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Inequality and Top Incomes in Uruguay: a comparison between household surveys and income tax micro-data[1]

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Abstract

After increasing over more than a decade, recent studies based on household surveys data show that income inequality in Uruguay started to decline in 2008. In this study we assess whether this trend is robust to the use of novel micro-data from the recently restored Uruguayan personal income tax for the years 2009-2011. We analyze primary income and pensions and carry out to main comparative exercises. In the first part of the paper, we adjust household surveys to make them comparable to tax records. After that, we follow the methodology proposed by Atkinson et al (2011) and Alvaredo (2011) to compute top income shares and corrected inequality measures. We also investigate the redistributive effect of the personal income tax burden in the two data sets. Inequality indexes depict a similar trend in inequality reduction, even though the decrease is less sharp in tax records than in harmonized household surveys. According to our estimations from income tax data, the share of the top 1% did not decline in this period, and was situated around 14%. Household survey data underestimate the share of the top 1% in total income by approximately 3 p.p. and depict an opposite trend in the top shares evolution throughout the period compared to the one observed in income tax micro-data. This result might be revealing an increasing difficulty of ECH for capturing very high incomes. Finally, personal income tax in Uruguay redistributes roughly 2 p.p. of the Gini index. Effective tax rates exhibit a progressive pattern in the case of total income, labour income and pensions, whereas they are slightly regressive when considering capital income.

JEL Classification: D31, H24, O54
Keywords: top incomes, income inequality, personal income taxation, Uruguay

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I. Introduction

In 2008, after a permanent increase over more than a decade, income inequality in Uruguay started to decline. Many studies attest that both income inequality indexes and the share of the higher quintiles have consistently decreased during the last years (Table 1). Even though inequality reduction in Uruguay begun later, its recent evolution is consistent with the pattern observed in most Latin American countries (López Calva and Lustig, 2010; Cornia, 2010).

As in most countries, contemporary research on the personal income distribution in Uruguay has mainly relied on household surveys micro-data (*Encuesta Continua de Hogares*; hereafter, ECH). Considering the well-known fact that household surveys misreport income from self-employed workers and capital owners (Székely and Hilgert, 1999), and that in this period Uruguay experienced rapid GDP and household income growth, it is particularly important to assess the robustness of both the level and the recent fall in inequality using alternative data sources.

Table 1- Income inequality in Uruguay. Inequality indexes and income distribution by quintile. Per capita household income. Individuals. Selected years. 1986-2012. (*).

Year	Gini	Theil	Income distribution by per capita household income quintile					
			1	2	3	4	5	Total
1986	42.0	32.4	5.0	10.1	15.2	22.3	47.4	100
1990	41.9	34.1	5.5	10.1	14.8	21.6	48.0	100
1995	42.2	31.7	5.2	9.9	14.8	22.2	47.9	100
2000	45.5	38.7	4.7	9.1	13.9	21.3	51.0	100
2005	45.0	36.8	4.8	9.1	14.1	21.6	50.4	100
2006	46.2	38.9	4.7	8.7	13.6	21.4	51.7	100
2007	46.7	39.9	4.6	8.5	13.5	21.4	52.0	100
2008	46.2	39.6	4.5	8.8	13.8	21.6	51.4	100
2009	45.2	38.1	4.9	9.0	13.9	21.7	50.6	100
2010	44.2	35.2	5.0	9.2	14.2	22.0	49.7	100
2011	42.3	32.1	5.3	9.8	14.8	22.1	48.0	100
2012	40.0	27.3	5.7	10.3	15.4	22.8	45.9	100

(*) These calculations donot include health insurance (FONASA) imputations.
Source: own estimations based on ECH, INE

This study exploits for the first time micro data from the Uruguayan personal income tax records for the period 2009-2011 (*Impuesto a la Renta de las Personas Físicas* -IRPF- and *Impuesto a la Seguridad Social*-IASS-) and pursues three main objectives. First, we analyze differences in reported personal income between ECH and income tax micro-data, particularly focusing on non-labor income sources and top income groups (top 1%, 0.5% and 0.1%). Second, we compare inequality levels and trends in both data sources. Finally, we assess progressivity and redistribution of the Uruguayan personal income tax burden in the two data sources.

To meet these purposes, we perform two exercises. First, we harmonize the personal income vector in both data sources in order to ensure comparability. Second, following

the top incomes literature (see, e.g. Atkinson et al., 2011) we estimate income shares of the high strata and adjust inequality measures computed upon household surveys, using information from tax data and the national accounts system (NAS hereafter).

Our analysis yields the following results. First, regarding the comparison between harmonized ECH and tax data, the top 1% share is 3 p.p. lower in ECH than in tax data. Differences are even more pronounced for higher fractiles and for capital income, especially in the case of entrepreneurial income. For instance, the top 1% captures 66% and 34% of capital income in tax data and ECH respectively. Second, the analysis of income trends for top income groups shows divergent patterns in ECH and tax data. Third, the top 1% income share, computed on the basis of the methodology developed by Atkinson et al (2011), was around 12.5%-14% over the period 2009-2011, which is lower than available estimates for Latin American countries but higher than in most developed countries, except United States and Switzerland. Fourth, the corrected Gini index is systematically higher than the unadjusted one, but inequality trends are similar, although the gap between the two measures widened over time. This seems consistent with the fact that while the income share of the top 1% declined in ECH, it remained stable when computed using tax data. Finally, we find that IRPF and IASS redistribute roughly 2 p.p. of the Gini index, even though the analysis performed on ECH seems to overestimate the redistributive impact of personal taxation. Effective tax rates exhibit a progressive pattern in the case of total income, labour income and pensions. Meanwhile, they show a descending configuration for the higher strata in the case of capital income.

The remainder of the paper is organized as follows. Section II presents a brief review of previous research and describes the main features of the Uruguayan personal income tax. Section III contains the methodology and describes the data sources employed in this study. Section IV presents the main results and Section V concludes.

II. Previous studies

We first present a short review of international studies on the accuracy of household surveys to capture the different income sources (II.1) and then we focus on previous research in Uruguay on this topic (II.2). We conclude this section presenting the main features of personal income taxation in Uruguay (II.3).

II.1 International studies

Deaton (2005) finds differences in income and consumption reported by household surveys and national accounts for several countries in which both data sources are available. He indicates that total income captured by household survey represents around 60% of GDP and that the growth rate of income and consumption observed in household surveys is lower than in national accounts. He provides four explanations for these results. First, surveys generally suffer from non-response problems that are particularly salient in the case of high-income households. Second, although many efforts have been done to harmonize them, there are still significant differences in variables definition among surveys and national accounts. Third, the information on imputed rents for owner occupied housing is not properly collected in many countries. Finally, national accounts contain imputations that are usually not made in household surveys (e.g. financial intermediation services and consumption of non profit institutions serving the households).

Since the 1980s, ECLAC has conducted several studies comparing information from national accounts and household surveys in Latin American countries and introduced adjustments in order to make both data sources compatible (Altimir, 1987). The assumption underlying this procedure is that only surveys are subject to measurement problems. Hence, the adjustment mainly consists on correcting surveys to make them consistent with NAS income. Different criteria are used to correct labor and non-labor income. This type of adjustment modifies both levels and trends in inequality and alters the relationship between different income sources compared to traditional measures based on micro-data. The Uruguayan case casts doubts on the reliability of the accuracy of these corrections: while the Gini index computed on adjusted income fell 8.5 pp between 1986 and 1994 (ECLAC, 1997), it remained steady when computed on non-adjusted micro-data (see Table 1).

Székely and Hilgert (1999) analyze household surveys from 18 Latin American countries, including the 1997 Uruguayan ECH. They conclude that these data sources severely underreport top incomes. However, by comparing managers´ income reported in household and firm-level surveys, and restricting the comparison to medium and large firms, they find that household surveys in Brazil, Guatemala, Chile, Paraguay and Uruguay capture high incomes.

Considering the caveats of household surveys to capture income from top income earners, distributional studies have been increasingly incorporating information from the income tax administrative records (Feenberg and Poterba, 1993; Atkinson et al, 2011). The literature on top incomes, based on tax data, has been notably expanded over the last decade (Piketty, 2003; Atkinson et al, 2011; Alvaredo et al, 2013). These studies have built historical time series on top income shares for most developed countries and some developing countries, providing two main findings. First, the evolution of top income shares has exhibited a U-shaped pattern in most advanced economies since the end of the Second World War. However, the rise in income concentration at the top has been greater in English Speaking countries (mainly US) than in Continental Europe (France, Germany) and Japan. Considering that developed countries have been exposed to similar technological shocks, the observed differences in the trend of inequality in the last decades may reflect differences in institutions, tax systems and preferences for redistribution between those countries. Second, inequality measures, such as the Gini index, have demonstrated to be sensible to misreporting problems at the top of the income distribution, even if high income groups represent by definition a very small fraction of the population (Leigh, 2007; Alvaredo, 2011).

However, tax records also present severe caveats when used for distributive analysis due to elusion and evasion. Feenberg and Poterba (1993) study the participation of top income groups in US using information from the personal income tax between 1951 and 1990, showing that the rise in top income shares was partly driven by a substantial reduction in top marginal tax rate from 70 to 28% implemented in 1986, that impacted evasion rates at the top.

Recently, Burkhauser *et al* (2012) compare inequality trends in household surveys and personal income tax data from US during the period 1967-2006, adjusting the Current Population Survey to make it consistent with the estimations from tax return data. They find that once income and tax units are consistently defined across data sources differences between surveys and tax data are shortened, even though modifications in

the tax system and survey design may explain differential trends, particularly during the period 1993-2000.

Despite a long-standing tradition of distributional studies in Latin America, research focused on top income groups is less frequent, partly due to data availability. Two recent exceptions are Alvaredo (2010) and Alvaredo and Londoño (2013) who study top income groups using tax data from Argentina and Colombia respectively. [2]

II.2 Previous studies on ECH and personal income taxation

During the 1990 decade, several studies analyzed the accuracy of ECH to capture household income by source compared to the NAS and expenditure surveys (Grosskoff, 1993; Mendive and Fuentes, 1997; Carella and Amarante, 1997). As expected, most of these studies conclude that while wage income and pensions are adequately captured, capital income is generally underreported. Mendive and Fuentes (1997) estimate correction factors to apply to reported income in ECH by comparing ECH and the 2004/05 income and expenditure survey (*Encuesta de Gastos e Ingresos de los Hogares*). Correction factors were 11% for total income, 30% for entrepreneurial income and 70% for housing rents and interests on bank deposits. More recently, Amarante *et al*.(2007) find that ECH captures 39.7% of housing rents and 23% of interests on bank deposits.

A bulk of studies have analyzed the ex-ante redistributive impact of the recent restoration of the personal income tax in Uruguay carrying out micro-simulations on both ECH and expenditure surveys (Barreix and Roca, 2006; Amarante, Arim and Salas, 2007; Llambí et al., 2008; Rodríguez and Perazzo, 2007). Micro-simulation exercises suggest that the tax system reform reduces the household income Gini index in 1 to 2 percent points. Amarante *et al.* (2011) analyze progressivity of both direct and indirect taxes and simulate the effect of alternative tax schemes. They do not consider modifications in capital income taxation, arguing that capital income is severely underreported in ECH. Their findings show a reduction of the Gini index of 1.5 percent point as a result of the introduction of the personal income tax.

Some outcomes of the reform have also been micro-simulated in recent studies, as tax data were not available. Amarante *et al.* (2014) find that the inception of the personal income tax was associated to a reduction in the returns to schooling for skilled workers and to a consequent decrease on inequality among the labour force. They find a modest redistributive effect of the income tax, located around 2 percent points of the Gini coefficient.[3] Finally, other studies analyze the effect of personal taxation on labor supply, not finding any significant effect (De Rosa, Esponda and Soto, 2010; Martorano, 2011). As they rely on household surveys, the main shortcoming pointed out by all these studies is that information on capital income may be severely misreported.

III.3 Personal income taxation in Uruguay

The Uruguayan tax system is mainly based on indirect taxes, which represent roughly 65% of total fiscal revenue. Personal income tax was originally established in 1961

[2] Results from top income studies have become easily available at the *World Top Incomes Database* (http://topincomes.gmond.parisschoolofeconomics.eu/). Top 1% shares vary substantially between countries, reaching a maximum of 20.2% in the case of Colombia.

[3] The redistributive effect of the Uruguayan personal income tax is generally lower than in European countries (Paulus et al, 2009).

(Law N°12804). The military government that took power in 1973 abolished both the personal income and the inheritance tax.

In 2006, personal income tax was reintroduced in the context of a broader reform implemented during the first government of the centre-left party *Frente Amplio*. The reform introduced a dual personal income tax (*Impuesto a las Retribuciones de las Personas Físicas*, IRPF), combining a progressive tax schedule on labor income with a flat tax rate on capital income and corporate income tax (*Impuesto a las Retribuciones de las Actividades Económicas*, IRAE). Pensions were originally included in IRPF as labor, but soon after the reform this component was declared unconstitutional. As a result, pensions were no longer taxed by IRPF; instead, a new tax on pensions was passed in July 2008, known as *Impuesto de Asistencia a la Seguridad Social* (IASS).

In Uruguay, the fiscal year coincides with the calendar year. The tax unit is the individual, but married couples have the chance of filling the tax return jointly in the case of labor income. However, only 1.8% of the individuals in the tax records choose this regime. Appendix II contains a in detail description of the tax system and the corresponding tax rates.

III. Methodology

In what follows we describe the main data sources and criteria used to harmonize income captured by ECH and income tax administrative records (III.1). After that, we describe the methodology used in the estimation of the top incomes share and in the calculation of adjusted income inequality measures (III.2).

III.1 Data sources

This research is based in three main data sources: NAS, income tax micro-data from the administrative records gathered by *Direccion General Impositiva* (the public tax agency collecting the income tax) for 2009-2011, and the household surveys (ECH) gathered by the National Statistical Office (INE). Additionally, DGI prepared specific information for this research on total retentions and taxable income for those non-nominative sources (mainly shares, financial assets and bank deposits in which the owner's name is not disclosed), as well as business profit rates and business profit withdrawal opened by several employment and legal status categories. In what follows, we briefly present the main characteristics of ECH (III.1.1) and DGI micro-data (III.1.2).

III.1.1. The Uruguayan household surveys (ECH)

The National Statistical Office (INE) gathers the household surveys since 1968. These surveys are carried out throughout the whole year and collect information in detail on household composition, labour force status and outcomes, socioeconomic variables and personal income by source. During the period covered by this research, the sampling framework was the 2006 First Phase of the National Census (*Conteo de Población* 2006). Since 2006, ECH are representative of the whole country, including rural areas (which account for 15% or less of the population). The micro-data include a weighting factor that expands the results to the corresponding population projections estimated by

INE-CELADE for each year. Sample size was 46, 936 households in 2009, 46, 550 in 2010 and 46,669 in 2011.

After-tax labor income is gathered for each household member aged 14 years or more, including cash and in-kind payments for salaried workers, self-employed and business owners. Information is separately recorded for the main occupation and the remaining ones. The survey also gathers information on the contributory status of the labour force in each occupation. Salaried workers are also asked on whether they contribute to the social security system for their whole earnings.

Earnings from self-employed workers and business owners are captured in two separate questions. The first one focuses on cash withdrawals in the last month (*Which amount of money did you withdraw from your enterprise to meet household expenditure?*). The second refers to distributed utilities (*How much did you receive in the last 12 months as distributed profits?).* These two variables posed severe difficulties for the harmonization with tax data, as no information is gathered on the legal status of the firm, aggregate sales and on whether these enterprises are subject to corporate income taxation (IRAE) or not.[4] Section III.2.1 presents in detail the assumptions carried out to make this information comparable with DGI micro-data. Finally, a set of questions gathers information for non salaried workers in agriculture, collecting information on sharecropping and cattle pasturage and capitalization.

Except for profit withdrawals in the case of self-employed mentioned in the last paragraph, since 2006 capital income is captured in the household questionnaire. This means that each item is added up for the whole household and attributed to the household head, and, hence, the information for each individual cannot be recovered. This modification in the questionnaire was meant to foster the declaration of capital income, which actually occurred (Alves et al, 2009). Information on interests, dividends, rents, benefits and imputed value of owner occupied housing is separately gathered.

Transfer income is separately collected for each individual and questions allow to disclose their origin (public/private, domestic/foreign) and the type of benefit in pensions (retirement and survival), child allowances, unemployment insurance, accident compensation and other benefits.

To end this section, it must be remarked that labor earnings considered in this paper do not include health insurance (FONASA) cash imputations for workers, pensioners and their families, as it is currently done by INE. Considering that in 2007 a significant health system reform was carried out and coverage was expanded to spouses and children aged 18 or less, both income levels and inequality estimations presented here differ from INE´s ones. In spite of this, inequality trends are similar.

III.1.2. Income tax micro-data

DGI created special databases for this research, merging the universe of IRPF and IASS records for 2009-2011. In this way, for each individual we have information on capital, pension, labour income and tax burden. Additionally, each record contains information on sex, age, industry for each occupation, employer (salaried or non salaried) and

[4] As mentioned in Annex I, only self-employed and business owners working on firms that contribute to IRAE are liable for the personal income tax on distributed benefits.

deductions by category. Labour income sources separate salaried and non salaried work. Table A 2 1 lists the sub-sources in the case of capital income. Non-nominative capital income was not included in the micro-data. This is the case of non nominative shares, equities, securities, dividends or interests coming from bank deposits which are subject to the bank secrecy act. DGI provided us a list of total gross/taxable income and tax burden for these sources. Approximately 60% of capital income throughout the period was nominative (Table A 2 2).

Additionally, DGI provided information on income and income tax of those personal services societies that chose contributing IRAE and not IRPF (see Annex I for details on this regulation). These cases were incorporated to our database.

The data base also provides information for those households where couples choose to jointly become a tax unit, which represent 1.8% of the whole database. In next section we describe how we considered this information in order to include it in the individual database.

In the case of labour income and pensions, as the Social Security Institute (Banco de Previsión Social, BPS) acts as the retention agent, the information included in the micro-data refers to all workers contributing to the social security or pensioners, independently on whether they are net tax payers or not. Table 2 depicts the number of records in the database for each year, including the total number of cases and those who are net tax payers (in which IRPF or IASS is positive).[5]

[5] DGI provided a single identifier for each person throughout the whole period, which enables to explode the unbalanced panel nature of the data.

Table 2. Individuals and income tax contributors (IRPF and IASS) in DGI micro-data. 2009-2011			
Observations	2009	2010	2011
Total income			
Records	1,843,910	1,854,590	1,932,358
Tax units	1,835,152	1,838,298	1,913,948
% Couples	0.48	0.89	0.96
Tax payers	463,669	506,287	575,877
Capital income (Category I)			
Records	60,542	66,415	78,150
Tax payers	60,542	66,415	78,150
Labour income (Category II)			
a) IRPF option			
Records	1,197,066	1,199,558	1,256,084
Tax units	1,188,388	1,183,491	1,237,968
% Couples	0.73	1.36	1.46
Tax payers	304,219	330,240	376,851
b) IRAE option			
Records	3,334	3,412	3,430
Tax payers	3,334	3,412	3,430
Pension income (IASS)			
Records	639,571	661,405	675,742
Tax payers	98,908	109,632	120,877
Source: own estimations based on DGI micro data			

III.2 Methods

In what follows we describe the procedure used to harmonize ECH and income tax micro-data (III.2.1). Then, we briefly present the criteria adopted to define the population and control income used to compute top income shares (III.2.2).

III.2.1. Harmonization of household surveys and income tax micro-data

In what follows we briefly describe the harmonization procedure followed in this paper, separately considering each source of income and database.

Labour earnings

a) Household surveys (ECH)

As it was previously mentioned, ECH captures post-tax labour income. In order to make this information comparable to the pre-tax information contained in DGI micro-data, we used the following procedure:

1) We computed labour earnings for those workers who contribute to the social security system (formal workers), adding up salaries and wages, commissions, incentives, overtime payments, allowances not subject to return, tips, arrears, transport, food or housing vouchers, other in-kind payments, other complements paid by the employer,

rights to pasturage and crop for own consumption, bonuses, vacation pay and unemployment insurance.[6]

As mentioned in section III.1, ECH´s information does not allow assessing whether self-employed workers that contribute to the social security system are subject to income tax for distributed benefits or these declared withdrawals are to be considered as labour income. At the same time, it is not possible to identify whether these workers contribute to the social security system for the whole value of their labour income or for a notional value. Present regulations establish that self-employed workers cannot contribute to the system for less than a notional value of 11 *Bases de Prestaciones Contributivas* (BPC), rising to 15 if they occupy salaried workers (Lanzilotta, 2009).[7] This means that they have choice to contribute on a notional salary or on their real earnings. This might be a difference among the two databases difficult to overcome.

In all cases, the amounts declared in the question on monthly withdrawals were labeled as labour earnings (*Which amount did you withdraw last month from your enterprise to meet household expenditure?*). Interviewers are asked to include firm owner salaries in this question if it corresponds. To assign withdrawn business profits (*How much did you receive in the last 12 months as distributed benefits/business profits?)* into labour and capital income, we made several assumptions in consultation with DGI personnel. As it was mentioned in section II.3, individuals are liable for paying the personal income tax for benefits withdrawals only if their firms' annual sales are above 4 million *Unidades Indexadas* (UI) and they contribute to IRAE.[8] As ECH neither gathers information on firm´s legal status, nor annual sales, the number of employees was used as a proxy. We considered benefits withdrawal as capital income only for business owners in firms of 20 employees and more. This assumption is grounded in cross-tabulations of total revenue, number of employees and legal status of the firm specially provided by DGI for this research. However, in the case of self-employed professionals, this amount was always considered as labour income.

2) After identifying labour earnings, we add up social security contributions (Table A 2 3) and contributions to a retraining fund (*Fondo de Reconversión Laboral*), which are set in a fix among of 0,125% for all workers. Finally, we sum health insurance contributions based on the income brackets depicted in Table A 2 4 .

3) To conclude, we compute income tax contributions (IRPF) on the basis of the rates presented in Table A 1 1 and we add them up to the totals obtained in 4). In this way we obtain pre-income tax.

[6] In 2010, salaries, wages, year-end bonuses and holiday payments represented 89% of total post income tax. Following in decreasing share, are comissions, incentives and overtime payments (4%), food tickets (2%), other inkind payments(2%) and unemployment benefits (1%).
[7] BPC values for 2009-2011 are presented in Annex I.
[8] The average value of one UI equalized Uruguayan 1910 pesos in 2009, 2080 in 2010 and 2200 in 2011.

b) DGI tax records

We consider pre-income tax corresponding to IRPF, Category II (See Annex I for details on the income tax and for the tax rates).

Capital income

a) ECH

There are several problems to harmonize capital income from the two databases. Firstly, INE does not provide guidelines to ECH interviewers on whether to ask interviewees to report pre or post- tax amounts. In this version of the paper we assume that declarations correspond to post- income tax, as a significant amount of capital income taxes are collected by retention agents (see tax rates in Table A 1 2). However, we checked that assuming pre-tax declarations yields very similar results. Secondly, the already mentioned difficulties in regard to identifying taxable benefits operate in this case, as ECH does not gather legal status information on firms. We grouped capital income into three main categories: profits, housing rents and other capital income.

In the case of business profits, we consider benefits and dividends reported in the household form and distributed profits coming from the individual form for the self-employed and business owners in firms employing 20 workers or more. Considering the regulations described in Annex I, we do not add up those housing rents below 40 BPC a year, if the remaining annual capital income of the individual is less than 3 BPC. The number of cases excluded here is negligible. Finally, the category *other capital income* gathers sharecropping, cattle pasturage or capitalization from the individual form.[9]

b) DGI tax records

We grouped the information into three categories: profits and dividends, housing rents and other capital income.[10] Recall that the items we included in other capital income in DGI micro-data and in ECH are very different. In this version of the paper we are not including capital gains.

Non-nominative capital income was distributed using two different methods. Business profits and utilities were distributed proportionally among those individuals receiving nominative benefits. This criterion was adopted because it was not possible to access to any source of information on the profile of income earners in the two cases. However, in the case of interests it was not possible to make an assumption, so we estimated a probit model in ECH on the probability of receiving interests, based on the scarce covariates present in the two data sets (age, sex, industry, income sources perceived). After predicting the probability of receiving interests, a second model allowed to predict the amount, based on the same group of covariates. Burdín et al (2013) presents in detail model estimations and the parameters used in the imputation.

Pensions

[9] In 2010, 33% of the capital income gathered in ECH corresponds to business profits, 62% to housing rents and 5% to other capital income.

[10] In 2010, 33% capital income reported in DGI micro-data corresponds to business profits, 61% to housing rents and 6% to other capital income.

a) ECH

ECH gathers post tax pensions. In order to make them gross, we add up health insurance (FONASA) contributions according to Table A 2 5. After that, we add up income tax contributions (IASS) according to Table A 1 3. In this way, we obtain pre-tax pensions.

b) DGI tax records

We use pre tax pensions as reported in the micro-data.

III.2.2 Top income shares estimation: population and income controls

In order to estimate the income share of top percentiles, we depart from the definition of population and income control, following Atkinson et al (2011). As tax micro-data contain information on formal workers, capital owners and pensioners, it is necessary to consider the whole population and not only that appearing in the database. In their study for Colombia, Alvaredo and Londoño (2013) consider the population aged 20 and more and we follow the same criteria here, as the number of individuals in DGI micro-data under that age is really low. According to the population projections, total population aged 20 was 2,313,671 in 2009; 2,331,494 in 2010; and 2,349,685 in 2011. This means that the fraction of the population aged 20 or more included in the tax micro-data represents 79, 81 and 85% of the population control.

To estimate the control income we used the two alternative procedures proposed by Atkinson (2007). The first one departs from total income captured in tax records and adds an income estimation of the non-taxpaying population (*Control Income 1*). The second one, starts from the national accounts estimation of "Households and non-profit institutions serving households" and subtracts those items not included in the income tax micro-data (*Control Income 2*).

To compute Control Income 1, we estimate total income of the non-taxpaying population from household surveys. This generates a control income of approximately 48% of GDP during 2009-2011. To estimate income from the informal population, we worked with ECH information for individuals aged 20 or more that were not contributing to the social security and were not receiving pensions or capital income. For this sub-set, we created groups considering sex, decennial age groups and labour force participation. For each group, we calculated mean and median labour earnings. These means/medians were added to the DGI tax records data set as rows (one for each group), with a weighting factor equal to the expanded number of individuals in each group. In this way, we obtained income estimations for informal workers, whereas those groups not participating in the labour force had zero earnings. As calculations using mean and median income yielded the same results, we present results for the mean.

To compute *Control Income 2* we should depart from a NAS estimation of household primary income. Unfortunately, the latter is not available in Uruguay since 1997. In order to overcome this problem, we carried out a preliminary estimation. In what follows we provide a short synthesis of the main features of this calculation.[11] The first step was to update the Income Generation Account, estimated by the Uruguayan Central

[11] The whole procedure is described in detail in Burdín et al (2013).

Bank (BCU) in 2005 for the last time, using ECH based variation indexes for wages, salaries and self-employment income and data on employer contributions provided by the social security system. The operating surplus is computed as the remaining difference to GDP. Next step was to determine the operating surplus appropriated by households. In order to compute the household income account, we include salaries and wages (excluding employers´ contributions to the social security system), gross self-employment and business owners´ income and an estimation of the fraction of the operating surplus accrued to households (i.e. excluding non distributed profits). In order to estimate that fraction we followed two different procedures that yield to very similar results. The first one is based on savings rates estimated upon the 2004/05 expenditure survey, whereas the second relies on profit rates provided by DGI.[12] Finally, we excluded items that are not considered in taxable income such as imputed rents from owner occupied housing and housing rents and business profits below taxable thresholds and we added up total pensions bill delivered by the social security system. This procedure results in an estimation of NAS household income which approximately accounts for 65% of GDP during 2009-2011.We consider 80% of household income estimated from NAS as Control Income 2 due to the reasons previously stated. Table 3 summarizes information on population and control income. As long as in our tax records data set a large amount of the adult population is included, we consider that Control Income 1 provides a more accurate estimation than Control Income 2. However, the two estimations yield to very similar results.

Table 3. Control income (in millions, Uruguayan pesos) and population. 2009-2011

	2009	2010	2011
Income			
DGI total	303,300	348,400	416,000
Control income 1 (DGI total+non-taxpaying)	322,500	369,700	437,900
Control income 2 (80% household income estimated from NAS)	363,531	417,068	490,864
Population			
Population DGI	1,843,910	1,854,590	1,932,358
Population control	2,313,671	2,331,494	2,349,685

Source: own estimations based on BCU, ECH, BPS, INE and DGI data.

In order to compute top income shares, we consider reported income (before income tax and before employee social security contributions) from the income tax micro-data, excluding capital gains. Tax units mostly correspond to single adults. Households where couples choose to jointly become a tax unit represent less than 1% of the whole DGI database in each year.

IV. Main results

In what follows, we firstly present the results of a comparative exercise, very similar to the one carried out by Burkhauser *et al* (2012) aimed at assessing the proportion of household income and earners captured by DGI tax records and adjusted ECH data and

[12] See Burdín (2013) for an explanation in detail of the two procedures

their respective distribution (IV.1). After that, section IV.2, focuses in high income groups and contains estimations on top income shares and corrected Gini indexes, based on the methodology proposed by Atkinson (2007), Alvaredo (2011) and Atkinson et al (2011). Finally, we analyze the distributive impact of the personal income tax burden using adjusted ECH and DGI tax data.

IV.1 A comparison among household surveys and income tax micro-data

We first present comparisons on income earners and aggregate amounts by source (IV.1.1). After that, we analyze the distribution of income by strata (IV.1.2) and income inequality indexes (IV.1.3).

IV.1.1. Income earners and aggregate income by source

Table 4 shows the proportion of GDP and estimated household income (based on NAS) captured by DGI and ECH. Information on ECH is presented both for the whole data set and harmonized with the DGI micro-data. The first option includes informal workers. The second option includes (salaried and non salaried) workers that contribute to the social security system; pensioners; and capital owners.

Table 4. GDP and estimated household income captured in DGI tax records and ECH micro-data (%). 2009-2011

	2009		2010		2011	
Data and income source	% GDP	% NAS household income	% GDP	% NAS household income	% GDP	% NAS household income
Income						
DGI micro-data	44.5	71.6	45.7	71.8	46.4	72.3
ECH						
Full data-set	56.4	93.3	56.9	90.7	56.4	87.9
Adjusted ECH	43.0	69.2	44.7	71.8	45.9	71.5

Source: own estimations based on BCU, ECH, BPS and DGI data.

Estimations on total earners and income are very similar in the two data sets, in the case of total income, labour earnings and pensions (Table 5). However, in the case of capital income ECH systematically yields lower values, and the gap is broader than in the remaining income sources.

Table 5. Income earners and income amounts declared in DGI and ECH by income source. 2009-2011

	%ECH/DGI					
	2009		2010		2011	
	Earners	Amount	Earners	Amount	Earners	Amount
Total income						
Labour income	80.7	95.8	90.1	99.6	91.3	99.1
Capital income	78.9	100.6	89.4	104.1	94.2	106.4
Bussiness profits	63.3	96.0	66.2	74.0	71.6	48.0
Housing rents	341.4	72.6	93.9	92.3	59.0	26.6
Other capital income	49.3	69.6	59.9	77.3	57.3	75.0
Pensions	84.6	84.6	93.9	92.3	88.0	86.2

Source: own estimations based on BCU, ECH, BPS and DGI data.

In the case of business profits, the number of earners increased in DGI records throughout 2009-2011 and that´s why the ratio significantly falls. Absolute numbers show an increase in DGI, whereas they remain steady in ECH.

IV.1.2. Income distribution

In this section we analyze income shares by percentile, considering DGI tax records and adjusted DGI. As expected, in the two databases capital income is more concentrated in the higher strata than the remaining income sources (Table 6). However, the proportion of income captured by top strata is considerably higher in tax micro-data than in adjusted ECH. For example, the share in total income of the tenth decile is 24% higher in DGI than in ECH, and the major gap is found in the case of labour earnings. Considering further fractiles (as percentiles 1, 5 and 0.1), differences widen, particularly in the case of capital income. In fact, the highest 0.1% in DGI concentrates 49% of capital income, whereas this figure falls to 13% in ECH. Although shares are almost constant throughout the whole period, the proportion of capital income appropriated by the tenth decile and the top percentiles in adjusted ECH tends to decline while it rises in DGI micro-data (Table A 2 6 and Table A 2 7). We will come back to this point in section IV.2.

Table 6. Income distribution by percentile and income source. DGI tax records and adjusted ECH. 2011								
Percentile	Total		Labour income		Pensions		Capital income	
	DGI	ECH	DGI	ECH	DGI	ECH	DGI	ECH
Decile 1	0.6	1.7	0.6	0.5	0.6	6.7	0.4	0.2
Decile 2	1.9	2.6	1.3	0.9	4.1	9.5	0.7	0.4
Decile 3	2.7	3.8	1.0	2.6	8.6	8.7	0.5	1.6
Decile 4	3.7	5.1	2.7	4.5	7.6	7.8	1.1	1.3
Decile 5	5.0	6.4	4.3	6.2	8.2	7.6	1.3	2.5
Decile 6	6.6	7.8	6.4	8.1	8.0	7.3	1.7	3.0
Decile 7	8.7	9.5	8.8	9.7	9.9	9.3	2.4	4.4
Decile 8	11.7	12.3	11.9	13.2	12.7	9.5	3.3	6.5
Decile 9	16.8	16.7	18.2	18.0	14.8	12.2	5.5	13.0
Decile 10	42.3	34.2	44.8	36.4	25.5	21.4	83.2	67.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Top 1%	13.2	10.2	13.1	8.7	1.9	2.7	65.9	33.5
Top 0,5%	9.5	6.9	8.7	5.5	0.6	1.1	60.7	24.8
Top 0,1%	4.6	2.7	2.9	1.8	0.1	0.1	48.7	13.2

Source: own estimations based on BCU, ECH, BPS and DGI data.

Observing the capital income components (business profits, housing rents and other capital income), it can be noticed that the three groups are significantly concentrated at the top, but the distribution is more unequal in the case of business profits, where the highest 0.1% keeps 72% of the total amount (Table 7 and information by deciles in Table A 2 8 and Table A 2 9). Meanwhile, housing rents show comparatively lower concentration levels. In all cases, capital income inequality is lower in adjusted ECH.

Table 7. Capital income distribution by decile and sub-group. DGI tax records and adjusted ECH. 2009-2011								
Percentile	Business profits		Housing rents		Other capital income		Total Capital income	
	DGI	ECH	DGI	ECH	DGI	ECH	DGI	ECH
2009								
Top 1%	90.4	61.7	41.1	25.6	67.4	35.8	57.0	45.9
Top 0,5%	85.5	56.0	35.5	19.5	62.6	26.2	51.7	37.4
Top 0,1%	72.3	37.5	27.7	12.5	50.0	0.6	42.0	21.4
2010								
Top 1%	91.8	64.7	37.6	26.0	66.6	19.0	61.8	38.3
Top 0,5%	86.9	56.4	31.9	20.2	62.2	18.0	56.5	30.8
Top 0,1%	73.1	42.2	24.0	7.1	49.3	9.5	45.7	17.4
2011								
Top 1%	92.3	55.0	36.0	25.9	74.9	20.2	65.9	33.5
Top 0,5%	87.8	44.8	30.2	17.6	69.2	14.0	60.7	24.8
Top 0,1%	73.0	31.7	21.5	6.2	55.5	6.6	48.7	13.2

Source: own estimations based on BCU, ECH, BPS and DGI data.

IV.1.3. Inequality trends

Inequality indexes reveal very different levels in each data-set, both in the case of total income and by source (Table 8). It must be recalled that inequality measures presented here are significantly different from the usual household income inequality figures, as the ones presented at the beginning of this paper. First of all, the income variable we are using adds up pre-tax income for formal workers, capital income, and pensions, excluding any other sources, as for example, non contributory transfers. Secondly, the calculations are carried out for income earners only, as they are the income tax units. Thirdly, as a result of the previous consideration, income is not aggregated by households. In the case of labour, our calculations very much resemble the usual inequality indexes calculated for employed workers with household survey data.

Although there is a considerable gap in levels, inequality indexes decline in the two data bases, although at a faster pace in the case of adjusted ECH. As expected, the main disparities are located in labour and capital income. It can be noticed that capital income inequality increases in income tax micro-data, whereas it shows a declining path in ECH. The latter might be related to high incomes underreporting. These issues will be discussed again in section IV.2.

Table 8. Gini and Entropy inequality indexes by source. DGI tax records and adjusted ECH. 2009-2011

Inequality index	Total		Labour income		Pensions		Capital income	
	DGI	ECH	DGI	ECH	DGI	ECH	DGI	ECH
2009								
Gini	0.570	0.488	0.571	0.442	0.494	0.476	0.944	0.661
Theil	0.683	0.462	0.638	0.378	0.447	0.411	3.931	0.949
Enthropy 0	0.683	0.429	0.738	0.340	0.451	0.405	3.152	1.056
2010								
Gini	0.568	0.474	0.566	0.428	0.493	0.466	0.946	0.615
Theil	0.684	0.422	0.632	0.343	0.445	0.394	3.926	0.793
Enthropy 0	0.684	0.402	0.758	0.319	0.448	0.385	3.004	0.887
2011								
Gini	0.559	0.457	0.549	0.410	0.486	0.459	0.955	0.539
Theil	0.672	0.387	0.589	0.315	0.433	0.385	4.216	0.618
Enthropy 0	0.653	0.373	0.692	0.293	0.431	0.370	3.162	0.615

Source: own estimations based on ECH and DGI micro-data.

Why are inequality levels so different in adjusted ECH and income tax micro-data? One reason might rely in ECH failures to capture higher incomes. At the same time, DGI micro-data present a significant fraction of very low labour earnings, which are very close to zero. We computed inequality indexes eliminating these cases under different hypotheses, yielded a fall of approximately 5 percent points in DGI micro-data. In Burdín et al (2013) we exploit the panel nature of the data and observe that in the lower

tail there are many entrances and exits from the data base. These issues need to be further investigated.

IV.2. Top incomes

In order to compare our results with previous research on this topic, and particularly with the study by Alvaredo and Londoño (2012) for Colombia, in this section we follow the methodology proposed by Atkinson (2007), Atkinson et al (2011) and Alvaredo (2011).

Table 9 depicts average income in Uruguayan pesos, US dollars and PPP dollars for the different income fractiles considered in this section.[13] Following top income studies, Frac. *y–x%* refers to a certain index computed for the top y% minus percentile *x*. *(net-fractiles)*.

Comparing these results with the ones obtained by Alvaredo and Londoño (2012) for Colombia, we notice that although average income is 10% higher in Uruguay than in Colombia (10,025 versus 9,152 ppp US dollars), average income and thresholds are significantly higher in Colombia amongst the top income strata, doubling the Uruguayan values since percentile 0.5.

Although income increased in all income strata, growth was higher in the case of the upper strata. The variation of the Retail Price Index in 2009-2011 was 15%, which means that there was a real income increase across the whole income distribution.

Table 9. Evolution of average income by fractile (2009=100). 2011. Control income 1 (*).

Income group	Pesos	Us dollars	PPP dollars
Total	131	153	119
Perc. 50 -10%	145	164	132
Perc. 90 -1%	129	145	117
Perc. 1 -0.5%	129	146	118
Perc. 0.5 -0.1%	134	150	122
Perc. 0.1 -0.05%	143	161	130
Perc. 0.05-0.01%	148	167	135
Perc. 0.01%	142	160	129

(*) As stated in footnote 13 results are the same for Control income 2, except in the case of the second row, where the values are 137, 160 and 124
Source: own estimations based on information from Table A3 10

On the basis of the population and income controls presented in section III.2.2, we estimated the top fractiles share, comparing DGI and ECH micro-data but now introducing corrections in the former. Thus, in the estimations carried out with income tax micro-data we used as control income 80% of the estimated value. The reason for this option mainly relies in the lack of availability of estimations of of business profits` remittances to other countries and private pensions` interests, which are to be deduced from the household income account as long as these items are not taxed and are exempted from filing a tax return. We also did not compute rents net of expenses. We

[13] Considering that the population control is similar, using the two control incomes yield to the same results, excepting average income for Perc. 50-10 and top income shares.

will be providing more precise estimates in further versions of this paper, as it is quite probable that we are estimating a lower bound for top incomes share.

During 2009-2011, the top 1% income share is around 14% in the estimations based on corrected DGI micro-data, showing a mild increasing trend throughout the period (Table 10). These estimations very much resemble the values provided in the previous section, based on the pure DGI micro-data, without the population and income correction. The estimations based on ECH data are lower than in DGI and show the opposite trend, decreasing across the three years. This difference can also be seen when observing the fall in the average income ratio of the 1% in ECH relative to the 1% in DGI. This decrease in the ratio combines stagnation in ECH and a significant growth in DGI. This might derive from a genuine increase in income among the top 1%, as well as from a better uptake of income in DGI.

Compared to the estimations for Colombia (20.17%) carried out by Alvaredo and Londoño (2012), the share of the top 1% is lower in Uruguay, which is consistent with the ordering of personal inequality indexes in the two countries. At the same time, the estimations obtained in this paper are higher than those presented for several developed countries in the *World Top Incomes Database*, except for Switzerland and the US. However, we must be cautions in carrying out these comparisons because the methodologies used in the estimations and the tax bases might vary significantly across countries.

Table 10. Characteristics of the top 1% in ECH and DGI micro data. 2009-2011

Year	Individuals in top 1%		P99 Threshold (in pesos)			Share top 1%			Average income of top 1%		ECH/DGI
						ECH	DGI				
	ECH	DGI	ECH	DGI	ECH		Control income 1	Control income 2	ECH	DGI	
2009	21,002	23,137	1,009,768	1,006,637	100.3	11.5	13.8	12.3	1,779,485	1,930,114	92.2
2010	23,279	23,315	1,070,965	1,141,568	93.8	10.2	14.3	12.6	1,712,744	2,260,334	75.8
2011	23,861	23,497	1,145,119	1,295,735	88.4	9.3	14.1	12.6	1,789,333	2,623,996	68.2

Source: own elaboration based on ECH and DGI micro-data, control income calculations and INE population projections and estimations.

We computed the top income share for smaller fractiles (Table 11). As it was the case of the top 1%, in 2009, shares of these smaller groups are similar among the two data-bases, but trends diverge throughout the period. Moreover, the last two columns of illustrate that the average value of the top incomes captured by each source follows different paths, growing in DGI micro-data and falling in ECH. [14]

[14] In ECH the top 1% is composed of 954 (unexpanded) observations. Considering that the top 0.01% gathers only 9 observations we did not include values in the table for ECH.

Table 11. Share of top income groups and income evolution in DGI and ECH. 2009-2011.

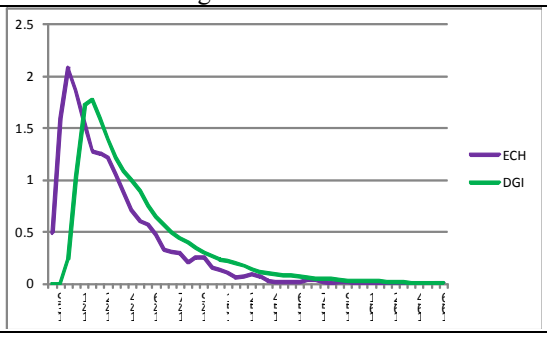
Grupo	2009			2010			2011			Average income index	
	ECH	DGI control income 1	DGI control income 2	ECH	DGI control income 1	DGI control income 2	ECH	DGI control income 1	DGI control income 2	ECH	DGI
0.5% sup.	7.7	9.7	8.6	6.6	10.1	9	5.9	10.1	9	95.3	138.8
0.1% sup.	3	4.4	3.9	2.3	4.7	4.2	2	4.8	4.3	84.3	144.7
0.05% sup.	1.9	3.3	2.9	1.5	3.5	3.1	1.3	3.6	3.2	79.6	145.2
0.01% sup.	-.-	1.7	1.5	-.-	1.7	1.5	-.-		1.7	-.-	142.3

Source: elaborated on the basis of ECH and DGI micro-data, control income calculations and INE population projection/estimations.

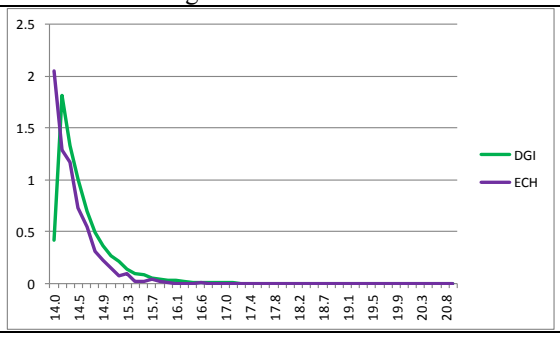
To appreciate the differences in the grid of top incomes captured by the two data sources, we present kernel density functions for the top 1% in the two data bases, using a common support (Graph 1). As expected, ECH is truncated respect to DGI, which clearly captures higher incomes. At the same time, panel b. depicts that the mass of the income distribution of the top 1% in ECH is very close to the lower threshold and that the tail of the DGI distribution is longer. Consistently, the Gini index of the top 1% is respectively 0.24 and 0.30.

Graph 1. Kernel density functions. Logarithm of the income of the top 1% in ECH and DGI by range. 2011

a. ECH range



b. DGI range



Source: own elaboration based on ECH and DGI micro-data, control income calculations and INE population projections and estimations.

The share of capital income rises with income (Table 12), climbing to more than 35% in the top 0.01%. This share increased throughout the period and, in 2011, it almost explained 75% of this group's income. As it was already pointed out, more research is needed in order to distinguish genuine income growth from improvements in income uptake in DGI.

Table 12. Top incomes composition by source. 2009, 2010 and 2011. Control income 1

Percentile	Labour income	Capital income	Pensions	Total
		2009		
50-10%	48.3	1.4	50.2	100.0
10-1%	69.6	1.3	29.0	100.0
1-0.5%	78.7	2.3	18.7	100.0
0.5-0.1%	84.1	4.6	11.0	100.0
0.1-0.05%	89.3	6.9	3.5	100.0
0.05-0.01%	86.6	12.0	1.1	100.0
0.01%	77.5	21.3	0.7	100.0
Total	72.8	3.7	23.3	100.0
		2010		
50-10%	45.0	1.4	53.6	100.0
10-1%	69.8	1.3	28.8	100.0
1-0.5%	78.4	2.4	18.9	100.0
0.5-0.1%	84.3	4.8	10.6	100.0
0.1-0.05%	88.1	8.3	3.3	100.0
0.05-0.01%	80.1	18.5	1.2	100.0
0.01%	64.5	34.5	0.7	100.0
Total	72.2	4.3	23.3	100.0
		2011		
50-10%	43.6	1.5	54.9	100.0
10-1%	72.3	1.3	26.3	100.0
1-0.5%	78.9	2.4	18.5	100.0
0.5-0.1%	84.1	5.8	9.9	100.0
0.1-0.05%	86.3	10.4	3.1	100.0
0.05-0.01%	78.2	20.6	0.9	100.0
0.01%	63.8	35.3	0.5	100.0
Total	72.4	4.8	22.6	100.0

Source: own calculations based on DGI micro-data, control income calculations and INE population projections and estimations.

The income structure by source clearly resembles the results obtained by Alvaredo and Londoño (2013) for Colombia, where a significant proportion of the income of top income groups is composed of capital income, in contrast to the findings for developed countries (Atkinson et al, 2011 provide a synthesis of these results).

IV.3 Adjusted Gini indexes

Based on the estimations of the top 1% share, we computed adjusted Gini indexes following the procedure developed by Atkinson et al (2011) y Alvaredo (2011). The adjusted Gini index can be computed as $G^*=G(1-p)+p$, where p is the share of the top fractile of interest and G is the Gini index computed with household survey data for the remaining population.

We carried out estimations based on the full ECH data-set considering formal and informal labour earnings, capital income and pensions as presented in this section (Table 13). We exclude non contributory cash and in-kind transfers and imputed owner occupied housing rent due to the reasons mentioned in the previous section. In this way

we are analyzing the primary distribution of income plus pensions, before taxes and non contributory transfers.

Table 13. . Adjusted Gini index using DGI micro-data. 2009-2011.

Year	ECH		DGI			
			Control income 1		Control income 2	
	Gini	Gini 99%	Share top 1%	Adjusted Gini	Share top 1%	Adjusted Gini
2009	0.511	0.466	13.8	0.540	12.3	0.532
2010	0.497	0.455	14.3	0.533	12.6	0.524
2011	0.48	0.442	14.1	0.521	12.6	0.512
Diff. 09-11 (p.p.)	-0.031	-0.024	0.3	-0.019	0.4	-0.019

Source: own calculations based on ECH and DGI micro-data, control income calculations and INE population projections and estimations.

Adjusted Gini indexes are higher than the uncorrected ones, rising approximately rise 3 percent points. It must be pointed out that, probably as a result of increasing difficulties in the ECH fieldwork to capture higher incomes, the gap among the adjusted and the real Gini index grows in the time span considered in this study. In all cases, the inequality decrease is still observed, although milder than in the case of the unadjusted Gini index.

IV.4. Income tax, redistribution and progressivity

Finally, we carried out an exploratory analysis of redistribution and progressivity effects of the personal income tax using the two data-bases considered in this study. We also computed effective tax rates by income strata. It must be recalled again that estimations based on DGI micro-data are carried out on potential tax payers and not on total households. One of the main objectives of this exercise is to obtain for the first time estimations based on real data resulting from DGI micro-data, and compare them with estimations based on adjusted ECH, which are necessary simulations as this data source gathers post-tax information.

Redistribution indexes allow to analyze the effect of a certain tax on inequality, carrying out static pre and post tax comparisons. The behavioral estimations of the redistributive effect of income taxation in Uruguay carried out by De Rosa et al (2011) and Amarante et al (2011), show no significant effects on labour supply.

Reynolds-Smolensky index computes the net effect of a certain tax/transfer by substracting the Gini after taxes to the Gini before taxes. Jointly considered, IRPF and IASS approximately reduce 2 percent points of the Gini index (Table 14). Results are very similar in tax-data and in adjusted ECH. The redistributive capacity of the tax remained steady across the three years. It must be remarked that, although the magnitude of the effect is very similar, the proportional reduction of inequality is considerably higher in ECH. This reduction is lower to the estimations by Paulus et al (2009) for European countries, where RS is around 0.04.

Calculations by source of income provide similar results in the two databases, although ECH seems to overestimate the redistributive impact of the income tax in the case of

labour earnings. To understand this difference, a more in detail analysis is needed, separating employees and self-employed as it can be the result of evasion and differences in declaration (as a proportion of the self-employed contribute for a notional value).

Capital income taxation yields a regressive pattern, which can result from the fact that those individuals at the top have a higher share of business profits than housing rents and hold a higher proportion of assets that are taxed at a lower rate. According to these results, taxation on capital income is reinforcing the already high inequality of the distribution of this source and it might be reducing the redistributive effect of the whole income tax.

Table 14. Redistribution indexes of income taxation in Uruguay. DGI micro-data and adjusted ECH. 2009-2011

Index	Total		Labour income		Pensions		Capital income	
	DGI	ECH	DGI	ECH	DGI	ECH	DGI	ECH
			2009					
Pre-tax Gini index	0.564	0.488	0.564	0.442	0.494	0.471	0.944	0.673
Post-tax Gini index	0.546	0.466	0.544	0.416	0.480	0.458	0.944	0.678
Average tax rate	0.051	0.051	0.055	0.056	0.031	0.027	0.106	0.082
Reynolds-Smolensky	0.019	0.021	0.020	0.025	0.014	0.013	0.000	-0.005
			2010					
Pre-tax Gini index	0.563	0.472	0.559	0.426	0.493	0.462	0.946	0.623
Post-tax Gini index	0.543	0.451	0.538	0.401	0.477	0.448	0.946	0.626
Average tax rate	0.054	0.049	0.057	0.052	0.033	0.028	0.104	0.103
Reynolds-Smolensky	0.019	0.021	0.021	0.024	0.015	0.014	0.000	-0.003
			2011					
Pre-tax Gini index	0.554	0.452	0.542	0.407	0.486	0.458	0.955	0.552
Post-tax Gini index	0.534	0.432	0.521	0.384	0.470	0.444	0.955	0.555
Average tax rate	0.055	0.047	0.058	0.049	0.034	0.029	0.100	0.116
Reynolds-Smolensky	0.020	0.020	0.021	0.023	0.016	0.014	0.000	-0.003

Source: own elaboration based on ECH and DGI micro-data, control income calculations and INE population projection/estimations.

Progressivity was analyzed computing Kakwani and Suits indexes (Table A 2 16). These indexes compare the Lorenz curve of pre income tax and the tax concentration curve in the case of the first index, and the equi proportional line in the second case. The higher the association among payment capacity and tax payments, the higher tax progressivity.

Results are in line with the previous comments: progressivity is observed in the case of total income, labour income and pensions, whereas capital income taxation is regressive. The differences among the results obtained from each data base are milder in the case of Suits index. Regressivity in capital taxation is lower when computed on household surveys, which is consistent with the results obtained in the previous section in regard to the truncation of the upper tail of the income distribution in this data source. Table A 2 17 shows that effective rates are progressional in the case of total income,

pensions and labour income, whereas they start to decline in the case of the higher income strata.

Finally, it must be recalled that the estimations presented in this section are restricted to formal labour income earners, pensioners and capital owners and might be very different to the ones usually computed based on household surveys and using pooled household income.

V. Final comments

In this research we carry out a first exploration of DGI income tax micro-data (IRPF and IASS). We compare this information with household survey micro-data and estimations based upon the NAS. We adjusted household survey income data to make it comparable with DGI micro-data.

Although this study covers a very short time span, it is a relevant one because it starts one year after the turning point in recent inequality trends. In fact, inequality started to fall in 2008, reverting the concentration trend of the previous ten years. In 2009-2011 a decline of 3 percent points in the Gini index computed upon household survey data is observed. Based on the analysis of primary income and pensions, in this paper we find a similar but milder trend in inequality reduction both in DGI and adjusted ECH data. Corrected Gini indexes yield the same results.

However, according to our estimations from income tax micro-data, the share of the top 1% did not decline in this period, and was situated around 12%-14%. This value is lower than the estimations for Colombia carried out by Alvaredo and Londoño (2013) and is higher than the ones available for developed countries, excepting for Switzerland and the US.

Household survey data underestimate the share of the top 1% in total income by approximately 3 percentage points. A worrying result is that they depict an opposite trend to the one observed in DGI data.

The income composition by source of the richer strata computed upon DGI micro-data and household surveys present a very different pattern, partly resulting from capital income underestimation in ECH. Similar to Colombia, and clearly different from available WTIDB data from developed countries, capital income predominates in the composition of the top income sectors in Uruguay.

The progressivity and redistribution analysis carried out for the universe of individuals included in DGI income tax records compared to adjusted ECH, shows that IRPF and IASS generate a moderate redistribution in total income, pensions and labour income. Meanwhile, taxation is slightly regressive in the case of capital income. Results are similar in ECH. The regressive effect of capital income might be resulting from the fact that income composition of the richest sectors is more intensive in those capital rents taxed at lower rates.

The study reveals an increasing difficulty of ECH for capturing very high incomes in a period of rapid economic growth. The increasing average income ratio DGI/ECH for the top 1% and higher fractiles can be considered as an illustrative example of this problem. There is a need of reinforcing supervision to the capture of top incomes in ECH. In this sense, computing adjusted inequality indexes might be useful for monitoring the

evolution of household survey data. A monitoring system following the capacity of household surveys to capture higher incomes can be generated based on income tax micro-data. The study also shows that Uruguay lacks of information referring to key aspects that are necessary to carry out accurate distributive analyses and to evaluate the quality of household surveys. Particularly, no information on the functional distribution of income has been published since 2005 and the NAS household income estimation has not been carried out since 1997. However, these data are available for many Latin American countries. Other related aspects to be considered rely in the harmonization of household survey data to correctly capture self-employment income, including more questions on the legal status of firms and the rewording the income questions that do not show coherent criteria.

It must be remarked that the use of tax data presents several caveats, notably those derived from evasion and elusion problems, which are even more acute in short periods, particularly those characterized by significant changes in the tax system. However, the access to income tax micro-data considerably expands the sources of information that can be used for distributional analysis in Uruguay. Moreover, DGI information can be integrated with other administrative records already used in research in Uruguay, such as the labour contributions histories gathered by BPS and the non contributive transfers administrative records, where individuals are singled out by the national identification number (*cedula*). At the same time, information on individuals and firms can be exploited in order to better understand the links between the personal and the functional distribution of income.

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Annex I. **Personal income taxation in Uruguay: IRPF and IASS**

In what follows we describe the main features of the Uruguayan personal income tax system. As mentioned in the body of the text, personal income taxation is based on Impuesto a la Renta de las Personas Fisicas (IRPF) and Impuesto de Ayuda a la Seguridad Social (IASS).

a) Impuesto a la Renta de las Personas Fisicas (IRPF)

IRPF Category II. Labour income

This group gathers labour earnings as employee or self-employed as well as inactivity subsidies. Wages, salaries, commissions, overtime payments, vacation payments, annual leave, End of the year payments, per diem stipends not subject to return and any other payments received from employers are considered taxable income. Unemployment, illness and maternity subsidies, accident insurance and unemployment benefits and child allowances are excluded. Minimum thresholds and progressional tax rates are depicted in Table A 1 1. Throughout the years, the minimum threshold has been increased, although in the period under study it remained steady.

Table A 1 1. Labour earnings tax rates by annual income bracket. Category II.

Income bracket (BPC)	July-Dec. 2007	Income bracket (BPC)	2008	Income bracket (BPC))	2009/12
0-30	0%	0-68	0%	0 - 84	0%
30-60	10%	68-120	10%	84 - 120	10%
60-90	15%	120 - 180	15%	120 - 180	15%
90-300	20%	180 - 600	20%	180 - 600	20%
300-600	22%	600 - 1200	22%	600 - 1200	22%
More than 600	25%	More than 1200	25%	More than 1200	25%

Source: based on information from DGI

The following deductions are allowed:

Deduction	
13 BPC for each child in charge aged less than 18	Person in charge of the child or it can be shared 50% mother and 50% father
26 BPC for each offspring or person in charge with disability	
Employee retirement contributions to the social security system	
Employee contributions to health insurance (FONASA), Fondo de Reconversión Laboral, al Fondo del Sistema Notarial de Salud and Cajas de Auxilios and Conventional Insurance	
Fondo de Solidaridad	

Source: DGI (2013)

Those individuals having only one occupation do not need to file a tax return, as the retention operates as one.

In the case of self-employed workers all their income generated out of salaried workers is considered, although if they are not contributing to the entrepreneurial income tax (IRAE) or to the income tax for non residents (IRNR). Self-employed workers with annual revenue higher than 4 million UI or those choosing to pay IRAE although they donot surpass that limit, will not be liable for IRPF. All self-employed workers can deduce up to 30% from their income. They pay through quarterly payments in advance and a final annual payment.

Capital income (Category I)

Capital rents are divided into financial and profit rents and rents from real estate capital and lease. The first group includes all cash or in-kind rents coming from bank deposit and other financial assets, business profits and utilities distributed by firms contributing to entrepreneurial income tax (IRAE), copyright among others. Among this group, public debt interests, gains obtained from private capitalization pension accounts and business profits distributed by firms with total annual revenue lower than 4.000.000 UI are exempt from IRPF and from filing a tax return. The same holds for the personal services sector if individuals choose for contributing IRAE. Banks, real estate agencies and institutions in charge of payments are set as retention agents. In case retentions did not correspond, individuals need to file a tax return. Tax rates are flat but they vary depending on the type of capital rent (Table A 1 2).

Table A 1 2. Tax rates by type of capital rent	
Concept	Tasa
Interests corresponding to bank deposits in Uruguayan currency or UI, more than one year lengh in local financial institutions	3%
Obligations and other debt titles interests-3 years or more (1)	3%
Interests for bank deposits to one year or more, in Uruguayan currency with no indexation clause	5%
Dividends or business profits paid or credited by IRAE contributors	7%
Dividends or business profits paid or credited by IRAE contributors originated in section ii) l literal C) d Art. 27 Section 7. (3)	12%
Copyright	7%
Remaining rents (real estate rents, lease, etc.)	12%

Source: DGI (2013).

Those individuals having housing rents whose anual value is below 40 Bases de Prestaciones y Contribuciones (BPC)[15] are not subject to IRPF, in case they authorize to make their bank information public and do not have other capital rents higher than 3 BPC a year.

Lease and housing rents income tax is payed through retention agents. In case this not applicable, individuals might carry out in advance payments and file a tax return at the end of the year.

b) Impuesto de Ayuda a la Seguridad Social (IASS)

IASS was created in July 2008 and taxes pensions delivered by resident institutions. Although IRPF originally included taxation on pensions, after a lawsuit it became a separate tax. As in the case of IRPF Category II, tax rates are progressional () and the tax is monthly withdrawn from pensioners' payments.

Table A 1 3. IASS tax rates by annual pension bracket	
Pension bracket (BPC)	Tasa
0 - 96	0%
96 - 180	10%
180-600	20%
More than 600	25%

[15] One BPC was $1.944 in 2009, $2.061 in 2010 and $2.226 in 2011. 1 dollar=20 Uruguayan pesos.

Annex II. Additional tables

Table A 2 1. Capital income sources contained in DGI micro-data. 2009-2011
Interests of bank deposits in Uruguayan currency or UI for an year length or less[16]
Interests of bank deposits in Uruguayan currency or UI for an year length or less with no adjustment clause for an year or more
Interest, obligations and other securities 3 years or more length
Copyrights
Profits, dividends and benefits
Sports rights
Participation certificates (issued by financial trusts)
Remaining financial and mobiliary capital
Real-estate capital
Capital gains
Dividends or benefits from IRAE contributors
Imputed rents by non resident entities

Source: DGI

Table A 2 2. Non-nominative and nominative capital income in DGI records. 2009-2011						
Source	Total			% Non-nominative		
	2009	2010	2011	2009	2010	2011
Interests corresponding to bank deposits in Uruguayan currency or UI, more than one year lengh in local financial institutions	200,177,067	207,476,333	197,622,867	99.8	100.0	97.5
Interests for bank deposits to one year or more, in Uruguayan currency with no indexation clause	224,943,540	297,942,780	349,128,240	99.9	100.0	98.3
Obligations and other debt titles interests-3 years or more	307,967,667	340,577,933	339,261,700	41.2	34.2	48.1
Remaining everlasting rents	92,564,589	80,914,986	98,991,457	100.0	100.0	100.0
Remaining financial and mobiliary capital rents	1,034,963,458	807,354,800	825,582,883	62.0	50.8	45.4
Dividends and utilities	3,680,400,143	6,805,858,529	10,091,469,971	30.7	39.3	42.7
Sportpersons royalties	31,462,192	4,598,900	99,002,983	10.4	2.5	54.0
Author royalties	41,000,000	42,600,000	43,500,000	0.0	0.0	0.0
Total	5,613,480,664	8,587,326,271	12,044,562,113	42.8	43.9	45.9

Source: DGI

[16] Due to the bank secrecy act, the number of cases in the two first rows of the table is extremely low (less than 10 per year), as they correspond to those persons who voluntary file a tax declaration.

Table A 2 3. Social security contribution rates by institutional sector. Uruguay. 2009-2011	
Occupation	Rate
Private employees	15%
Private-construction	17,8%
Private-financial system	17,5%
Public employees	15%
Public-police and military	13%
Public: city council employees	15%
Cooperative members	15%
Non salaried workers	15% (on notional values)

Source: BPS (2013)

Table A 2 4. Contribution rates to FONASA by income bracket. 2009-2011	
Income bracket	Rate
Less than 2.5 BPC	3%
More than 2,5 BPC, without children	4,5%
More than 2,5 BPC with children	6%
Additional spouses with 3 children or more (since 2011)	(+2%)

Source: BPS (2013)

Table A 2 5 Contribution rates to FONASA for pensioners. 2009-2011	
Income bracket	Rate
No FONASA	1%
FONASA - Less 2,5 BPC	3%
FONASA – More than 2,5 BPC	4,5%

Source: BPS (2013)

Table A 2 6. Income distribution by percentile and income source. 2009								
Percentile	Total income		Labour income		Pensions		Capital income	
	DGI	ECH	DGI	ECH	DGI	ECH	DGI	ECH
Decile 1	0.5	1.5	0.5	0.4	0.5	5.9	0.4	0.2
Decile 2	1.7	2.6	1.4	0.9	2.9	9.2	0.8	0.1
Decile 3	2.7	3.7	1.2	2.6	7.7	8.4	0.6	0.8
Decile 4	3.5	4.7	2.6	4.1	6.8	7.7	1.2	0.8
Decile 5	4.8	6.3	4.0	6.2	7.7	7.6	1.5	1.6
Decile 6	6.3	7.1	5.8	7.2	8.7	7.8	2.0	1.8
Decile 7	8.6	9.3	8.3	9.5	10.4	10.1	3.0	2.3
Decile 8	11.7	11.8	11.4	12.2	13.6	11.4	4.5	4.8
Decile 9	17.1	16.3	18.1	17.8	15.6	12.1	7.5	9.0
Decile 10	43.1	36.8	46.6	39.2	26.1	19.8	78.7	78.5
Top 1%	12.8	10.2	13.9	10.7	2.0	1.4	57.0	45.9
Top 0,5%	9.0	6.9	9.4	6.9	0.6	0.7	51.7	37.4
Top 0,1%	4.2	2.7	3.5	2.4	0.1	0.0	42.0	21.0

Source: own elaboration based on ECH and DGI micro-data.

Table A 2 7. Income distribution by percentile and income source. 2010								
Percentile	Total income		Labour income		Pensions		Capital income	
	DGI	ECH	DGI	ECH	DGI	ECH	DGI	ECH
Decile 1	0.5	1.7	0.5	0.5	0.6	6.3	0.4	0.2
Decile 2	1.8	2.8	1.3	1.0	3.4	9.5	0.7	0.2
Decile 3	2.7	3.9	1.0	2.7	8.1	8.7	0.5	1.0
Decile 4	3.6	5.1	2.6	4.5	7.0	7.7	1.1	1.2
Decile 5	4.8	6.2	4.0	6.0	7.9	7.6	1.3	1.9
Decile 6	6.4	7.8	5.8	8.0	8.9	8.1	1.9	2.5
Decile 7	8.6	9.3	8.5	9.8	10.1	8.4	2.6	3.7
Decile 8	11.7	11.9	11.7	12.3	13.1	11.2	3.6	5.7
Decile 9	17.0	16.4	18.2	17.8	15.2	12.5	6.4	9.9
Decile 10	43.0	34.8	46.2	37.3	25.7	19.9	81.4	73.8
Top 1%	13.2	8.5	13.9	9.1	1.9	1.6	61.8	38.3
Top 0,5%	9.4	5.4	9.3	5.6	0.6	0.8	56.5	30.8
Top 0,1%	4.4	1.9	3.3	1.7	0.1	0.2	45.7	17.4

Source: own elaboration based on ECH and DGI micro-data.

Table A 2 8. Capital income distribution by decile and source. ECH and DGI. 2009						
Percentile	Business profits		Housing rents		Other capital income	
	DGI	ECH	DGI	ECH	DGI	ECH
Decile 1	0.0	0.2	0.5	0.0	1.1	1.6
Decile 2	0.0	0.3	1.2	0.0	0.8	1.3
Decile 3	0.0	0.5	1.0	1.5	0.4	1.4
Decile 4	0.0	0.9	1.9	1.3	0.7	1.2
Decile 5	0.0	0.8	2.4	2.6	0.9	2.7
Decile 6	0.1	1.1	3.2	2.7	1.2	2.9
Decile 7	0.2	1.3	4.0	3.5	1.8	3.3
Decile 8	0.3	3.4	6.0	7.3	2.7	5.9
Decile 9	1.0	6.1	10.3	13.8	5.3	12.1
Decile 10	98.3	85.4	69.4	67.4	85.1	67.6

Source: own elaboration based on ECH and DGI micro-data.

Table A 2 9. Capital income distribution by decile of total income and source. ECH and DGI. 2010						
Percentile	Bussiness profits		Housing rents		Other capital income	
	DGI	ECH	DGI	ECH	DGI	ECH
Decile 1	0.0	0.2	0.6	0.0	1.3	1.2
Decile 2	0.0	0.1	1.4	0.0	0.8	0.3
Decile 3	0.0	0.2	0.9	1.5	0.5	1.4
Decile 4	0.0	0.8	2.2	1.7	1.0	1.6
Decile 5	0.1	0.5	2.7	2.7	0.8	3.7
Decile 6	0.1	0.4	3.8	4.1	1.7	3.3
Decile 7	0.1	1.6	4.7	5.6	2.1	2.3
Decile 8	0.3	2.0	6.5	8.2	2.8	7.6
Decile 9	0.7	5.1	10.9	13.7	5.0	14.8
Decile 10	98.7	89.0	66.3	62.3	83.9	63.7

Source: own elaboration based on ECH and DGI micro-data.

Table A 2 10. Capital income distribution by decile of total income and source. ECH and DGI. 2011						
Percentile	Bussiness profits		Housing rents		Other capital income	
	DGI	ECH	DGI	ECH	DGI	ECH
Decile 1	0.0	0.3	0.7	0.0	0.8	1.6
Decile 2	0.0	0.2	1.6	0.4	0.5	0.8
Decile 3	0.0	0.4	1.1	2.0	0.3	2.0
Decile 4	0.0	0.6	2.5	1.5	0.6	2.9
Decile 5	0.0	1.2	2.9	3.2	0.7	1.9
Decile 6	0.1	1.2	3.9	3.6	0.9	3.5
Decile 7	0.1	2.4	5.2	5.2	1.2	4.2
Decile 8	0.3	3.6	6.8	7.8	2.2	6.2
Decile 9	0.7	7.4	10.8	15.2	3.2	13.8
Decile 10	98.7	82.6	64.7	61.0	89.5	63.2

Source: own elaboration based on ECH and DGI micro-data

Table A 2 11. Income composition by source and total income percentile. ECH and DGI. 2009								
Percentile	Total income		Labour income		Pensions		Capital income	
	DGI	ECH	DGI	ECH	DGI	ECH	DGI	ECH
Decile 1	100.0	100.0	73.9	21.1	23.4	78.4	2.7	0.5
Decile 2	100.0	100.0	58.6	26.3	39.7	73.4	1.8	0.2
Decile 3	100.0	100.0	32.2	52.6	66.9	46.5	0.9	0.9
Decile 4	100.0	100.0	54.0	65.8	44.7	33.5	1.3	0.7
Decile 5	100.0	100.0	61.3	74.4	37.4	24.6	1.2	1.0
Decile 6	100.0	100.0	66.6	76.5	32.1	22.5	1.2	1.0
Decile 7	100.0	100.0	70.5	77.0	28.2	22.1	1.4	0.9
Decile 8	100.0	100.0	71.3	78.8	27.2	19.7	1.5	1.6
Decile 9	100.0	100.0	77.0	82.7	21.3	15.1	1.7	2.1
Decile 10	100.0	100.0	78.7	80.7	14.1	11.0	7.2	8.3
Top 1%	100.0	100.0	78.9	79.8	3.7	2.9	17.4	17.4
Top 0,5%	100.0	100.0	75.8	77.1	1.7	2.1	22.5	20.8
Top 0,1%	100.0	100.0	60.2	68.9	0.5	0.4	39.3	30.7

Source: own elaboration based on ECH and DGI micro-data

Table A 2 12. Income composition by source and total income percentile. ECH and DGI. 2010								
Percentile	Total income		Labour income		Pensions		Capital income	
	DGI	ECH	DGI	ECH	DGI	ECH	DGI	ECH
Decile 1	100.0	100.0	72.0	20.1	25.0	79.5	3.0	0.4
Decile 2	100.0	100.0	54.1	27.5	44.1	72.2	1.8	0.3
Decile 3	100.0	100.0	28.3	51.3	70.9	47.9	0.8	0.8
Decile 4	100.0	100.0	52.7	66.4	45.9	32.8	1.4	0.8
Decile 5	100.0	100.0	60.5	72.8	38.3	26.2	1.3	1.0
Decile 6	100.0	100.0	66.0	76.7	32.7	22.3	1.4	1.1
Decile 7	100.0	100.0	71.3	79.2	27.4	19.5	1.3	1.3
Decile 8	100.0	100.0	72.3	78.1	26.3	20.3	1.4	1.6
Decile 9	100.0	100.0	77.4	81.5	20.9	16.4	1.7	2.0
Decile 10	100.0	100.0	77.5	80.6	14.0	12.3	8.5	7.1
Top 1%	100.0	100.0	75.6	80.8	3.4	4.5	21.0	14.7
Top 0,5%	100.0	100.0	71.4	78.2	1.6	2.9	27.0	19.0
Top 0,1%	100.0	100.0	53.3	67.9	0.5	2.2	46.2	30.0

Source: own elaboration based on ECH and DGI micro-data

Table A 2 13. Income composition by source and total income percentile. ECH and DGI. 2011								
Percentile	Total income		Labour income		Pensions		Capital income	
	DGI	ECH	DGI	ECH	DGI	ECH	DGI	ECH
Decile 1	100.0	100.0	73.0	21.2	23.8	78.5	3.2	0.3
Decile 2	100.0	100.0	50.1	26.8	48.1	72.8	1.8	0.4
Decile 3	100.0	100.0	27.5	53.9	71.7	45.1	0.9	1.0
Decile 4	100.0	100.0	52.1	69.2	46.5	30.2	1.5	0.6
Decile 5	100.0	100.0	61.6	75.6	37.1	23.4	1.2	0.9
Decile 6	100.0	100.0	71.1	80.6	27.6	18.5	1.3	0.9
Decile 7	100.0	100.0	73.0	79.7	25.6	19.2	1.4	1.1
Decile 8	100.0	100.0	74.0	83.5	24.6	15.2	1.4	1.3
Decile 9	100.0	100.0	78.4	83.8	20.0	14.4	1.6	1.9
Decile 10	100.0	100.0	76.7	83.0	13.6	12.3	9.7	4.7
Top 1%	100.0	100.0	72.1	83.7	3.2	6.4	24.7	9.9
Top 0,5%	100.0	100.0	66.8	84.1	1.5	4.3	31.7	11.6
Top 0,1%	100.0	100.0	46.7	80.7	0.4	0.9	52.9	18.4

Source: own elaboration based on ECH and DGI micro-data

Table A 2 14. Income thresholds by percentile. 2009-2011. Control income 2

	2009			2010			2011		
Group	Pesos	US Dollars	PPP US Dollars	Pesos	US Dollars	PPP US Dollars	Pesos	US Dollars	PPP US Dollars
P50	60,718	2,690	3,279	68,556	3,418	3,527	87,216	4,516	4,282
P90	314,442	13,933	16,979	355,097	17,703	18,266	410,339	21,246	20,144
P99	1,006,637	44,605	54,354	1,141,568	56,911	58,723	1,295,735	67,088	63,610
P99.5	1,371,011	60,750	74,029	1,566,524	78,096	80,582	1,788,936	92,624	87,822
P99.9	2,812,833	124,638	151,881	3,404,418	169,720	175,124	3,965,503	205,318	194,674
P99.95	3,871,836	171,563	209,062	4,836,191	241,098	248,775	5,566,422	288,207	273,266
P99.99	8,817,033	390,687	476,082	11,721,012	584,327	602,933	13,254,996	686,290	650,712

Source: own estimations based on ECH and DGI micro-data, control income calculations and INE-CELADE population projections and estimations and *World Development Indicators*.

Table A 2 15. Tax units and average annual income by total income percentile.

Group	Tax units	Pesos	US Dollars	PPP US Dollars
		2009		
Total	2,313,671	170,629	7,561	9,213
Perc. 50 -10%	925,462	145,572	6,450	7,860
Perc. 90 -1%	208,228	500,842	22,193	27,043
Perc. 1 -0.5%	11,568	1,157,628	51,295	62,507
Perc. 0.5 -0.1%	9,253	1,831,140	81,139	98,874
Perc. 0.1 -0.05%	1,156	3,243,392	143,716	175,129
Perc. 0.05-0.01%	925	5,344,851	236,833	288,599
Perc. 0.01%	231	24,293,793	1,076,471	1,311,760
		2010		
Total	2,331,494	195,535	9,748	10,058
Perc. 50 -10%	932,581	165,983	8,275	8,538
Perc. 90 -1%	209,832	564,220	28,128	29,024
Perc. 1 -0.5%	11,657	1,316,640	65,638	67,728
Perc. 0.5 -0.1%	9,326	2,128,688	106,121	109,500
Perc. 0.1 -0.05%	1,165	3,989,890	198,908	205,241
Perc. 0.05-0.01%	932	6,905,714	344,270	355,232
Perc. 0.01%	233	27,461,692	1,369,046	1,412,638
		2011		
Total	2,349,685	224,125	11,604	11,003
Perc. 50 -10%	939,827	198,764	10,291	9,758
Perc. 90 -1%	211,471	643,625	33,324	31,597
Perc. 1 -0.5%	11,748	1,497,950	77,558	73,537
Perc. 0.5 -0.1%	9,397	2,448,794	126,789	120,216
Perc. 0.1 -0.05%	1,174	4,648,035	240,656	228,180
Perc. 0.05-0.01%	939	7,922,278	410,183	388,919
Perc. 0.01%	235	34,580,525	1,790,438	1,697,620

Source: own estimations based on ECH and DGI micro-data, control income calculations and INE-CELADE population projections and estimations.

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Table A 2 16 Progressivity indexes. IRPF and IASS in income tax micro-data and adjustede ECH. 2009-2011

	Total income		Labour earnings		Pensions		Capital income	
	DGI	ECH	DGI	ECH	DGI	ECH	DGI	ECH
			2009					
Kakwani progressivity index	0.346	0.403	0.345	0.433	0.452	0.475	0.001	-0.049
Vertical inequality	0.019	0.021	0.020	0.025	0.014	0.013	0.000	-0.004
Reranking	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Suits index	0.557	0.558	0.562	0.559	0.718	0.732	-0.032	-0.095
			2010					
Kakwani progressivity index	0.341	0.411	0.341	0.441	0.449	0.482	0.003	-0.025
Vertical inequality	0.019	0.021	0.021	0.024	0.015	0.014	0.000	-0.003
Reranking	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Suits index	0.537	0.564	0.544	0.562	0.704	0.729	-0.035	-0.045
			2011					
Kakwani progressivity index	0.343	0.413	0.349	0.444	0.451	0.479	0.001	-0.020
Vertical inequality	0.020	0.020	0.021	0.023	0.016	0.014	0.000	-0.003
Reranking	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
Suits index	0.525	0.555	0.537	0.554	0.693	0.710	-0.040	-0.028

Source: own elaboration based on ECH and DGI micro-data

Table A 2 17. Effective tax rates by income source in DGI micro-data and adjusted ECH								
2009								
Percentile	Total income		Labour earnings		Pensions		Capital income	
2009								
	DGI	ECH	DGI	ECH	DGI	ECH	DGI	ECH
Decile 1	0.4	0.0	0.1	0.0	0.0	0.0	11.7	7.2
Decile 2	0.2	0.0	0.0	0.0	0.0	0.0	11.9	9.0
Decile 3	0.1	0.1	0.0	0.0	0.0	0.0	11.9	10.8
Decile 4	0.2	0.1	0.0	0.0	0.0	0.0	11.9	10.5
Decile 5	0.2	0.1	0.0	0.0	0.0	0.0	11.9	10.6
Decile 6	0.2	0.1	0.0	0.0	0.0	0.0	11.9	9.9
Decile 7	0.2	0.2	0.0	0.1	0.0	0.3	11.3	10.1
Decile 8	0.5	1.6	0.3	1.3	0.6	2.0	11.3	10.1
Decile 9	3.1	4.6	2.9	4.5	3.0	4.2	11.4	10.2
Decile 10	10.6	11.1	10.8	11.7	9.7	9.6	10.3	7.7
Top 1%	14.4	14.3	15.6	16.1	12.8	10.3	10.0	6.8
Top 0,5%	14.9	14.8	16.8	17.2	11.3	10.3	9.9	6.7
Top 0,1%	15.0	15.8	19.5	19.8	8.8	9.9	9.8	6.9
2010								
Decile 1	0.4	0.1	0.1	0.0	0.0	0.0	11.4	37.4
Decile 2	0.2	0.1	0.0	0.0	0.0	0.0	11.7	25.2
Decile 3	0.1	0.1	0.0	0.0	0.0	0.0	11.7	14.4
Decile 4	0.2	0.1	0.0	0.0	0.0	0.0	11.8	17.5
Decile 5	0.2	0.1	0.0	0.0	0.0	0.0	11.8	13.6
Decile 6	0.2	0.1	0.0	0.0	0.0	0.0	11.8	13.8
Decile 7	0.2	0.4	0.0	0.2	0.0	0.7	11.6	13.4
Decile 8	1.2	2.1	0.9	1.7	1.6	2.3	11.4	25.8
Decile 9	4.0	4.7	4.0	4.6	3.8	4.3	11.2	12.9
Decile 10	11.0	10.6	11.3	10.6	10.4	9.6	9.7	12.1
Top 1%	14.0	13.8	15.9	14.3	13.0	10.9	9.4	11.8
Top 0,5%	14.3	14.6	17.1	15.2	11.2	10.8	9.4	11.4
Top 0,1%	13.5	15.8	19.8	17.0	8.4	6.3	9.3	10.9
2011								
Decile 1	0.4	0.1	0.1	0.0	0.0	0.0	11.4	37.4
Decile 2	0.2	0.1	0.0	0.0	0.0	0.0	11.7	25.2
Decile 3	0.1	0.1	0.0	0.0	0.0	0.0	11.7	14.4
Decile 4	0.2	0.1	0.0	0.0	0.0	0.0	11.8	17.5
Decile 5	0.2	0.1	0.0	0.0	0.0	0.0	11.8	13.6
Decile 6	0.2	0.1	0.0	0.0	0.0	0.0	11.8	13.8
Decile 7	0.2	0.4	0.0	0.2	0.0	0.7	11.6	13.4
Decile 8	1.2	2.1	0.9	1.7	1.6	2.3	11.4	25.8
Decile 9	4.0	4.7	4.0	4.6	3.8	4.3	11.2	12.9
Decile 10	11.0	10.6	11.3	10.6	10.4	9.6	9.7	12.1

Top 1%	14.0	13.8	15.9	14.3	13.0	10.9	9.4	11.8
Top 0,5%	14.3	14.6	17.1	15.2	11.2	10.8	9.4	11.4
Top 0,1%	13.5	15.8	19.8	17.0	8.4	6.3	9.3	10.9

Source: own elaboration based on ECH and DGI micro-data