Gendered effects of the Personal Income Tax: Evidence from a schedular system with individual filing in a developing country

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Abstract

This article analyzes the gender differences in the Personal Income Tax (PIT)-to-income ratio in Uruguay. Although the tax code does not explicitly specify gender differences, the tax burden varies among households types. When analyzing these differences, our findings suggest that the PIT serves as somewhat of an incentive towards equal gender time allocation within the family, which is consistent with gender equity. In turn, this pattern is reinforced by non-desirable aspects such as higher levels of informality among women and a higher level of non-taxable sources of income among single female households. The above conclusion relies on the assumption of individual filing. Our analysis also observes that the strengths of the PIT system from the gender perspective are eroded by the possibility to opt for a (rarely used) joint filing. The empirical strategy was assessed through the estimation of a zero-one inflated beta model (ZOIB). This model properly addresses the fact that the PIT-to-income ratio includes many zero data points.

Keywords: economics of gender, family economics, income tax, tax incidence

JEL classification codes: B54, J16, H22, H24, H31

Resumen

El presente artículo tiene como objetivo analizar la incidencia de género del IRPF en Uruguay, luego de la aplicación de un régimen dual de declaración individual. Para ello, se utilizan los datos de la Encuesta Continua de Hogares de 2013 y se clasifica a la población en diferentes categorías de hogares, según su organización familiar y la situación laboral de sus miembros. Si bien el código tributario no explicita diferencias de género, la carga impositiva varía entre los distintos tipos de hogares. Al analizar dichas diferencias, los resultados sugieren un patrón consistente con la asignación de tiempo más igualitaria en las familias, desde el punto de vista de género. Sin embargo, este patrón se ve reforzado por aspectos no deseables tales como mayores niveles de informalidad entre las mujeres y una mayor participación de fuentes de ingresos no gravadas entre los hogares de mujeres proveedoras. Dichos hallazgos se basan en el supuesto de declaración individual. El artículo también señala que las fortalezas del IRPF desde la perspectiva de género pueden verse erosionadas ante la posibilidad de declaración conjunta, poco utilizada en la actualidad. La estrategia empírica se basa en la estimación de un modelo ZOIB (*zero inflated beta model*). Este modelo aborda adecuadamente el hecho de que la variable dependiente es una fracción con alta proporción de ceros.

Palabras claves: economía de género, impuesto a la renta personal, incidencia impositiva

Introduction

A strand of the literature on gender equity studies the role of public policies in mitigating or reinforcing asymmetrical gender behavior. Stotsky (1996) defined and identified explicit and implicit gender bias in tax policies, which are particularly relevant in the Personal Income Tax (PIT). Explicit bias arises from the tax code when it identifies and treats men and women differently. Implicit forms of gender bias refer to provisions in the tax systems that tend to generate different incentives for men than for women, due to the culture or socioeconomic arrangements.

Many of the empirical studies focus on the presence of implicit bias when the tax is assessed on the combined income of the couple, through joint filing (Andrienko et al., 2014). Under this rule, the second earner (typically women) effectively pays a higher tax (on her income) than if she was taxed individually, because of increasing marginal rates. This pattern is criticized for different reasons. For example, it is at odds with policy recommendations derived from the optimal taxation perspective, in which individuals with higher labor supply elasticity should be less taxed. As married women have a more elastic labor supply than their spouses, tax rates on labor income should be lower for women than for men (Alesina et al., 2011). Also, from a gender equity perspective, joint taxation discourages the participation of married women in the labor market and men's participation in unpaid domestic work, creating gender biases (Bach et al., 2013; Guner et al., 2011, Apps and Reese, 2010).

In this context, it is not surprising that feminist economics gives support to individual filing. However, Stotsky (1997) and Elson (2006) mention different source of gender bias that persist under individual filing. Particularly under a global income tax, gender bias may arise for example from the rules governing the allocation of shared capital income, exemptions or other tax preferences. Thus, under the gender equity perspective, an income tax regime that taxes every source separately (schedular income tax) is preferable (a review of this literature is presented in Apps and Reese (2009)).

In recent decades, there has been a trend in developed countries to reform their PIT systems to dual regimes (capital and labor taxed separately) with individual filing (Genser and Reutter, 2007). It is expected that these reforms would diminish gender bias. However, gender tax burden differences may be observed even under individual filing and a schedular system as reported in several empirical studies (see Grown and Valodia, 2010,

for a survey). For example, Rodríguez Enriquez et al. (2010) find a gender gap in Argentina because women are more prone to be employed in occupations that are taxed at lower rates than occupations which tend to intensively employ males.

The purpose of this study is to analyze the gender differences in the Personal Income Tax (PIT)-to-income ratio in Uruguay, considering the household as the unit of analysis. The PIT was introduced in 2007, and reflects the general spirit of the latest reforms in developed countries. Labor income, pensions and capital income are subject to a differentiated schedule tax, with marginal progressive rates for the first and second sources and a flat rate for capital income. Individual filing is the norm but joint taxation is also allowed.

Our study is similar to the work on gender and taxation collected in Grown and Valodia (2010) and the comparative study by Grown and Komatsu (2015). Like in these studies, we capture the gender dimension through a classification of households. The main difference with the first of these studies is that we use actual data instead of simulations of representative agents. Compared to the second study, which uses household data, we innovate in two ways: the econometric strategy and the classification of households.

We use the Household Survey carried out in 2013 by the Statistical Office in Uruguay. We classify the population according to a combination of dimensions: employment status, whether or not there are many subfamilies in the household, and whether the main subfamily is formed by a couple or a single adult. We are particularly interested in comparing the PIT incidence in three typical cases: a) households supported by a male worker who lives with a dependent housewife who is not engaged in paid employment, b) households in which both members of the couple work, and c) households in which a single woman works. We also compare households of non-employed individuals, i.e. pensioners. We assess the effect of household type on the PIT-to-income ratio by estimating a zero-one inflated beta model (ZOIB). This model properly addresses the fact that the PIT-to-income ratio is a proportion with presence of zeros.

We find that, given per capita household income, the PIT incidence is higher for male breadwinner households than for dual earner households. Following Elson (2006) and Grown (2010), we consider this result to be consistent with gender equality because it is in line with more equal gender time allocation within the family. However, male breadwinner households also bear a higher tax incidence than female breadwinner households with a

dependent spouse. This gender difference mainly comes from their different structure of income sources. The households headed by a single female worker exhibit a lower PIT incidence mainly due to the high share of non-taxed sources in their household income. Finally, we do not find gender differences within pensioners.

These results are based on the assumption that everybody files taxes individually. This assumption is realistic because joint filing is rarely used. Joint filing has not been analyzed in Uruguay and probably its non-use is partly due to lack of information. However, joint filing is preferable for households in which one spouse does not work and for a percentage of the households in which both members of the couple work. Thus, as a robustness check for the basic results, we estimate gender gaps under the assumption that households opt for joint filing when it allows them to pay lower taxes than under individual filing. Though equity gender is eroded, we come up with the same conclusions.

The main contributions of this work are a) the implementation of a new strategy to analyze the data in the study of gender and taxation and b) the presentation of evidence about the gendered differences in the PIT burden in a developing country which recently last decade passed a tax reform that follows the main guidelines of regimes in advanced economies.

The remainder of this study proceeds as follows. In the next section we provide a description of the Uruguayan economy, after that we present the data and methodology and then we report the main results of the analysis. In the final section we conclude.

Traits of Uruguayan economy

A gendered socio-economic picture

In Table 1 we present a set of indicators that gives a gendered socio-economic picture of Uruguay and the average of the Latin American region.

At the beginning of the XXth century, the country had low fertility and high life expectancy compared to Latin American standards. Since then, fertility has decreased and life expectancy has increased, and Uruguay is now in an advanced stage of demographic transition. Around 14% of the population is older than 64 years of age as compared to less than 7% on average in Latin America.

Also, the level of education of women, their labor force participation and their marital status have undergone a substantial change since the middle of the XXth century. Uruguay is among Latin American countries in which these processes are in the most advanced

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stage, in part because of differences in initial conditions. Uruguayan women have on average 10.2 years of schooling and their participation rate is 67% whereas the Latin American averages are respectively 8.7 years and 55%. In sum, this brief picture shows that women are very much involved in the economy, and thus they were affected by the creation of the Personal Income Tax.

The socio-demographic changes have impacted household structures to the extent that they are substantially different from the Latin American average. Since the aging process is more advanced in Uruguay, there is a relatively high incidence of one person households (mostly elderly) and couples without children, as reported in Table 1. Another relevant characteristic is that the share of extended households is relatively low. In this paper we focus on non-extended households (84% of all households). Single-parent households, majoritarily headed by an adult woman, are 12% of total households.

Table 1. Socio-demographic characteristics

	Uruguay			Latin American average		
	All	Women	Men	All	Women	Men
Children per woman [a/]		2.04			2.14	
Life expectancy [a/]	77.0	80.5	73.3	74.8	78.1	71.5
Population older than 64 [b/ c/]	14.0	16.5	11.2	6.7	7.5	5.9
Years of education [b/ d/]	9.8	10.2	9.5	8.7	8.7	8.8
Participation rate [b/ c/ e/]	76.1	66.9	85.7	68.5	54.8	82.6
Households structure [b/ f/]						
One person households	21.9			11.0		
Couple without children	17.2			9.0		
Couple with children	33.2			39.9		
Lone-parent family	12.0			11.9		
Other households	15.7			28.2		

Source: CEPAL (2016) and World Bank (2016)
Notes: [a/] 2005-2010; [b/] 2010; [c/] Percentage of population; [d/] Population ages 25-59; [e/] Population ages 15-64; [f/] Percentage of households.

The Personal Income Tax

In 2007 the government implemented a tax reform with the objective of improving the efficiency and progressivity of the tax system. The reform included the creation of a Personal Income Tax that reflected the spirit of the latest reforms that were proposed and debated in developed countries.

First, it is an individual filing system without explicit gender bias, although joint taxation is allowed for labor income received by married couples or those in a consensual union.

According to the Tax Office, less than 2% of potential taxpayers choose joint taxation (Burdin et al., 2015), which can be explained by a combination of the lack of incentives in the tax rate schedule and lack of information.

Second, it was conceived as a dual tax under which capital income was taxed at a flat rate whereas labor income and pensions were subjected to progressive rates. Some months after its introduction, litigious issues led to taking out pensions and creating a progressive tax specific to them. In this study we refer to the PIT, including on pensions. The government justified the dual income tax because of the difficulties of tracing non-domestic sources of income, the prevention of lobbying activities and the high risk of evasion (Barreix and Rocca, 2007). At the same time, it facilitates tax administration relating to ownership and splitting treatments (for pros and cons of dual income taxes, see Genser and Reutter, 2007). With regard to the topic of concern in this study, a relevant characteristic of the dual structure is that a flat rate on capital income eliminates the incentive for capital income splitting between the household members, which has potential gender consequences.

Capital gains (derived from sales) and holding income (derived from the possession of assets) are taxed at a flat rate that varies between 3% and 12% depending on the source (interests, profits, etc.). Deductions are allowed for bad debts, real estate taxes, and the cost of renting. In most of the cases, there is a withholding agent. If not, advance payments and annual filings are required.

Pensions are subject to individual progressive taxation and there is no option for joint taxation. There are four marginal rates that range from zero to 25%. Tenants are allowed to subtract 6% of their rent and no other deductions are allowed. The agencies that administer the Social Security System are the withholding agents responsible for collection and payment of the tax. When receiving pensions from different agencies, the taxpayer must do an annual filing.

Taxes on labor income have to be paid monthly in the case of employees (held at source) and bimonthly in the case of the self-employed. An annual filing is required except in the case of employees with only one job and eventual disparities should be closed out. The tax is equal to a primary tax minus tax credits.

The primary tax is calculated by applying the rate on the gross earnings of employees and on 70% of gross income of the self-employed under the consideration that inputs account

for 30% of the amount of the sales. The tax schedule has seven marginal rates ranging from zero to 30%.

The tax credits are comprised of worker contributions and taxes levied on labor income, a fixed amount per child (higher in the case of a disabled child) and mortgage payments when the house is used for permanent residence and its cost is lower than a threshold. The tax credit for children can be distributed between parents. When parents are divorced and they do not agree about this distribution, each one can deduct 50%. In order to calculate the amount of the tax credit, a progressive rate schedule applies that ranges from 10% in the first bracket to 30% in the sixth. After subtracting these tax credits, tenants are allowed to additionally subtract 6% of their rent. If this deduction generates a surplus, this surplus is not refunded by the tax office and cannot be transferred to the following year.

In Figure 1 we show the tax burden by monthly income according to the statutory rates under individual filing. We graph the cases of pensioners and four types of workers, in order to take into account that the tax-to-labor income ratio depends on the feasibility of using tax credits. We only show the tax burden for income below US$ 8000, although this amount falls inside the fifth bracket of the primary tax on labor earnings. A level of income (wage or pension) over US$ 8000 is rarely observed as shown by the overlapped vertical lines. Dotted lines indicate the 75th, 90th and 99th percentiles of the distribution of pensions and continuous lines indicate the same percentiles of the distribution of labor income.[1].

As shown in Figure 1, pensioners are exempt up to about US$ 1000 per month. The labor earnings schedule starts after a tax-free allowance of about US$ 900 but a single worker (who faces the highest burden among workers) pays taxes only when gross earnings exceed US$ 1100 because of tax credits. The actual applicability of these thresholds can be observed in the vertical lines. According to estimations by Burdin et al. (2015) based on tax records, in 2012 only 20.1% of pensioners and 33.6% of workers paid the PIT.

For most income levels, the tax burden is higher for pensioners than workers because tax credits are allowed for labor earnings but there is no tax-free threshold for pensions. Among workers, the highest burden corresponds to a single person without children followed by a single person with one child. To calculate the tax burden of a single parent worker with one child we assumed that he/she makes 100% use of the child deduction. The

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[1] Percentile values were provided by the Economic Institute of the Faculty of Management, Universidad de la República and are based on administrative records of the Tax Office

tax burden is a bit lower when the parent of a child is married or in union. Although there are no explicit legal differences, the single worker pays a higher share of income as PIT because contributions to the health system (eligible for tax credits) are lower for them than for married people. Finally, the lowest burden corresponds to a married worker with a child who is paying a mortgage equal to the maximum permitted value for the tax credit.

Figure 1. Personal Income Tax burden by income for selected individual types
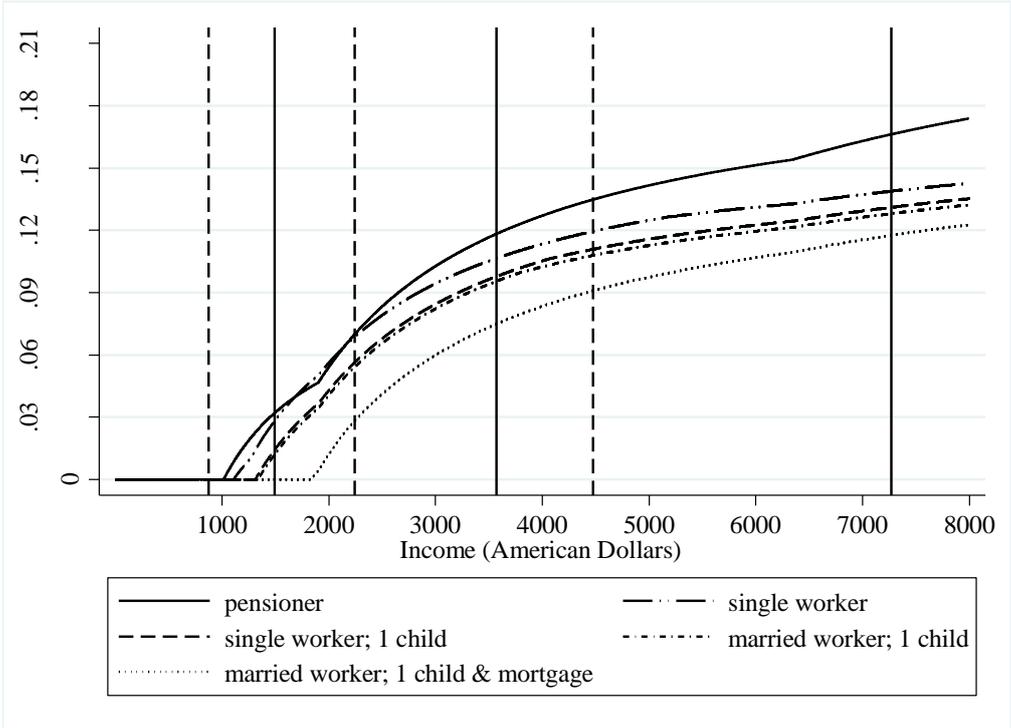
Source: author's calculations based on tax schedule rates.

To analyze joint filing we calculated the tax burden for selected couples. Specifically, we calculated taxes that would be paid under joint and under individual filing for couples with same labor income but different participation of each spouse in income generation. We assumed that there are no children or mortgage credits. In Figure 2 we show the PIT-to-labor income ratio paid by the couple for chosen income levels which are indicated close to the curves. The solid lines depict the path of the tax burden under individual filing as the participation of one spouse in income generation rises. Participation ranges from 0 to 50%, so unsurprisingly the curves are decreasing (or at least non-increasing), reflecting the advantages of sharing labor market activities between spouses.

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Figure 2. Personal Income Tax-to-income ratio for selected couples by participation of one spouse in generating labor income
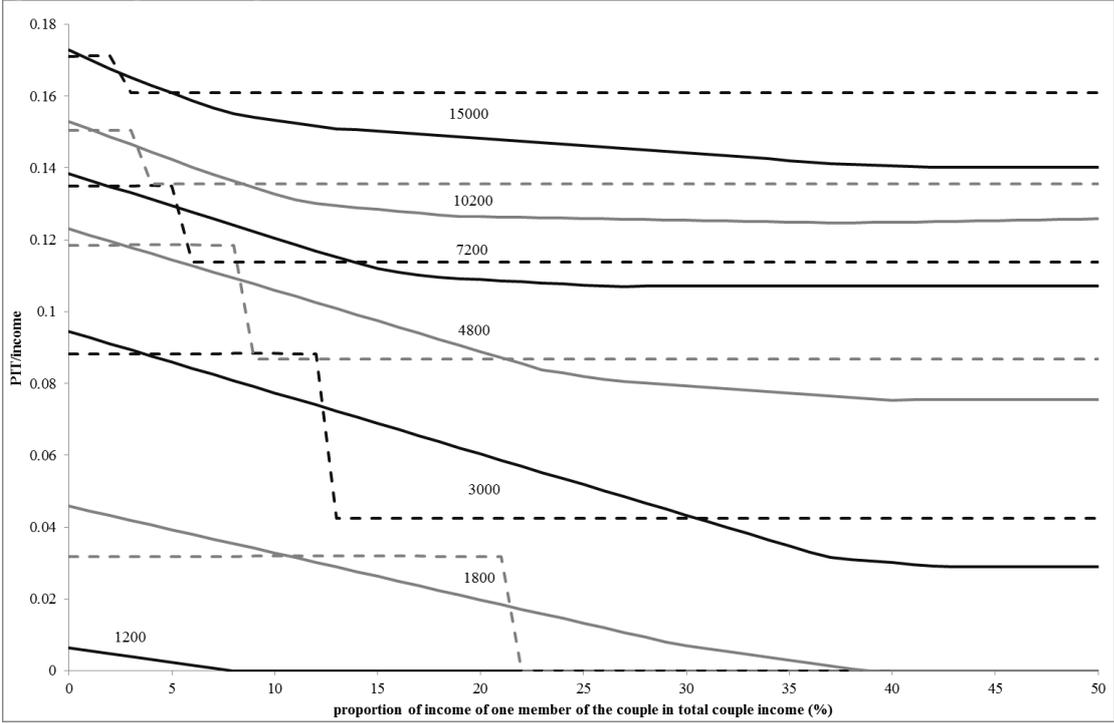
Source: author's calculations based on schedule rates.

The dotted lines show the pattern of the tax burden with one spouse generating labor income under joint filing. When one spouse does not work, the tax burden is lower under joint than individual filing. As seen in Figure 2, this holds for the lowest values of the x-axis. We also observe that all the joint filing curves show a one-step fall. This is easily explained. The tax schedule under joint filing distinguishes two cases: one is applied when the earnings of at least one spouse are below a threshold (12 times annual minimum wage) and the other one when earnings of both spouses exceed the threshold. Although the figure does not reflect all possible situations, a first look suggests that the code does not encourage uneven participation between spouses to reach a level of income. Indeed, the most interesting aspect of the curves is that if the couple chooses the least burdensome option (given income), the resulting curve is non-increasing, reflecting that there are advantages to sharing working time between spouses, or at least that there are not disadvantages.

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Data and methods

Data and imputations

We use the Household Survey (ECH because of the Spanish abbreviation of *Encuesta Continua de Hogares*) carried out in 2013 by the National Statistical Office (INE, following the Spanish abbreviation *Instituto Nacional de Estadística*). It is a nation-wide representative survey that reported information of 46,622 households (89.3% response rate). Among several characteristics of household members, it registers in-kind and monetary income received in the month before the interview, by source. As is usual in income surveys, capital income is underestimated.

Our variable of interest is the per capita household PIT-to-(gross)income ratio. Working at the population level entails assigning the same tax burden to all household members. As the ECH asks about income after taxes and contributions, we estimated taxes and contributions using the statutory rates in force in 2013, and we added them to the reported income in order to have a proxy of gross income.

In the case of capital income, we computed the taxable capital gains as the sum of all capital income and we assumed that there is no evasion. The ECH does not provide information to estimate tax deductions so we implicitly assumed that conditions for them were not present.

The ECH reports whether or not the worker contributes to the Social Security System. We assumed that there is no partial evasion by contributors and that non-contributors do not pay taxes either. Regarding PIT credits, we considered contributions and child benefits, but we did not impute deductions related to mortgages and rents due to the lack of information for an appropriate assumption. Credits for children were assigned to the head of the household who is usually the household member who receives the highest income.

When estimating the amount of PIT paid we assumed that individuals opt for individual filing because joint filing is rarely used. Besides, the survey does not provide any information that would help distinguish couples that used different options. Thus, we performed a first analysis using estimations of gross income and PIT based on individual filing. Then, to analyze the effect of the joint filing option we estimated the amount of PIT under joint filing given the already estimated gross income.

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To analyze sources of income we deflated them by the Consumer Price Index and classified them into four groups: capital income, labor income, other income (public and private transfers plus self-consumption), and imputed rental value of owner-occupied houses).

Gendered classification of the population

In order to capture gender differences, we made a classification of the population that takes into account the household structure and the employment status of household members. The classification appears in the first column of Table 2.

We first distinguish non-extended from extended households. Non-extended households are comprised of single individuals or couples, with or without children at any age, whereas in the extended households there are members related by other links (grand-parents, brothers-in-law, nephews, non-relatives, etc.). We distinguish eight household types within each group. In the rest of the paper we focus on the eight types of non-extended households.

Three categories represent the typical cases that are of interest from the gender perspective of tax studies. The "couple, male breadwinner" category includes non-extended households formed by a couple (with or without children) in which only the male works. Around 19% of individuals live in this type of household. The "single, female breadwinner" category consists of a non-extended household headed by a single worker woman, and accounts for 7.8% of population. The "couple, dual earner" category corresponds to non-extended households formed by a couple in which both the male and female work. This category is the most frequent, accounting for 30.7% of individuals.

As reported in Table 2, most of the households in these three categories have children and the average age of the adults is fairly similar. In turn, as shown in Figure 3, the "couple, dual earner" category has the highest per capita income of the three types. Labor income is the most important source in all three categories and public transfers are more important for the "single, female breadwinner" type than for the others.

Two minor categories (that account for 6% of the population) may serve as points of comparison: a) "couple, female breadwinner", in which only the female in a couple works, may be compared with "couple, male breadwinner" and b) "single, male breadwinner"

whose household is headed by a single worker man (and not a woman). The latter type is the richest of all non-extended households.

Non-extended households without workers are classified into three groups: "couple, non-employed" (7%), "single, non-employed male" (1.3%) and "single, non-employed female". These categories are mostly supported by pensions and the average number of children is relatively low. However, the "single, non-employed female" group includes cases of one-parent homes headed by working-age women mostly supported by public transfers.

An analogous classification is made within extended households, which account for 22% of the population; per capita income is lower in extended than in non-extended households.

Table 2. Main characteristics of household categories.

Household category	Frequency (weighted cases) (%)	Households with children (%)	Number of members (average)	Number of earners (average)	Number of informal workers (average)	Age of the household head and spouse (average)	Number of cases in the sample
All	100.0	59.8	3.7	1.9	0.4	48.9	124,987
Couple, male breadwinner	18.4	72.4	4.1	1.4	0.4	42.5	22,230
Single, female breadwinner	7.8	60.6	2.9	1.5	0.4	45.2	11,225
Couple, dual earner	30.7	72.1	3.8	2.3	0.5	41.4	37,082
Couple, female breadwinner	3.2	42.1	3.3	1.9	0.4	52.4	4,033
Single, male breadwinner	3.2	20.1	1.7	1.2	0.4	47.1	4,125
Couple, non-employed	7.0	9.1	2.6	1.7	0.1	68.5	9,008
Single, non-employed male	1.3	3.6	1.4	1.1	0.0	70.2	1,886
Single, non-employed female	6.1	22.0	2.2	1.1	0.1	65.9	8,670
Couple, male breadwinner, extended	4.0	83.1	5.8	2.3	0.7	48.5	4,721
Single, female breadwinner, extended	4.1	71.8	4.4	2.2	0.7	47.9	5,113
Couple, dual earner, extended	4.5	80.5	5.4	3.2	0.8	45.8	5,268
Couple, female breadwinner, extended	0.8	70.1	5.2	2.8	0.6	56.5	943
Single, male breadwinner, extended	1.7	37.7	3.5	2.2	0.6	44.4	1,976
Couple, non-employed, extended	2.2	65.2	5.0	2.7	0.2	66.5	2,615
Single, non-employed male, extended	0.8	50.1	3.9	2.0	0.3	65.6	974
Single, non-employed female, extended	4.2	62.8	4.3	2.2	0.3	65.8	5,118

Source: Authors' calculations based on *Encuesta Continua de Hogares* 2013, *Instituto Nacional de Estadística*

Figure 3. Per capita income of households by source
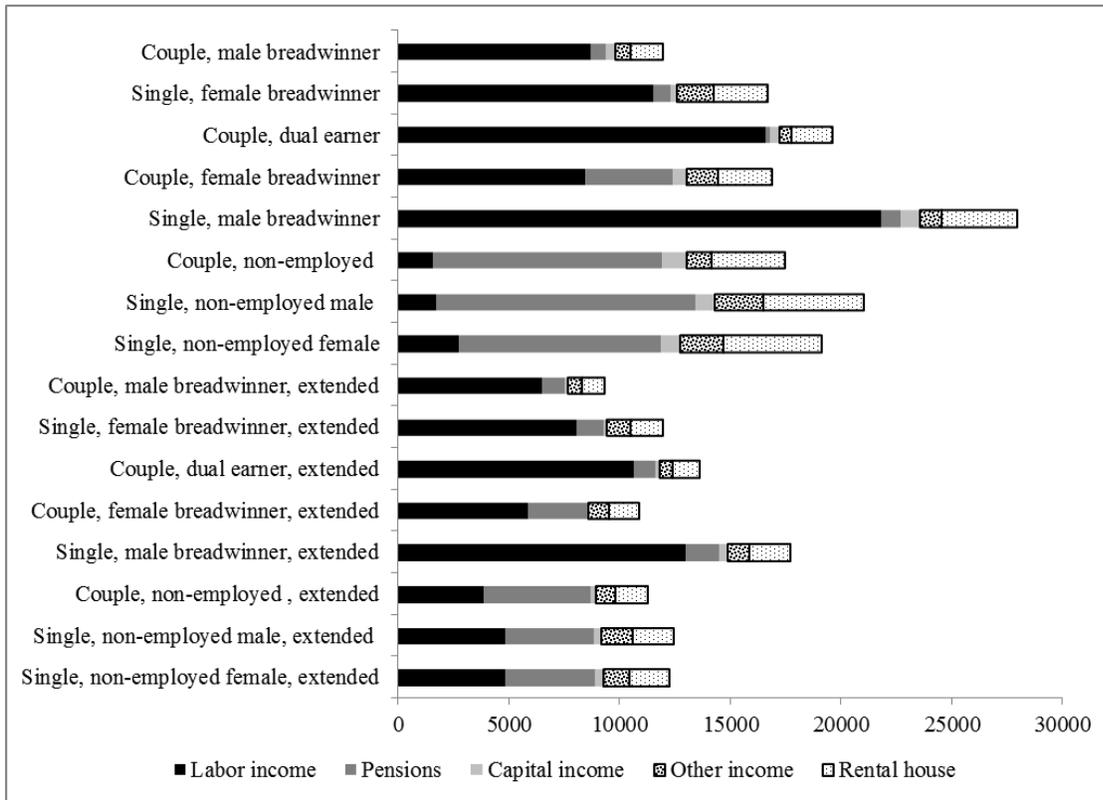
Source: Authors' calculations based on *Encuesta Continua de Hogares* 2013, *Instituto Nacional de Estadística*

Empirical strategy

We aim to identify gender differences in the PIT burden and also to examine the role of some specific household characteristics in the explanation of those differences. A particular issue in our study is that the main variable of interest, the PIT-to-income ratio, includes many observations of 0 and no 1s (no household is taxed at 100%). These zeros can provide important information for the study of the lowest levels of taxation and they are included for theoretical and empirical reasons. Hence, we conduct the empirical analysis considering a dependent variable that assumes values in the interval [0, 1) and contains excess of zeros.

In a case like this, the dependent variable is not symmetrically distributed, so the predicted values of the linear regression model may lie outside the unit interval. As an alternative, Cook et al. (2008) proposed the zero-one inflated beta model (ZOIB) which properly addresses the issue related to the inflation process in the data.

Several authors (Paolino, 2001; Kieschnick and McCullough, 2003; Smithson and Verkuilen, 2006) argue that the beta regression model is the most suitable for distributional asymmetries and can be adjusted for data in the interval (0, 1) since the density function takes different shapes depending on the function parameters. Ferrari and Cribari-Neto (2004) proposed the following parameterization for the density function of the response variable *y* when it adopts a beta distribution $B(\mu,\phi)$:

$$f(y; \mu, \emptyset) = \frac{\Gamma(\phi)}{\Gamma(\mu\phi)\Gamma((1-\mu)\phi)} y^{\mu\phi-1}(1-y)^{(1-\mu)\phi-1}, \qquad y \in (0,1)$$

where μ is the mean ($0 < \mu < 1$), ϕ a precision parameter ($\phi > 0$) and $\Gamma(.)$ is the gamma function.

In practice, the beta distribution is not suitable for modeling data that contains zeros or ones. But we want to consider observations where the dependent variable is zero. Therefore, we apply a combination of two distributions: a beta distribution when the variable is bounded by 0 and 1, and another distribution function that is in effect when the variable takes the value 0. For a detailed description of this methodology see Ospina and Ferrari (2010, 2012). The density is called a zero-inflated beta distribution and the probability function generated by the combination is:

$$b_c(y; \alpha, \mu, \phi) = \begin{cases} \alpha & if \ y = 0 \\ (1-\alpha)f(y; \mu, \phi) & if \ y \in (0,1) \end{cases}$$

In this paper, we carry out all the estimations using the Stata module *zoib* developed by Buis (2012). The *zoib* command consists of a maximum likelihood estimation of the combined model: a logistic regression of whether or not the income share paid to taxes equals zero and a beta regression for the proportions in the interval (0, 1). We perform all the estimations using robust standard errors.

Our explanatory variable of interest is a vector of dummy variables that captures household type, which provides the gendered classification of the population. We also use several variables that reflect household characteristics which may explain differences in the PIT burden: the household per capita income, a dummy variable that takes a value equal to 1 when there is at least one member younger than 18 in the household, the household size, the number of earners per household and the number of workers that are not contributors to the social security system in the household. Additionally, we break down the household income by source in order to separately

capture the incidence of all sources: capital income, labor income, pensions, other income (public and private transfers plus self-consumption) and rental value.

We compute and report the marginal effects of the dependent variables on the PIT-to-income ratio. In the case of the household type vector, the effect is the discrete effect of moving from "couple, dual earner" to each respective other household type. For the other variables, the effect is measured for the "couple, dual earner" household, valuing the rest of the variables at their mean.

Results

Tax incidence analysis

The PIT is a progressive tax. Its Kakwani index is positive (0.360) and the Gini index declines from 0.426 pre-tax to 0.413 post-tax, reflecting the PIT's equalizing effect. However, the distributive effect is limited because of the tax size and exemptions. Around 54% of the population lives in households that do not pay the tax, and the average PIT burden is 1.8% population wide and 3.9% among the population of households who face this tax.

In Figure 4 we present the PIT incidence by household type. The dark bar shows the average burden and the pale bar shows the proportion of non-taxpayers; for both variables, a straight line indicates the 95% confidence interval of the estimation.

At the top we show the five types of non-extended working households. The "couple, dual earner" category bears the largest PIT burden (2.4%) and has the highest proportion of taxpayers (61%). The "couple, dual earner" category is followed by male breadwinner households which have an average burden of 2% when living with no partner and 1.8% when living with a partner. Finally, the lowest burden corresponds to female breadwinner types: 1.5% when in union or married and 1.2% when single.

The PIT burden is lower for non-employed households than households of workers. Among the latter ones, the highest tax incidence corresponds to the "couple, non-employed" type with an average burden of 1.5% whereas the single types pay an average of 1% of income in the form of the PIT. There are no significant gender differences between single types.

Figure 4. Average PIT burden and proportion of non-taxpayers by household type
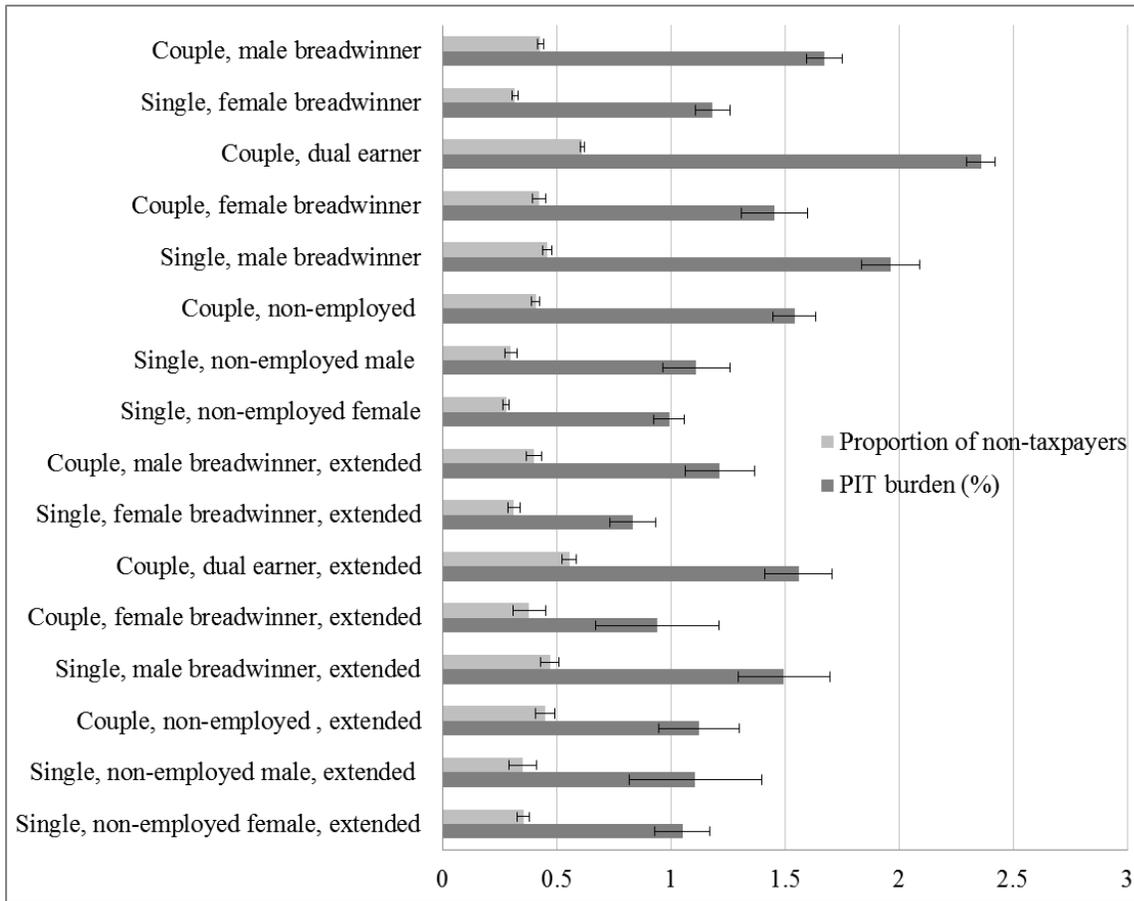
We report the PIT incidence for extended households following the same order as for non-extended households. The tax burden is lower among extended households. The gender differences within extended households are similar to those already depicted.

Exploring differences among non-extended workers' households

We analyze the tax burden differences between household types through the estimation of a ZOIB model. We include sixteen dummy variables that distinguish household types, but in this section we only show the results for the household types of interest.

In Table 3 we report the discrete effect of the household type relative to the "couple, dual earner" type. In column Model 1 we show the results of an estimation in which we do not include any control. Thus, these estimated effects replicate the patterns of the raw PIT burden differences already shown: all effects are negative, indicating that the dual earner type has a higher PIT-to-

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income ratio, and that male types have a higher ratio than female types regardless of whether comparing singles or couples.

Table 3. Marginal effects estimated by a zero-inflated beta regression

VARIABLES	Model 1	Model 2	Model 3
Couple, male breadwinner	-0.0067***	0.0048***	0.0047***
	(0.00005)	(0.00007)	(0.00007)
Single, female breadwinner	-0.0116***	-0.0141***	-0.0055***
	(0.00006)	(0.00006)	(0.00007)
Couple, female breadwinner	-0.0084***	-0.0071***	0.0033***
	(0.00008)	(0.00008)	(0.00009)
Single, male breadwinner	-0.0045***	-0.0184***	-0.0153***
	(0.00010)	(0.00006)	(0.00010)
Per capita income		0.0205***	
		(0.00004)	
Presence of children (yes=1)			0.0085***
			(0.00005)
Household size			0.0042***
			(0.00002)
Number of earners (labor, capital earnings or pensions)			-0.0040***
			(0.00003)
Informal workers			-0.0054***
			(0.00004)
Per capita capital income			0.0570***
			(0.00073)
Per capita labor income			0.0291***
			(0.00008)
Per capita pension			0.0279***
			(0.00009)
Per capita public transfer			-0.0037***
			(0.00012)
Per capita imputed rent of owner-occupied house			-0.0050***
			(0.00011)
Observations	124987	124987	124987

Source: Authors' estimations based on *Encuesta Continua de Hogares* 2013, *Instituto Nacional de Estadística*
 *** p<0.01, ** p<0.05, * p<0.1
Note: For household types, we report the discrete effect related to the "couple, dual earner" type, valuing the rest of the variables at their means. For the rest of the dependent variables, we report the 'marginal effect' by household type compared to the "couple, dual earner" type.

The purpose of the PIT is progressivity, so a proper analysis needs to control the results by income. Thus, we estimate Model 2 in which we add per capita gross income as a control. As expected, the PIT burden increases with income. The difference in income levels by household type affects the order of the three typical cases: now, the "couple, male breadwinner" type has the highest PIT-to-income ratio, followed by "couple, dual earner" and "single, female breadwinner".

To refine the analysis of the PIT ratio differences between household types, we estimate Model 3 in which we include additional controls: presence of children, household size, number of earners and number of informal workers. Also, the explanatory variable of income is split into several sources. As shown in Table 3, even after including all the variables that may explain the differences, a small gap between the three types remains.

A result consistent with gender equality is that the tax burden is lower among households in which both members of the couple work than when one member specializes in the labor market and the other in household production. Also, there would be a fairness concern if the latter case receives a better treatment than a worker without a spouse. Thus, the positive effect of "couple, male breadwinner" and the negative effect of "single, female breadwinner" are consistent with gender equality in taxation and an equal gender time allocation within the family, although we do not know (and we do not address the study of) the optimal magnitude of the gaps.

Let's analyze the demographic controls. The tax burden is higher when there are children in the household and increases with household size. This result is not surprising: on the one hand, the tax burden is likely to increase with total household income because of the progressivity of marginal tax rates on pensions and labor earnings; on the other hand, in each level of per capita household income, total income of the household increases with its size. As the average values of household size and presence of children are higher for "couple, male breadwinner" than "couple, dual earner", the raw PIT burden tends to be higher for the former.

We interpret that the presence of children and the household size are demographic characteristics mainly related to life-cycle stage. But the number of earners, the number of informal workers and the income sources are at least partially influenced by culture and socioeconomic arrangements,

so the interpretation of the PIT ratio differences should be interpreted cautiously from a gender perspective.

The effect of the number of earners is negative because of the progressivity of marginal taxes. I.e., at a given level of income, the PIT-to-income ratio is lower when the number of members receiving income is higher. As the number of earners is lower in the "couple, male breadwinner" category than the "couple, dual earner" category, the variable contributes to a higher gap between these types.

Unsurprisingly, the number of informal workers (the ones who evade contributions and taxes on labor income) has a negative effect. The number of informal workers is lower among "couple, male breadwinner" than "couple, dual earner" households. Informality in these households comes mainly from informality among women. That is, a gender difference in informality also contributes to widening the gap between these types. Gender differences in informality may be due to barriers faced by women in the labor market. But it is possible that undesired consequences of the program also play a role. Formal workers and their families are covered by contributory health benefits and there is evidence that this program encourages formality (Bergolo and Cruces, 2014). However, just one formal worker is enough to make the family eligible for the benefits. Thus, the gender gap in informality captured by the difference between "couple, male breadwinner" and "couple, dual earner" types may be capturing behavioral reactions to the incentive structure of the health program.

Finally, the marginal effects by income source indicate that the tax burden decreases when households are supported by non-taxable income (transfers and rental value). These sources are very important within the female type households.

Besides the three typical types, there are two other comparisons that may help to understand gender differences: "couple, male breadwinner" vs "couple, female breadwinner" and "single, female breadwinner" vs "single, male breadwinner".

According to the raw gaps, the "couple, male breadwinner" type faces a higher tax burden than its female counterpart. But part of this difference is related to demographic variables and the structure of income sources. Indeed, the "couple, female breadwinner" contains households in which a worker woman lives together with a pensioner man; as income comes from two different

sources, these couples avoid tax progressivity. Besides, the incidence of non-taxed income (mainly imputed rental value) for "couple, female breadwinner" is higher than for "couple, male breadwinner". These patterns do not directly appear as stemming from a gender bias. But, Model 3 indicates that a remaining gender gap persists after controlling for these variables.

The "single, male breadwinner" type bears a higher raw burden than the "single, female breadwinner" type. Part of this difference is related to the structure of income sources, with the high proportion of non-taxed sources being noticeable among the female type.

These results reflect the average situation. We also did an estimation based on Model 3 in which the household type is interacted with all the income sources. In Figure 5 we report the predicted PIT burden across the per capita income distribution for "couple, dual earner", "couple, male breadwinner" and "single, female breadwinner". The average depicted pattern is clearly identified in the central range of the income distribution: between the 25th and 75th percentile, the "couple, male breadwinner" type bears the highest burden whereas the "single, female breadwinner" exhibits the lowest one. But over the 75th percentile, the difference between the curves for the "couple, dual earner" and the "couple, male breadwinner" categories are not statistically significant at conventional levels. Meanwhile, "single, female breadwinner" has the lowest burden level across the entire distribution, although the magnitude of the gap is lower at the tails.

Figure 5. Predicted PIT across percentiles of per capita income distribution for three selected household types
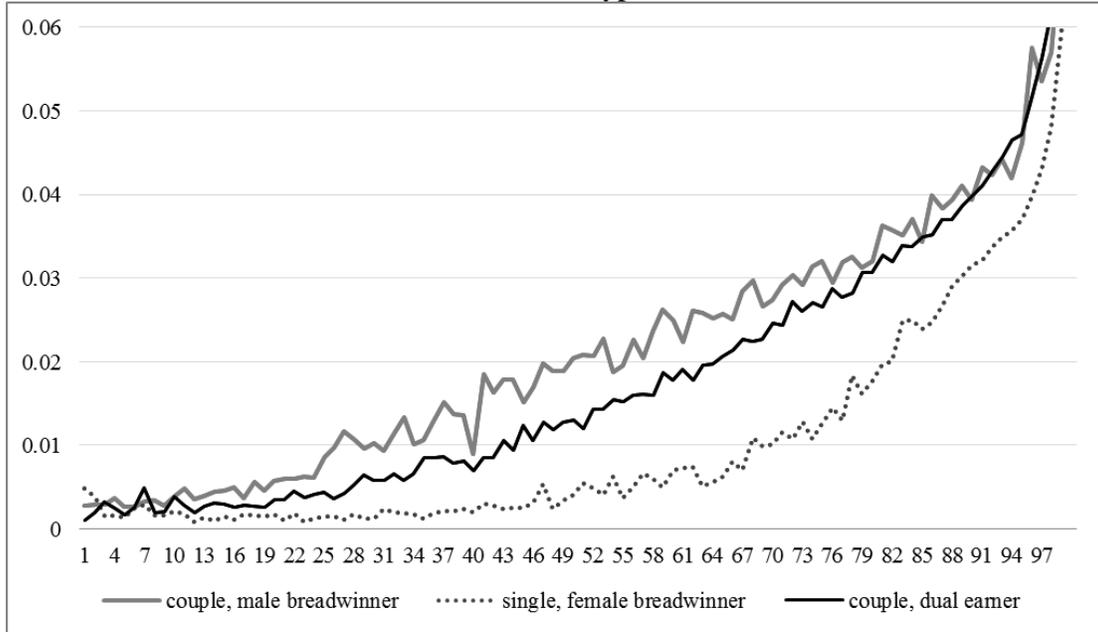
Source: Authors' estimations based on *Encuesta Continua de Hogares* 2013, *Instituto Nacional de Estadística*

Introducing joint taxation

Up to now we assumed that all individuals opt for individual filing. In this section we estimate the PIT amounts that would be paid under joint filing and we assume that couples choose the lowest burden option. We find that 12% of households would benefit by choosing joint instead of individual filing, much lower than the percentage who actually do so according to tax records. Joint filing is not only the best choice for the "couple, male breadwinner" type but also for one quarter of the "couple, dual earner" households in the database that pay PIT.

To analyze the potential effect of the joint filing option we estimate each model assuming that couples choose their best option. The results are reported in Table 4.

Table 4. Marginal effects estimated by a zero-inflated beta regression

VARIABLES	Model 1	Model 2	Model 3
Couple, male breadwinner	-0.0086***	0.0022***	0.0026***
	(0.00004)	(0.00006)	(0.00007)
Single, female breadwinner	-0.0107***	-0.0123***	-0.0029***
	(0.00006)	(0.00006)	(0.00007)
Couple, female breadwinner	-0.0095***	-0.0081***	0.0014***
	(0.00008)	(0.00007)	(0.00010)
Single, male breadwinner	-0.0036***	-0.0164***	-0.0124***
	(0.00010)	(0.00006)	(0.00011)
Per capita income		0.0201***	
		(0.00004)	
Presence of children (yes=1)			0.0087***
			(0.00004)
Household size			0.0047***
			(0.00002)
Number of earners (labor, capital earnings or pensions)			-0.0040***
			(0.00003)
Informal workers			-0.0055***
			(0.00004)
Per capita capital income			0.0667***
			(0.00088)
Per capita labor income			0.0304***
			(0.00007)
Per capita pension			0.0305***
			(0.00009)
Per capita public transfer			-0.0033***
			(0.00013)
Per capita imputed rent of owner-occupied house			-0.0054***
			(0.00011)
Observations	124987	124987	124987

Source: Authors' estimations based on *Encuesta Continua de Hogares* 2013, *Instituto Nacional de Estadística*
*** p<0.01, ** p<0.05, * p<0.1
Note: For household types, we report the discrete effect related to the "couple, dual earner" type, valuing the rest of the variables at their means. For the rest of the dependent variables, we report the 'marginal effect' by household type compared to the "couple, dual earner" type.

The patterns between models are similar to those obtained under the assumption of individual filing. Model 3 indicates that the "couple, male breadwinner" type bears the highest burden, followed by "couple, dual earner" and "single, female breadwinner". But the gap between

"couple, male breadwinner" and "couple, dual earner" narrows. This suggests that joint filing helps to offset the incentives of sharing work between spouses implicit in individual filing. Also the difference between "single, female breadwinner" and "couple, dual earner" becomes smaller. This is due to the gains for some "couple, dual earner" households opting for joint filing.

The tax burden on non-employed

In Table 5 we present the estimated effect of the "single, non-employed" types relative to the "couple, non-employed" type. The negative effects indicate that among non-employed households, the couple type has the highest burden. The interest for our purpose is that the difference between the female and male types is small in all models – i.e., the PIT seems to not have different gendered treatment among the non-employed.

Table 5. Marginal effects estimated by a zero-inflated beta regression

| VARIABLES	Model 1	Model 2	Model 3
Single, non-employed female	-0.0045***	-0.0103***	-0.0128***
	(0.00013)	(0.00007)	(0.00016)
Single, non-employed male	-0.0049***	-0.0105***	-0.0122***
	(0.00007)	(0.00006)	(0.00011)
Controls	No	Yes	Yes
Observations	124987	124987	124987

*** $p<0.01$, ** $p<0.05$, * $p<0.1$
Note: the vector of household types includes 16 categories (presented in Table 2); for the estimation we omitted "couple, non-employed". The rest of the variables are valued at mean. Models 2 and 3 include the control variables shown in tables 3 and 4.
Source: Authors' estimations based on *Encuesta Continua de Hogares* 2013, *Instituto Nacional de Estadística*

In Figure 6 we present the predicted PIT burden across the per capita income distribution, calculated based on Model 3. The average pattern holds for all ranges of the per capita income distribution: we do not find gender differences.

Figure 6. Predicted PIT across percentiles of per capita income distribution for three selected household types
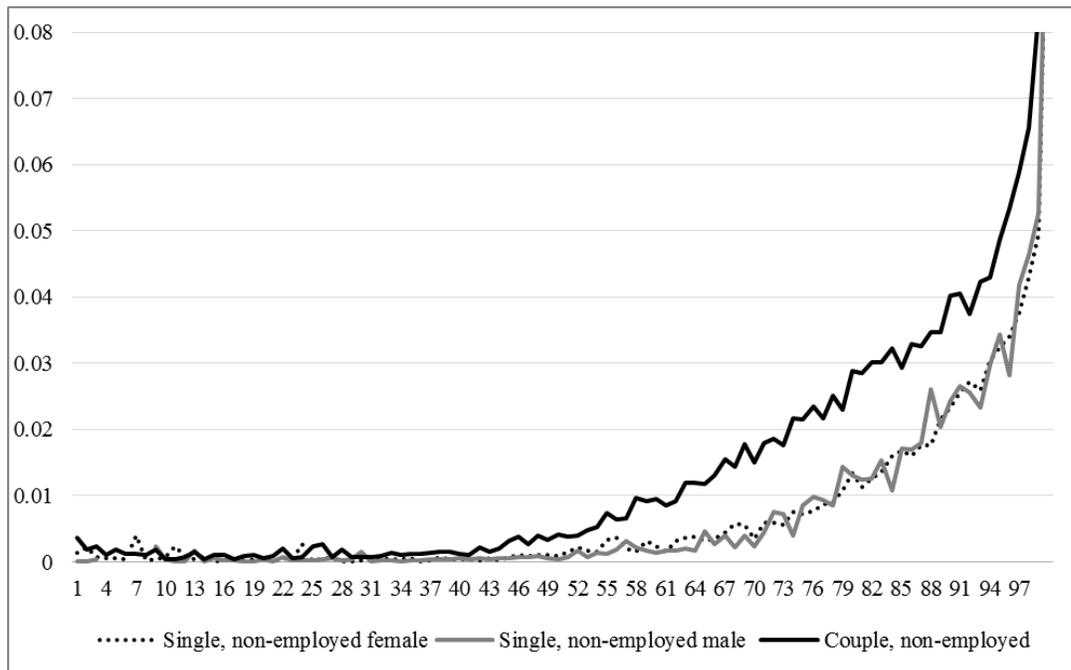
Source: Authors' estimations based on *Encuesta Continua de Hogares* 2013, *Instituto Nacional de Estadística*

Conclusions

In this study, we analyze the gendered effects of the PIT in Uruguay. The analysis of the legislation indicates that there are no explicit gender differences in the code, which means that the PIT treats women and men on an equal basis regarding rates, credits and deductions.

The combination of a dual system and the high prevalence of the individual filing have the strength of in principle not discouraging labor participation of women. However, the possibility to opt for joint filing is a weakness of the system because it may involve gender inequality and discriminate against workers without a spouse.

We conduct the analysis using microdata provided by the 2013 Household Survey to compare households supported by a working man who lives with a dependent housewife, with households in which both members of the couple work and also households in which a single woman works.

The raw data indicate that households in which both spouses work bear the highest PIT burden followed by the typical patriarchal household in which the husband works but not the wife, and finally, the single mother family. But this result relies on their higher income and demographic characteristics. Once these variables are controlled for, households supported by a working man who lives with a dependent housewife face the highest tax burden. This pattern means an incentive towards equal gender time allocation within the family, which is consistent with gender equity. However, this pattern is reinforced by non-desirable aspects: the highest level of informality among women (benefitting dual earner households) and the high participation of non-taxable sources of income among single female households.

The above conclusion relies on the assumption of individual filing. This assumption is quite realistic given how few taxpayers opt for joint filing. Both as a robustness check and to analyze joint filing, we also study the case in which the couples choose their best option between individual or joint filing. The first important result we obtain is that joint filing is the best option not just for a few. Our estimations suggest that many Uruguayans are not aware of the benefits of choosing joint filing. Second, our analysis suggests that the strengths of the PIT system from the gender perspective are eroded by the joint filing option.

We also study three typical types of non-employed households and we do not find differences between female and male single categories.

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