF capital)	0,516	0,496	0,515	12,444
Post tax income (only IRPF pensions)	0,517	0,498	0.519	12,440
Post tax income (IRPF)	0,504	0,473	0,490	11,780
Post tax income (IRPF and VAT)	0,515	0,517	0,517	13,222

Source: own calculations based on HS and ES

In what follows, we present the main results from our simulation exercises. To assess overall impact on welfare, we use different distribution indicators. We present the

results of changes in indirect taxes (4.1), a change in direct taxes (4.2), and the combination of changes in direct and indirect taxes (4.3).

4.1 Changes in indirect taxes (VAT)

As stated before, when we consider the indirect taxes, the pre-taxi Gini is lower than the post-tax Gini, implying that the progressivity indexes (Reynolds-Smolensky and Kakwani) are negative (-0.012 and -0.108 respectively) (table 8). A reduction of the VAT basic rate from 22% to 20% (scenario 1) means a decline of the average IT/income ratio from 9,4% to 8,9%. Under this alternative scenario, the ratio IT/income by percentile is always lower than in the baseline. Indeed, as figure 2 shows, the difference between the tax burden in the baseline and the alternative scenario 1 is negative along all the income distribution.

As reported in Table 8, the post-tax Gini and the progressivity indexes are similar in the alternative scenario 1 than in the baseline. In brief, the reduction of 2 percentage points of the VAT does not change the overall picture regarding progressivity of the tax.[15]

The elimination of the VAT for a basket of foods consumed by the poorer (alternative scenario 2), maintains the average tax rate of scenario 1 (lower than in the baseline) but has a slightly progressive impact. In effect, progressivity indexes continue to be negative but their absolute values are lower than those of the baseline and the scenario 1. The pos-Gini tax declines from 0.531 to 0.529, indicating a redistributive effect. The change in the RS index is statistically significant, although its magnitude is very small. In Figure 2 we can appreciate the reduction of the IT/income ratio along the distribution with respect to the baseline. This reduction is higher than in scenario 1 for the poorest up to percentile 80, and then becomes smaller.

[15] Confidence intervals for all indexes are available upon request.

Table 8. Redistributive impact of changes in VAT.

	Scenarios		
Measures	Base	Alt. Sc. 1	Alt.Sc. 2
Pre-tax Gini	0,518	0,518	0,518
Post-tax Gini	0,53	0,53	0,528
Average tax rate	0,095	0,089	0,089
Reynolds-Smolensky net redis. Effect	-0,012	-0,011	-0,01
Kakwani progressivity index	-0,108	-0,108	-0,093
Reranking	0,001	0,001	0,001
Suits progressivity index	-0,124	-0,125	-0,109
Change in total tax revenue (in %)	-.-	-8,9	-8,5

Source: own calculations based on HS and ES

In sum, as expected in both scenarios indirect taxes continue to have a regressive impact. Although changes are of very small magnitude, the second alternative, consisting on the elimination of the VAT for a basket of goods consumed by the poorest population implies a more progressive change, with a higher redistributional effect driven by this higher progrsivity.. Nevertheless, decisions about the best modification in indirect taxes must also take into account efficiency considerations. In effect, this second alternative is more difficult to implement in practical terms and may have undesired effects in terms of the efficiency of the tax system.

4.2 Changes in direct taxes (IRPF)

We simulated an increase in the upper limit of the tax free zone of the labor component, from 84 to 100 BPC. Tax rates for the different income brackets remain the same. The reduction in payments of the labor income component of the IRPF holds along all income deciles, and is decreasing in percentual terms by income decile (Table 9 and Figure 3).

Table 9. Payments of IRPF (labor component, per capita) by income decile

	IRPF 2008	IRPF simulated	Relative change	Absolute change
1	50,5	0		
2	32,6	18,4	-43,6	-14,2
3	76,9	58,8	-23,5	-18,1
4	114	84	-26,2	-29,9
5	167,2	135,5	-19	-31,7
6	232,3	194,6	-16,2	-37,7
7	377,6	313,1	-17,1	-64,4
8	620,9	525,5	-15,4	-95,4
9	1162,7	1004,3	-13,6	-158,5
10	3108,7	2894,5	-6,9	-214,2

Source: own calculations based on HS

The average tax rate decreases from 4,6 to 4,3% (Table 10). The simulated change on labor tax implies an improvement in terms of progressivity, according to both Kakwani and the Suits indexes. But the Reynolds-Smolensky index does not show any significant change. The two opposite trends, the decrease in the average tax rate (which decreases RS) and the increase in progressivity (which increases RS) cancel each other, and there are no reordering effects.

In brief, the simulated labor tax rate continues to be a progressive taxation, but the proposed change does not improve income inequality respect to the baseline. Increases in progressivity at the expense of lower average tax rate end up with no net effect on distributional terms.

Table 10. Redistributive impact of changes in IRPF on labor

Measures	Base	Alt. Sc. 3
Pre-tax Gini	0,518	0,518
Post-tax Gini	0,504	0,504
Average tax rate	0,046	0,043
Reynolds-Smolensky net redis. effect	0,014	0,014
Kakwani progressivity index	0,297	0,311
Reranking	0	0
Suits progressivity index	0,393	0,419
Change in total tax revenue (in %)	-.-	-1.7

Source: own calculations based on HS

The main message of our exercise is that it is very difficult to achieve important decreases in inequality through changes in direct taxes on labor income, as the actual design of this component of the IRPF is already progressive. Although more progressiveness could be achieved, it would imply no changes in overall inequality.

4.3 Changes in direct and indirect taxes (VAT and IRPF)

As a final step, we analyzed joint effects of changes in direct and indirect taxes, as specified in table 4. In scenario 4, there is a reduction of 2 points in VAT and an increase in the upper limit of the IRPF free zone. In scenario 5, the change in direct taxes is the same but there is an elimination of VAT for certain goods.

Both scenarios show a progressive impact respect to the baseline. Even when the average tax rate declines, the increase in progressivity leads to an increase in the net redistributional effect. Obviously, given a modification in direct tax, the progressive impact is higher when we simulate simultanously a reduction of the VAT for the goods consumed by the poor (the RS index is statistically higher in scenario 5 when compared to the baseline, although scenario 4 and the baseline are equivalent on statistical grounds).

Table 11. Redistributive impact of changes in direct and indirect taxes.

		Alternative scenarios	
Measures	Baseline	Scenario 4	Scenario 5
Pre-tax Gini	0,518	0,518	0,518
Post-tax Gini	0,515	0,515	0,513
Average tax rate	0,141	0,132	0,132
Reynolds-Smolensky	0,003	0,003	0,005
Kakwani progressivity index	0,025	0,029	0,039
Reranking	0,001	0,001	0,001
Suits progressivity index	0,046	0,052	0,063
Change in tax revenue	-.-	-10,6	-10,3

Source: own calculations based on HS and ES

5. Final remarks

The design of the tax structure is a central issue in any economy due to its implications on efficiency and equity grounds. In this article, we focused on the distributive impacts of

alternative designs of direct and indirect taxes. Two scenarios of changes in indirect taxes were analyzed, both implying a similar and significant cost in fiscal terms. We concentrated on equity effects, leaving aside efficiency considerations. As expected, these two scenarios continue to have a regressive impact. Although changes are of very small magnitude, the second alternative, consisting on the elimination of the VAT for a basket of goods consumed by the poorest population, implies a net redistributive effect with respect to the baseline.

On the direct taxes side, our results indicate that it is very difficult to achieve important decreases in inequality. As the actual design of this component of the IRPF is already progressive, an increase of progressivity through the proposed labor component tax does not have any significant redistributive effect.

Overall, more progressivity is achieved through the combination of reductions in the VAT for specific goods with and changes in the labor component of IRPF. Nevertheless, as found for other countries in the region (Goñi *et al*, 2008) redistribution through the tax system in Uruguay, at least with the considered tax changes, seems to be limited.

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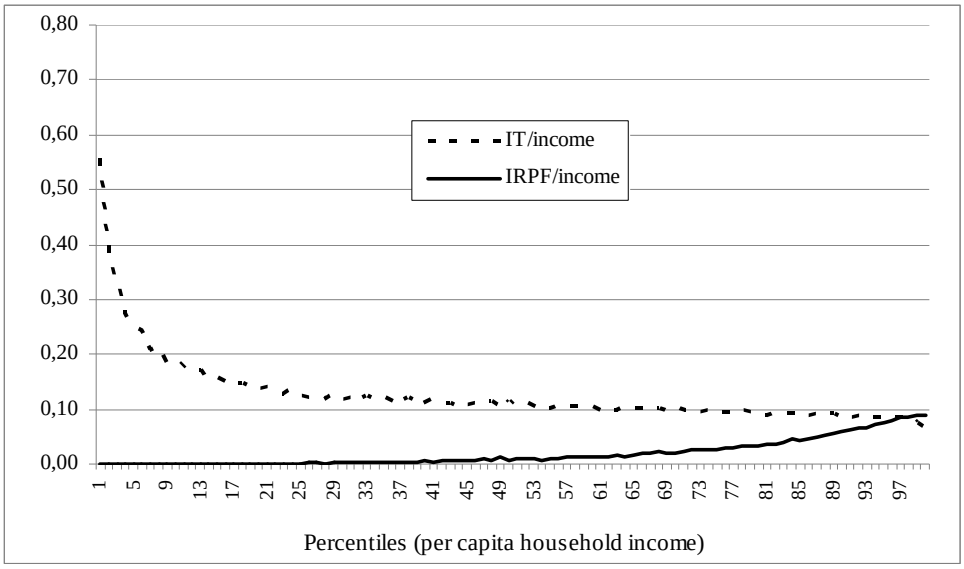
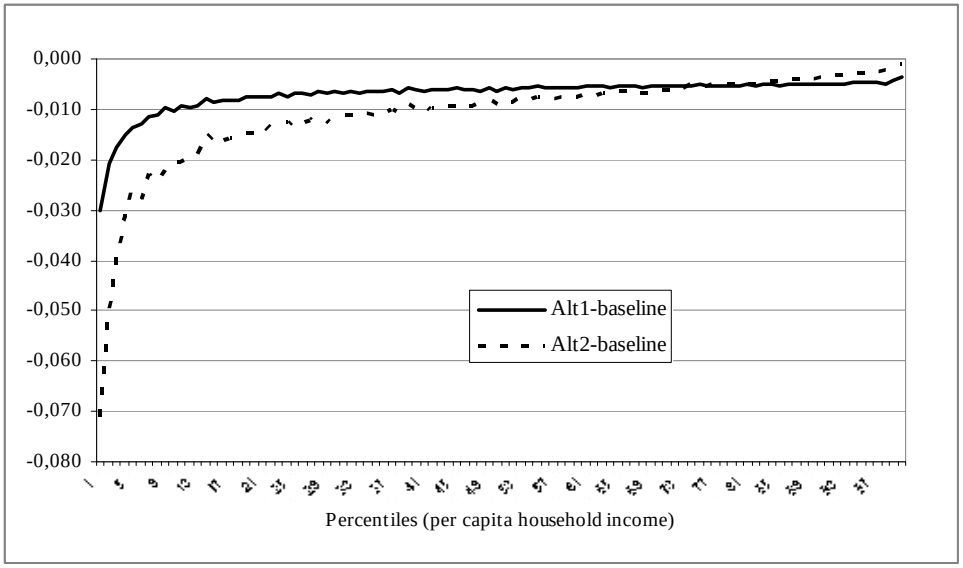
Figure 1. Ratio tax/income by percentile of the per capita household income distribution



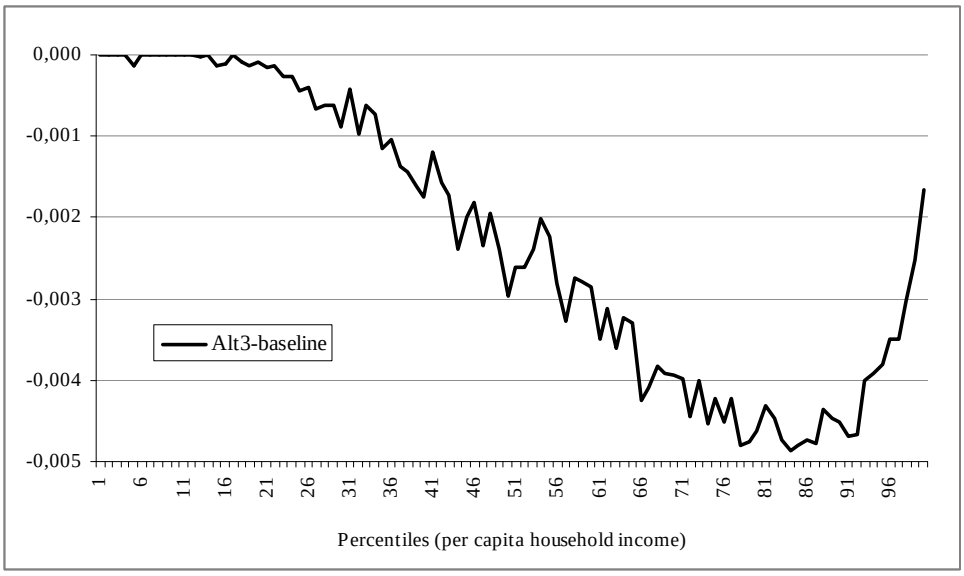
Source: based on HS and ES

Figure 2. Difference between the ratio indirect tax/income in the alternative scenario and in the baseline by percentile of the per capita income distribution.



Source: based on HS and ES

Figure 3. Difference between the ratio direct tax/income in the alternative scenario and in the baseline by percentile of the per capita income distribution.



Source: based on HS and ES