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Resumen

Varios estudios basados en datos de encuestas de hogares muestran que los países de América Latina experimentaron una caída significativa en la desigualdad de ingresos personales en los últimos quince años. Sin embargo, las estimaciones disponibles basadas en registros de impuestos sugieren que estas tendencias son sensibles a la fuente de datos y al indicador de desigualdad. Al mismo tiempo, la interacción entre los niveles de persistencia en las posiciones a lo largo de la distribución del ingreso y la desigualdad a mediano y largo plazo en la region ha sido escasamente estudiada.

En base a datos provenientes de registros tributaries de imposición a la renta personal y de las empresas compilados que cubren al 70 % de la población uruguaya de 20 años o más, en este trabajo analizamos la evolución de la distribución de ingresos primarios de 2009-2016 y la comparamos con estimaciones basadas en micro encuestas de hogares hogares (ECH) especiamente armonizadas. También investigamos la dinámica del ingreso, enfocándonos en las tasas de persistencia en las posiciones altas. Nuestros resultados muestran que: (1) los índices de desigualdad de ingresos de Gini y Theil antes y después de impuestos disminuyeron en ambas fuentes de datos en 2009-2013, con una caída más leve en los registros tributarios que en las ECH armonizadas. Al mismo tiempo, la información de los registros de impuestos sugiere que todo el proceso de reducción de la desigualdad ocurrió dentro del 99% inferior; (2) las estimaciones basadas en registros impositivos de la participación en el ingreso del 1% superior se mantuvieron estables cerca del 14 % en 2009-2014 y crecieron posteriormente; (3) las posiciones en la distribución del ingreso fueron muy estables: en el 1% superior, las tasas de persistencia promedio fueron cercanas al 80%; (4) la comparación entre las medidas de desigualdad anuales y permanentes basadas sugiere que el efecto igualador de la movilidad del ingreso es muy modesto, al menos durante el corto período considerado en esta investigación (reducción de 2.1 pp y 0.3 pp en el índice de Gini y el top 1% de participación en los ingresos respectivamente).

Palabras clave: ingresos altos, distribución del ingreso, movilidad, tributación a la renta, registros tributarios, Uruguay

Código JEL: D31, H24, O54

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Is the recent inequality fall in Latin America a data-driven illusion? Top income shares and mobility patterns in Uruguay 2009-2016

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Abstract

Although many studies based on household survey data show that Latin American countries experienced a significant fall in personal income inequality in the last fifteen years, tax records evidence for specific countries suggests that these trends are sensitive to the data source and inequality indicator. At the same time, there is limited evidence on the interplay between persistence levels in positions along the income distribution and medium and long run inequality. Using a unique array of longitudinal personal and firm income tax micro-data that covers 70% of the Uruguayan population aged 20 and over, we analyze the 2009-2016 evolution of primary income distribution and compare it to estimations based on harmonized household surveys micro-data (ECH). We also investigate income dynamics, focusing on persistence rates in top positions. Our findings show that: (1) pre and post-tax Gini and Theil income inequality indices decreased in both data-sets in 2009-2013, with a milder fall in tax records compared to harmonized ECH. At the same time, tax records information suggests that the whole inequality reduction process occurred within the bottom 99%; (2) tax records based estimates of top 1% income shares remained steady near 14% in 2009-2014 and grew thereafter; (3) positions at the income distribution were very stable: at the top 1% average persistence rates were close to 80%; (4) comparisons between annual and permanent income-based inequality measures suggest that the equalizing effect of income mobility is very modest, at least for the short period considered in this research (2.1 p.p. and 0.3 p.p. reduction in the Gini index and the top 1% income share respectively).

Keywords:top incomes, income inequality, mobility, personal income taxation, tax records, Uruguay. **JEL classification:** D31, H24, O54

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1 Introduction

Many studies attest that in the first fifteen years of this century, most Latin American countries experienced a substantial fall in monetary poverty and personal income inequality (41; 24; 7). While this decline was very fast in 2000-10, it continued at a slower pace in the next five years and, in almost all countries, it came to an end around 2015[1]. In spite of this recent fall, income concentration in Latin America is still very high compared to most regions in the world (7) and the paths and public policies needed to promote further reductions are an open academic and public debate.

Inequality reduction in Latin America was rather peculiar because at the same time the remaining regions of the world were moving in the opposite direction. Most analysts highlight three main reasons underlying this evolution (with ingredients varying depending on the country): i) a reverse to the mean after the substantial inequality increase observed in the previous decade; ii) exceptional economic growth rates resulting from the the commodity boom and an extremely favourable international context and; iii) a comprehensive package of redistributive reforms (33). In turn, a worsened international scenario and the need of deeper reforms to maintain the redistributive process can be associated to the post 2013 evolution.

However, to date, most of the available research on the recent evolution of inequality in Latin America has been based on household survey information, which might be subject to under-reporting and to the problem of the "missing rich" (2; 50; 28; 25; 18). In fact, the findings of the tax-returns based top incomes research (45; 15) have reinvigorated the discussion on the validity of survey data to provide accurate inequality estimates. In this vein, evidence based on personal income tax records for Argentina, Brazil, Chile and Colombia casts doubts on the magnitude of the inequality reduction and even on its trend, suggesting that conclusions are very sensitive to the data source, choice of inequality measure (3; 8; 32; 44), unit of analysis and income sources considered.

Since most income tax schemes are based on individual tax units, top incomes studies are not able to recover households. In general, tax records micro-data lack of information from non contributory cash transfers and other equalizing income sources. In this sense, comparisons among household surveys and tax records based inequality measures are not straight forward. Thus, much work needs to be carried on to reconcile these two strands of the literature and provide a consistent story of the trends observed in each data source.

To contribute to this ongoing discussion, this study provides evidence for Uruguay on the evolution of inequality among income receivers for the time span 2009-2016. Uruguay is a low inequality country in the Latin American context. However, inequality started to fall in 2008, later

[1]However, Tornarolli et al. (51) identify further inequality reductions in specific Latin American countries in 2014/15.

than in most countries of the region (SEDLAC, 2019; ECLAC, 2019)[2]). Previous studies report a significant decrease from 2008 to 2013, with per capita household income Gini index falling from 0.45 to 0.40, and stability thereafter ((26)). Thus, this study covers the period of apparently rapid decline and its later slowdown.

At the same time, in order to explore the extent and depth of redistribution, we exploit the panel nature of the tax data and assess persistence in the income ranking across the whole income distribution, particularly focusing on top positions. Recent studies for developed countries indicate that there is high persistence in the upper tail of the distribution (1; 16; 38; 36). Besides, in the Latin American and Uruguayan cases, the lack of panel data has hindered the analysis of intra-generational income and employment mobility, which has been mainly based on household survey pseudo panels or very short run panels.

As mentioned before, this study draws on a rich and comprehensive administrative personal income tax data-base (Impuesto a la Renta de las Personas Físicas -IRPF- and Impuesto a la Seguridad Social-IASS), that has been matched to the corresponding firms' balance sheets submitted to the tax authorities (Dirección General Impositiva, DGI) between 2009 and 2016. These micro-data have been anonimyzed by DGI for research purposes and include the universe of formal workers (despite having earnings below the minimum tax threshold), capital income earners and pensioners. Considered as a whole, it comprises 70% of the adult population aged 20 and more.

Based on the methodology proposed by Atkinson (2007), we combine tax records micro-data with household survey data (Encuesta Continua de Hogares, ECH) to include informal workers and individuals who donot receive income (non earners). We present several robustness checks to support our main conclusions[3].

Since personal income taxation in Uruguay was restored in 2007 (after a 33 years interruption), the use of administrative records for research purposes is very recent. Based on personal income tax records, Burdín et al. (21), (20) and (Burín et al.) analyse a shorter period (2009-2011 and 2009-2012) concluding that although levels are always higher than in household surveys, trends vary depending on the inequality measure. In this research, we provide estimations for a larger time-span 2009-2016 and also improve significantly the information on capital income by exploiting the newly acquired employers-employees data-base.

This study contributes to the existing literature in three main avenues. First, we add further evidence on the evolution of primary income inequality in Latin America among adults. Differently to previous studies, our findings support the hypothesis that there was a real decline in income

[2]In fact, household survey information reveals that the concentration trend that peaked with the 2002 severe economic crisis remained until 2008 (Amarante et al. (11)

[3]One of the facts explaining the wide coverage of the adult population of the data base used in this study derives from the fact that informality rates in Uruguay are lower than in most Latin American countries. Since 2006, there was also an explicit policy promoting formalization: whereas in 2009 social security coverage rates were 67.8% of total workers and 80.6% among salaried workers, in 2016 these figures rose to 74.7% and 87.9% respectively. Although in Uruguay there is a family tax return option available, 98.5% of the individuals in our data-base choose the individual regime

concentration when assessed on the basis of synthetic indices. However, in the same period, top income shares were stable and started to rise after the inequality reduction was over. We also present confidence intervals and robustness checks in top income shares estimations. We also add evidence on the meagre effect of personal income taxation in Latin American countries by showing that in the Uruguayan case tax progressivity is high, but average effective rates are low and, thus, redistributive effect is moderate. Secondly, we provide evidence on the source composition and earners' gender across the income distribution, confirming the high share of capital earners at the top and the under-representation of women among top income groups. Thirdly, we provide evidence on intra-generational top income mobility, adding to the emerging literature on this topic. Our estimations clearly convey high persistence rates, with larger values for top fractiles. These results suggest that the depth of inequality reduction was not translated into significant re-ranking among earners. At the same time, mobility has a very modest effect on medium term inequality.

As it is the case of most top incomes research, besides the standard limitations of tax data, a relevant caveat of this study comes from the fact that the unit of analysis are income receivers and we are not able to observe how these individual incomes are combined in households. Thus, we are leaving aside homogamy, fertility differentials and other relevant features that affect household conformation and can amplify or mitigate primary income inequality. Since in Uruguay they are not included in taxable income, we are also not considering relevant income sources such as the value of owner-occupied housing, and private and non-contributory public transfers. [4]

The remainder of this paper is organized as follows. Section 2 reviews previous research on inequality and top incomes in Latin America and in Uruguay. Section 3 describes the data sources and methodology used in this study. Section 4 analyzes the main results and Section 5 concludes.

2 Inequality, top incomes and mobility patterns in Latin America

We first present a short overview of international studies assessing the accuracy of household surveys to capture the different income sources, with focus on the discussion on top incomes and income mobility (2.1). After that, we review the existing evidence on top income shares in Latin America (2.2) and the recent evolution of inequality in Uruguay (2.3).

2.1 Primary income distribution and top income shares

Considering the caveats of household surveys to capture income from top income earners and the short time span they cover, distributional studies have recovered the tradition of analyzing

[4] Many studies show that both in LAC, the latter played a key role in inequality reduction (41; 24; 7). Moreover, in the case of Uruguay, household survey based studies conclude that the static contribution of child benefits and other cash transfers is similar to the equalizing effect of the income tax (19; 11).

income tax administrative records information (30; 13; 15). Thus, the related literature on top incomes has been notably expanded over the last three lustrums (45; 15; 6). These studies show that synthetic 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 (39; 4). In spite of this, Leigh (39) argues that the top 1% estimates are a good proxy of Gini indices rankings across countries.

As mentioned in the introduction, due to informational constraints, tax records based studies mainly assess inequality on the basis of individuals and primary income. Depending on the tax regime and the definition of taxable income, in most cases this information does not allow to reconstruct households and consider the whole set of income sources, which might be the relevant unit for many assessments and, particularly, for policy design. At the same time, these data are subject to evasion and avoidance and behavioural responses to changes in tax rates. For instance, Feenberg and Poterba (30) assess the participation of top income groups in the United States 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.

Thus, a bulk of the literature has been trying to create harmonized series to carry out more accurate comparisons among data sources. For instance, Burkhauser et al. (23) analyze inequality trends in household surveys and personal income tax data for the United States in 1967-2006, previously harmonizing the Current Population Survey to make it consistent with administrative data. They find that once income and tax units are consistently defined across data sources, differences are shortened, even though modifications in the tax system and survey design may explain differential trends, particularly in 1993-2000. In order to overcome these caveats, the recent literature has been moving forward to provide a common ground by developing new methods that combine household survey and tax data to ensure that the upper tail is properly captured (37; 5; 46; 12; 17). However, to date, there is not a consensus on which is the "benchmark" distribution and there is an ongoing discussion on the appropriate correction methods. As we describe in detail later in this paper, to overcome this problem we add household survey micro-data to the tax records universe.

Meanwhile, there are scarce studies assessing top income receivers mobility. The headline finding of the existing studies is the high persistence in the upper tail of the distribution compared to the remaining income strata (1; 16; 38; 36). There is also limited evidence on the interplay among inequality and mobility. In the case of Norway, Aaberge et al. (1) observe augmented top incomes mobility coexisting with increased shares at the top of the distribution.

2.2 The recent evolution of top income shares in Latin America

In Latin America, the first attempts to correct household survey income underreporting can be traced to Altimir (2)'s adjustment to national accounts included in Economic Commission for Latin America (ECLAC) inequality estimations. However, this methodology has shown to have many caveats (many of them coming from the quality and paucity of national accounts information) and recently ECLAC discontinued this procedure.

Despite a long-standing tradition of distributional studies in Latin America, research focused on top income groups has been less frequent, partly due to data availability, to the weaknesses of income taxation in the region and to the lack of covariates. To date, there is available evidence for Argentina (3); Colombia (8); Brazil (49; 44); Chile (40; 29; 32) and Uruguay (21; 27). However, many of these studies cover a shorter period than the top incomes scholarship for developed countries and rely on tabulations for some years or use micro-data that cover tax-payers or the upper income strata. In regard to the period of recent decline, the bulk of these studies find different inequality trends depending on the data source (Table 1). For instance, Alvaredo and Londoño Velez (8) find that top income shares in Colombia remained steady (around 20%) in the period that household survey-based Gini indices fell (2006-2010), even when corrected for underreporting with tax data information. In turn, Flores et al. (32) find opposite trends for Chile, with an increase in tax based top income shares since 2000, which combined a period of short decline in 2010 and 2013, and then continued raising (under different assumptions, in 2015 shares fluctuated between 23 and 27%). Souza and Medeiros (49) analyze the case of Brazil between 2006 and 2012 and report stability using a tax-based correction on household survey top income shares (around 25%) and Gini indices. However, the more striking results come from Morgan (44), who analyzes a longer time span combining household survey and tax information following the DINA guidelines and finds a trend towards increased or steady concentration in Brazil, contradicting most of the previous research that unanimously identified a consistent and long time span of rapid inequality decline (41) Paes de Barros, Fogely and Ulyssea (2006); Ferreira, Firpo and Medina, 2014 However, he finds that labour income inequality declined which is consistent with the type of income captured by household surveys.

Even when tax records are available, identifying correctly capital income can be difficult due to the design of tax systems and particularly the interplay among firm and personal income taxation. For instance, in their study for Chile covering 2005-2009, Fairfield and Jorratt De Luis (29) and Flores et al. (32) use information from individuals and firms tax returns forms and impute accrued profits and accumulated retained profits to taxpayers using ownership shares calculated directly from businesses tax-return forms. Although levels are extremely sensitive to this procedure, trends do not vary.

Finally, intra-generational mobility studies for Latin America are also scarce and mostly rely on pseudo -panels. Therefore, there are no studies assessing persistence patterns among top

Table 1: Top income shares and Gini index in Latin American countries

Country	Year	Top 1% share (primary income)	Source	Gini coefficient (per capita household income)
Argentina	2001/06	14.3 / 16.8%	Alvaredo (3)	0.504 / 0.493
Brazil	2001/15 2005/12	26.3/ 27.5% 22.7 / 26.4%	Morgan (44) Souza and Medeiros (49)	0.583 / 0.513 0.556 / 0.526
Chile	2000/15	20.2 / 23.7%	Flores et al. (32)	0.526 / 0.448
Colombia	2007/10	20.7 / 20.4%	Alvaredo and Londoño Velez (8)	0.59 / 0.554

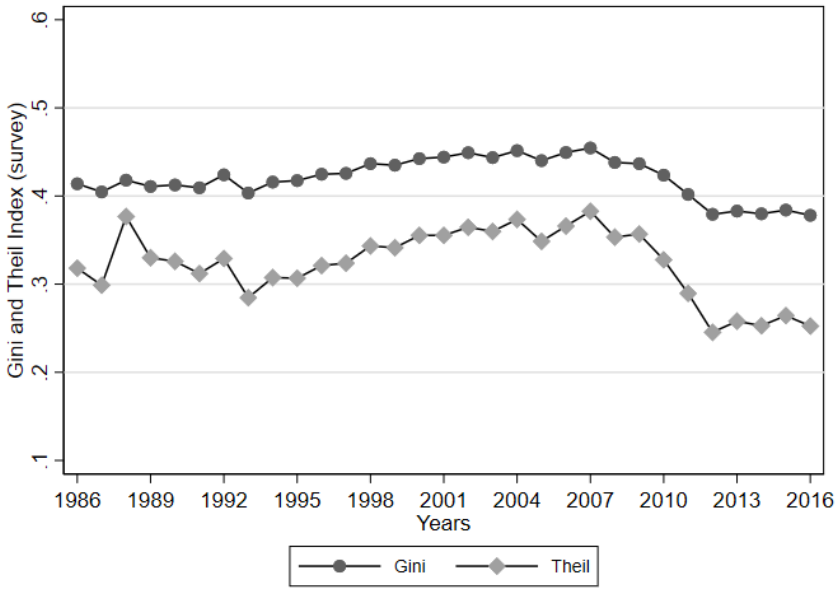
Source Top income shares: Alvaredo (3); Morgan (44); Souza and Medeiros (49); Flores et al. (32); Alvaredo and Londoño Velez (8). Source Gini indices: SEDLAC (2019)

income earners.

2.3 Recent inequality trends in Uruguay

In the case of Uruguay, inequality reduction observed between 2008 and 2013 resulted from a combination of outstanding economic growth and employment rates and a comprehensive package of redistributive reforms promoted after the centre-left coalition Frente Amplio took office in 2005 (Figure 1). Although it is difficult to single out their effect, most studies point out the role of increased minimum wages, restoration of centralized wage-setting mechanisms, a tax reform including the reinception of personal income taxation in 2007 and a significant expansion of non-contributory cash transfer schemes (11). Based on a comprehensive personal income tax records data-base for Uruguay, that covers 70% of the adult population, Burdín et al. (21), (20) and (Burín et al.)analyze a very short span (2009-2012) concluding that inequality levels are always higher than in household surveys, whereas trends vary depending on the inequality measure. While synthetic indices (Gini and entropy family) show a decline both in tax records and household surveys, top income shares remained stable in the former while fell in the later. As trends differ, during the period under study, the gap between ECH and tax records based estimations grew: while in 2009 the top 1% accumulated 10.2% in the former and 11.1 in the later, by 2011 these figures were 9.1 and 13.5% (21). Although when under-performing compared to most OECD countries direct taxation schemes, personal income taxation in Uruguay has a higher redistributive effect than most countries in the region (42)

Figure 1: Gini and Theil indices. Per capita household income, 1986-2016



Source: own calculations based on ECH micro-data.
Notes: Per-capita household income includes all cash and in-kind income sources and rental imputed income.For a complete description of the household survey, see Section 3.

3 Data and methodology

We first describe the main features of the data-bases used in this research (3.1) and then present the methods implemented to estimate the top income shares and the remaining inequality measures (3.2). Finally, we turn to the assumptions and procedures underlying the mobility analysis (3.3).

3.1 Income tax micro-data

The Uruguayan tax system is mainly based on indirect taxes, which roughly represent 65% of total fiscal revenue. Personal income tax was originally established in 1961, but jointly with inheritance taxation it was abolished in 1974 by the de facto regime that ruled Uruguay during 1973-1985. Framed in an overarching tax reform, a new and more comprehensive personal income scheme was passed in 2006. The reform introduced a dual personal income tax (Impuesto a las Retribuciones de las Personas Físicas, IRPF), combining a progressive tax schedule on labour income with a flat tax rate on capital income and a corporate income tax (Impuesto a las Retribuciones de las Actividades Económicas, IRAE). Although pensions were originally included in IRPF, 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). Details on tax rates for the three taxable income sources

can be found in Tables A.1, A.2 and A.3. Although tax units are individuals, married couples can fill a joint labour income tax return. In practice, only 1.8% of the taxpayers choose this regime. In Uruguay, the fiscal year coincides with the calendar year. Table A.4 depicts average income for different fractiles in current terms. In most brackets, a substantial increase in current and real incomes can be noticed.

DGI created anonymized databases for research purposes that put together the universe of IRPF and IASS potential tax payers for 2009-2016 and include in detail information on capital, pension, labour income for each occupation, tax burden and deductions (Table A.5). Additionally, each record contains information on sex, age, industry, and whether the individual is a salaried worker or self-employed. The database covers 70% of the population aged 20 years and more[5]. Although there are no official estimations available for the Uruguayan case, as it has been widely stated in the top incomes literature (13), our database might be subject to tax evasion and avoidance.

Since the Social Security Institute (Banco de Previsión Social, BPS) acts as the retention agent, the information on labour earnings and pensions included in the micro-data comprises the universe of workers contributing to the social security and pensioners, despite being net tax payers or not. Thus, these data cover the whole universe of formal workers and contains monthly and annual income and taxes. From Table A.5 it can be noticed that in 2009, only 26% of labour earners had incomes above the minimum taxable, whereas in 2016 this proportion rose to almost 59%. Respectively, these figures were 16% and 24% in the case of pensioners.

Additionally, DGI provided a supplementary database with information on income and taxes of those personal services societies that chose to pay corporate income tax (Impuesto a las Retribuciones de las Actividades Económicas, IRAE) instead of IRPF (see row IRAE in Table A.5). This option is available for liberal professionals and, thus, this earnings can be assimilated either to mixed or labour income. In this study we group it within labour earnings but disaggregate it for specific analyses.

Capital income was divided in the following categories: profits and dividends; housing rents; interests from bank deposits and; other capital income. Capital gains were excluded. Due to the bank secrecy act and to previous regulations that allowed firms to issue bearer shares, we did not access to micro-data on interests and non nominative profits.

From Table A.6 it can be noticed that while the first is not a relevant concern, non nominative profits account for a half of total profits. In recent years, to comply with international regulations (Basel agreement), Uruguay restricted the issuance of bearer shares. In spite of this, the composition looks steady in the period under analysis. Thus, the trespassing from non nominative to nominative profits does not seem to be a relevant concern.

Since we lacked information on the characteristics of non nominative profits receivers, to

[5]The remaining 30% is composed by informal workers (38,9%), unemployed (10,9%) and individuals out of the labour force not receiving pensions or capital income (50.2%).

distribute the total amount among individuals in the tax-records micro-data, we followed the same criteria as in the Uruguayan implementation of the Distributional National Accounts guidelines (27). Thus, we distributed these two income sources among capital income earners proportionally to their share in the nominative capital income distribution.

In turn, corporate tax declarations and balances are available for the sub-set of firms with revenues above 40.000 U$S a month, that are entitled to compulsory provide annual balances at DGI. For this subset of firms, we were able to match individuals appearing in the tax records micro-data to the balances of the firms that are their employers or they own. In this way, it is possible to compute accrued, reinvested, undistributed and distributed profits by each firm for each fiscal year.

It is noteworthy that until 2018 firms were allowed to maintain undistributed profits without any time limit, instead of declaring formal profit withdrawals (taxed at a 7% personal income rate additional to the 15% rate on corporate income), many owners took cash advances. Since these payments are singled out in the firms balance sheets data-base, we were able to reconstruct the actual distribution of capital income had these payments in advance been declared as distributed profits. Our estimations show a surprisingly low number of profit withdrawals per year (less than 10% of the firms distributed benefits) and this is partly explained by payments in advance representing a large proportion of distributed profits. To overcome this problem, we used the merged firm-employees and other income receivers data-base previously described.

Based on firms balance sheets, we first compute for each year the amount of undistributed profits. Secondly, based on the balance line indicating "share-holders/owners withdrawals in advance", we compute the potentially undistributed profits and check whether the firm also distributed profits during the same year or the next. If the firm has a positive value in "potentially undistributed profits" and in the next year profits were distributed and these accounts fall to zero, we only consider the actual distributed profits. This check explains why we do not consider 2017 in our estimations.

Since we lack information that allow us to identify business owners or share-holders and we only can label as such to those individuals withdrawing profits, we assign the "potential profits withdrawals" amounts based on three different assumptions. In the first one, we distribute these additional profits among all the individuals we can identify as firm owners based on different years withdrawals. In those cases in which we did not have this information, we created new individuals . Secondly, we distributed profit withdrawals among top labour income earners. Third, we combined the two previous criteria and created additional individuals in case the firm does report workers and profit withdrawals in the time span considered in this study. The three criteria yield to the same results, so we stick to the latter one. The final number of newly created individuals was between 0,09 and 0,11% depending on the year (see Table A.7).

3.1.1 The Uruguayan household surveys

The National Statistical Office (INE) gathers household surveys (Encuestas Continuas de Hogares, ECH) since 1968. At present, ECHs are nationally representative and are carried out throughout the whole year. They collect information in detail on household composition, labour force status and outcomes, socioeconomic variables and personal income by source. Further methodological details can be found in INE (2019).[6].

After-tax labour 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 owner (separately recording the main occupation and the remaining ones). The survey also gathers information on the contributory status of the labour force in each occupation.

Except for profit withdrawals by the self-employed and business owners, capital income is captured in the household questionnaire, which implies that each item is added up for the whole household and attributed to the household head. The questionnaire also gathers interests, dividends, rents, benefits and imputed value of owner occupied housing.

Transfer income is separately collected for each individual and origin (public/private, domestic/remittances), including pensions (retirement and survival), child allowances, unemployment insurance, accident compensation and other non contributory benefits.

As in other regions, the accuracy of household surveys has been a longstanding discussion in Latin America (Altimir (2); Szekely and Hilgert, 1999). In the same vein, uring the 1990 decade, several studies analyzed the accuracy of ECH to capture household income by source compared to National Accounts and expenditure surveys (34; 43; 10). More recently, Amarante et al. (9) find that ECH captures 39.7% o and 23% of the total amount of housing rents and interests on bank deposits. Based on a subsample of households with children aged 0 to 3 that gathered ID numbers and was merged to tax records, Higgins et al. (35) find the expected misreporting pattern: overreporting in ECH below the median and underreporting thereafter. In the case of the top 1% ECH captures 56% of DGI income.

In order to harmonize ECH information with the income tax micro-data, we computed income for formal workers, pensioners and capital earners and restricted income sources to the ones captured in DGI micro-data (see Burdín et al. (21) for details).

3.2 Top income shares estimation: population and income controls

In order to estimate top income shares, we start by defining population and income control totals Atkinson et al. (15). As tax micro-data are restricted to formal workers, capital income earners and pensioners, it is necessary to supplement this information by defining a reference population. The standard practice in top income studies is considering individuals aged 15 or 20 years and

[6]Sample size was 46, 550 households and 120,781 individuals in 2009 and 46,669 households and 128,204 in 2016.

more. In their study for Colombia, Alvaredo and Londoño Velez (8) consider the latter and we stick to the same criteria here, as long as the number of individuals in DGI micro-data under that age is really low.

To estimate the control income we follow the procedure developed in Atkinson (13). Thus, we depart from total income captured in tax records and add up an estimation to include earnings generated by individuals not comprised in DGI data.

Although the standard practice in most top income studies is departing from National Accounts System (NAS) information (13; 15), in Uruguay the last official estimation of the households income account is available for 1997. Burdín et al. (21) compared the procedure used in this study to the variant used in most top incomes studies that starts from NAS (13), reconstructing the households income account based on several assumptions.Since the two options yielded to very similar results, we stick to the first method. Besides expanding the series with five additional years, with respect to Burdín et al. (21), we introduced several methodological modifications in the estimations and final results differ. The two main innovations rely in the of use a different method to include non nominative profits and interests and (as mentioned in the previous subsection) and in using the matched employer-employee/owner data-base to identify undistributed profits that remained in firms (Table 2).

To estimate income generated by the informal population, we also restricted the ECH information to individuals aged 20 or more that were not contributing to the social security and were not receiving pensions or capital income (Table 3). We added this sub-set of individuals to DGI information, compressing the ECH population weight to fit the Population Projections (CELADE-INE, 2016). This procedure presents a severe caveat since it assumes that individuals cannot simultaneously receive formal and informal income. The findings by Higgins et al. (35) suggest that a significant fraction of low income population combine the two types of income. Though, we might be overweighting the lower tail of DGI.

Table 2: Income control

	2009	2010	2011	2012	2013	2014	2015	2016
Tax records	13,613.3	17,486.0	21,205.7	23,841.7	27,474.2	28,227.1	26,932.2	27,775.5
ECH	1,009.9	1,297.4	1,478.9	1,470.0	1,497.0	1,304.1	1,267.2	1,296.2
Total	14,623.2	18,783.4	22,684.6	25,311.8	28,971.3	29,531.1	28,199.4	29,071.7
GDP	31,661.0	40,284.6	47,962.4	51,265.5	57,531.2	57,235.9	53,274.6	52,687.6
Tax records/GDP	43.0%	43.4%	44.2%	46.5%	47.8%	49.3%	50.6%	52.7%
ECH/GDP	3.2%	3.2%	3.1%	2.9%	2.6%	2.3%	2.4%	2.5%
Total/GDP	46.2%	46.6%	47.3%	49.4%	50.4%	51.6%	52.9%	55.2%

Note: GDP in millions of Uruguayan currency (pesos). 1 U$S = 36.8*pesos*

Source: Own calculation based on tax records (DGI), household surveys (ECH) and GDP from Uruguay's National Accounts.

Table 3: Population control

	Total population	Tax records	Tax record (%)	Survey population	Tax record + survey	Survey adjust
2009	2,348,300	1,721,207	73.3	760,720	2,481,927	82.4
2010	2,370,788	1,722,902	72.7	743,279	2,466,181	87.2
2011	2,390,888	1,758,779	73.6	697,776	2,456,555	90.6
2012	2,410,258	1,793,012	74.4	687,845	2,480,857	89.7
2013	2,430,379	1,852,341	76.2	686,487	2,538,828	84.2
2014	2,451,739	1,928,833	78.7	676,524	2,605,357	77.3
2015	2,474,284	1,916,230	77.4	692,600	2,608,830	80.6
2016	2,497,361	1,923,850	77.0	710,096	2,633,946	80.8

Source: Own calculations based on population projections (CELADE-INE, 2016), tax records (DGI) and household surveys (INE).

Based on DGI micro-data, population and income controls on one side and harmonized ECHs on the other, we computed pre and post tax top income shares, synthetic inequality indices (Gini and Theil) and the corresponding group and income source decompositions (Shorrocks, 1982; Shorrocks, 1999; Lerman and Yitzhaki, 1985). Confidence intervals were calculated by boostrapping (100 repetitions).

3.3 Mobility analysis

We exploited the longitudinal nature of DGI data to analyze persistence in individual positions along the income distribution, particularly focusing on top income holders. To implement this analysis we restricted the data-base to those individuals appearing at least three times throughout the whole period.

We first estimated average absolute and positional persistence rates by regressing the 2016 logarithm of total income against the same variable in 2009 and a set of covariates and computed rank correlations (Kopczuk, Saez and Song, 2010). These exercises were carried out splitting by sub-period and gender.

In order to assess positional mobility we also built transition matrices, since this conventional and intuitive method allows to observe individuals' movements across different positions in the income distribution between two points in time. Following Fields and Ok (31), the transition matrix induced by transformation $x \to y$ is defined as the matrix $P(x, y) = [p_{rs}(x, y)] \in R_+^{mxm}$, where m are the specified income groups and is the fraction of individuals belonging to class r in the distribution x and experiencing a transition to class s. By construction, $\sum_{s=1}^{m} p_{rs}(x, y) = 1$ for all r.

Finally, we assessed the distributional effect of income mobility by computing top income shares and inequality measures based on annual income and each individuals longitudinally-averaged income. The difference between these two measures is usually interpreted as the re-

distributive effect of income mobility on longer-term income (Shorrocks, 1978; Shorrocks, 1981).

4 Results

We first analyze the evolution of income inequality in Uruguay, assessing trends in synthetic indices and top income shares. After that, we exploit the longitudinal nature of DGI data and study the extent of persistence of individuals in their original positions in the income distribution.

4.1 The recent evolution of income inequality and top income shares in Uruguay

a) Synthetic inequality indices

Figure 2 depict synthetic Gini indices computed on the basis of different ECH and DGI micro-data income aggregates. The longest line corresponds to ECH per capita household income, which is the aggregate used in most studies assessing inequality. Its evolution indicates a sharp decline between 2008 and 2013 and stability thereafter. Although at higher levels, inequality among income receivers in ECH mimics the path of household income distribution, either considering the original or the harmonized data. 2009-2013 differences are statistically significant and this hypothesis is rejected thereafter [7].

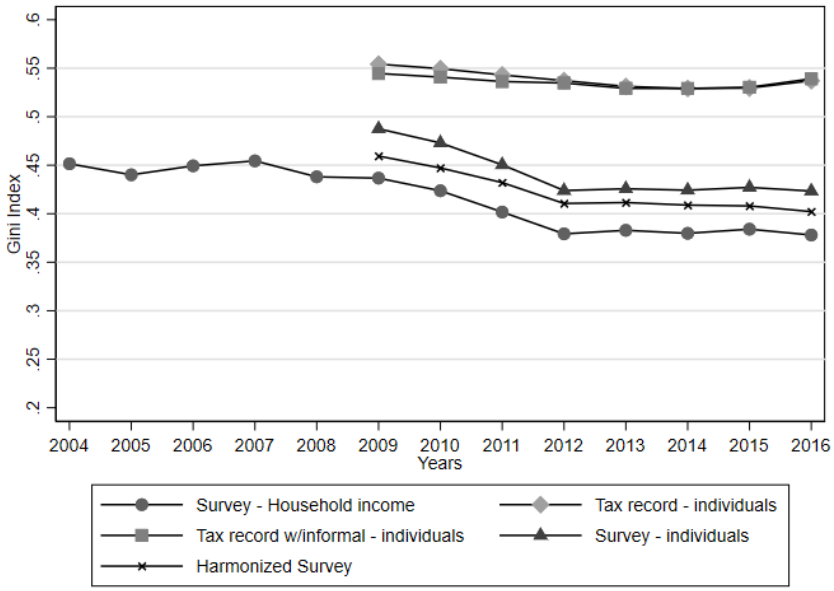
In turn, DGI micro-data based calculations are presented in two options considering the original information at the tax-records database only and an expanded version adding up informal workers and non earners micro-data from ECH. The two lines exhibit a mild decline and a slight increase by 2016, with almost negligible differences and inequality indices converging since 2012. 2009-2016 and 2009-2013 differences are statistically significant.

Thus, equalising trends can be observed in the five income variables in 2009-2013, indicating that they are robust to the data base and harmonization criteria, even when levels are considerably higher in DGI data and the slope of the decline is significantly smaller. Table A.8 suggests that synthetic indices that assign different weights to different points of the income distribution also show a consistent reduction pattern, despite the data-source.

Both household surveys and income tax micro-data show a statistically significant inequality reduction between 2009 and 2016, that mainly took place until 2013. In the last period, however, whereas household surveys estimations still indicate a slight decline in 2013-16, differences are not statistically significant in tax records data. Thus, this new data-source shows a consistent decline although at a slower pace. However, the inequality reduction was 25% in terms of ECH baseline

[7] see confidence intervals in Table. These results also hold when considering only the original DGI data with no further imputations

Figure 2: Gini index by income definition and source, 2004-2016



Source: Own elaboration based on household surveys (ECH) and tax records (DGI).

values and rose to 42% when considering 2009-2013. Since decreasing rates were milder in DGI, the gap among the two sources widened in the last years.

To conclude this sub-section, we briefly refer to the progressivity and redistributive effects of personal income taxation in Uruguay (Table 4). Kakwani indices indicate that income taxation is progressive in the two data sources. However, levels are almost 20% in higher in ECH, although in 2016 the two indices are very similar. This convergence results from the fact DGI data show a smooth decreasing trend in tax progressivity throughout the whole period (13% fall in 2009-2019), whereas in ECH values were almost steady, the index plummeted at the end. In turn, the comparison of before and after tax inequality indices, indicate a constant redistributive capacity of 2 percent points in the case of the Gini index (Reynolds-Schmolensky coefficient) in the two data sources. Thus, the proportional redistributive effect in ECH is considerably higher than in DGI. Meanwhile, Theil index presents a similar reduction in proportional terms in the two data sources (Table A.8).

Although personal income taxation is progressive, its redistributive effect is modest due to low effective rates (5 to 6% in average with a slight increase throughout the period in two data sources). This, in turn, relates to the dual scheme, the low proportion of taxpayers presented in section 3 an that the highest marginal tax rate in Uruguay was 25 in 2009-2011 and rose to 30 in 2012 since the maximum rate was low even for Latin American standards. For instance, OECD top rates are in average 41.5% (Jourmard, Pisu and Bloch, 2012).

b) Top income shares

Table 4: Tax progressivity and income redistribution indexes, 2009-2016

	Year	2009	2010	2011	2012	2013	2014	2015	2016
Tax records	Pre-tax	0.574	0.570	0.565	0.561	0.554	0.552	0.552	0.560
	Post-tax	0.554	0.550	0.543	0.537	0.531	0.529	0.530	0.537
	R-S	0.020	0.021	0.022	0.024	0.023	0.023	0.023	0.023
	Average tax rate	5.0%	5.4%	5.4%	5.6%	5.7%	6.0%	6.0%	6.1%
	Kakwani	0.334	0.331	0.334	0.327	0.328	0.324	0.301	0.293
Harmonized survey	Pre-tax	0.481	0.468	0.452	0.430	0.432	0.429	0.429	0.423
	Post-tax	0.459	0.447	0.432	0.411	0.412	0.409	0.408	0.402
	R-S	0.021	0.020	0.020	0.019	0.020	0.021	0.021	0.021
	Average tax rate	5.1%	4.8%	4.6%	4.6%	5.0%	5.2%	5.3%	5.1%
	Kakwani	0.399	0.406	0.406	0.392	0.39	0.381	0.382	0.304

Source: own calculations based on tax records (DGI) and household surveys (ECH).

The three panels in Figure 3 depict the evolution of the top 10, 1 and 0.1%. Although the point evolution of the top 10% is very similar to the path described by inequality indices analyzed in the previous paragraphs, confidence intervals rule out the decline hypothesis showing stability throughout the whole period. Meanwhile, the top 1% clearly remained almost unchanged in 2009-2013 and exhibits a statistically significant increase since 2014.

Considering the whole period, the top 1% share rose from 14.5 to 16%. This values place Uruguay among the countries with the highest concentration at the top in the WID database, being below all Latin American countries, South Africa and the United States (WID, 2019). It is noteworthy pointing out that this result is partly driven by the bias towards developed countries of WID, resulting from the availability of tax records information. [8]

Even the increase according to DGI data was relatively small, one striking feature of Table 5 relies in the evolution of the 1% share in the two data sources throughout this period: whereas in 2009 the DGI/ECH ratio was 85%, it fell to 55% in 2016. Thus, differently to synthetic indices, in this case results are sensitive to the data source.

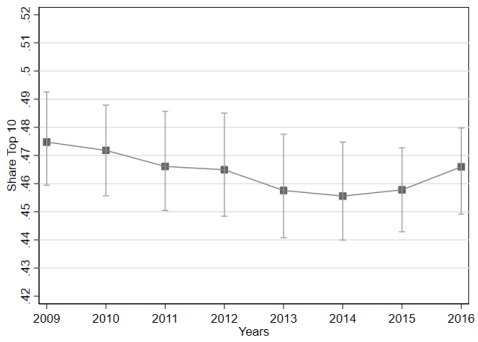
The ECH/DGI ratios of the lower thresholds and average income for the top 10% and 1% shares suggest that the erosion of ECH took place among the higher strata. In fact, the 10% threshold is very similar in the two data sources, with almost constant ratios above 90% in the whole period. However, in the case of the top 1%, this ratio falls from almost 90 to 74%. As expected, this loss in ECH capacity to reach the higher strata increases with income (as highligthed in the comparison between the means ECH/DGI ratios for the two fractiles).

Assessing the reasons under this impoverishment in ECHs ability to capture the richest strata and the consequent decline in the ratios examined in the previous paragraph, is beyond the scope of this study. Some conjectures can be raised considering that this was a period of

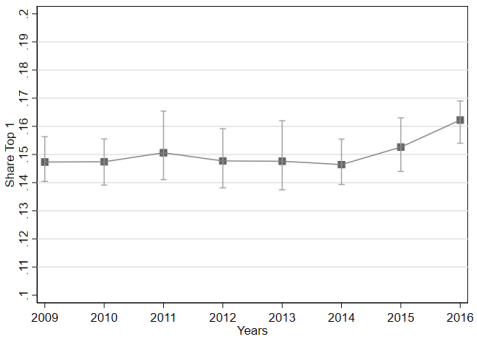
[8] These results also hold when considering only the original data with no further adjustments imputing bank deposits, non nominative and undistributed profits.

Figure 3: Top income shares, 2009-2016

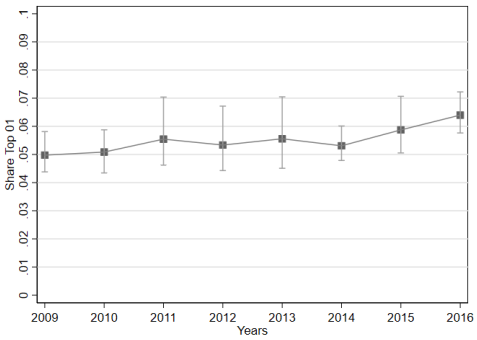
(a) Top 10%



(b) Top 1%



(c) Top 0.1%



Source: Own calculations based on tax records (DGI) and household surveys (ECH).

Table 5: Top shares comparison by data source, 2009-2016

	Top 1% share		Top 1% Survey/Tax records		Top 10% Survey/Tax records	
Year	Tax records	Harmonized survey	Threshold	Mean	Threshold	Mean
2009	13.6%	11.5%	88.2%	74.7%	93.6%	86.2%
2010	13.6%	10.6%	83.7%	65.4%	89.6%	80.1%
2011	14.0%	9.5%	79.0%	56.5%	91.8%	76.8%
2012	13.7%	7.7%	68.8%	45.3%	90.4%	69.6%
2013	13.7%	8.5%	74.2%	49.9%	90.0%	72.5%
2014	13.6%	8.4%	74.8%	49.9%	89.3%	72.2%
2015	14.2%	8.7%	77.2%	51.5%	93.7%	75.0%
2016	15.2%	8.4%	73.9%	45.2%	90.7%	70.0%

Source: Own calculations based on tax records (DGI) and household surveys (INE).

rapid income growth coupled with increased residential segregation (Rodríguez Vivas, 2019), and underreporting and refusal rates might have increased. On the side of DGI data, two main features might create an artificial inequality increase: reduced informality with the subsequent entries of low salaried workers in the data-base and a higher ability of the tax authority to enforce tax-payers.

Meanwhile, as in the case of the Gini index, personal income taxation had a constant effect throughout the period, reducing the top 1% in approximately 1.5 percent points.

c) Reconciling synthetic indices and top income shares

To dig into the two conflicting trends depicted by top income shares vis a vis synthetic indices in DGI data, we carried out two group decompositions considering the following income categories: bottom 50%; middle (50-90%); middle-top (90-99%) and top (99-100%), and bottom 99% versus top 1% (Tables 7 and 6). Although the aforementioned tables depict pre-tax income decompositions, both results and comments presented under this heading also hold for post-tax income based inequality indices in the two data-sources.([9]).

Table 6: Inequality decomposition among income groups, 2009-2016

	2009	2010	2011	2012	2013	2014	2015	2016
Gini index	0.574	0.570	0.565	0.561	0.554	0.552	0.552	0.560
Between	0.510	0.506	0.502	0.498	0.492	0.490	0.491	0.499
Within	0.065	0.064	0.063	0.063	0.062	0.062	0.061	0.061
Overlap	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Between (%)	88.8	88.8	88.9	88.9	88.8	88.8	88.9	89.1
Within (%)	11.2	11.2	11.1	11.1	11.2	11.2	11.1	10.9
Overlap (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bottom 50	0.328	0.323	0.321	0.312	0.314	0.316	0.317	0.322
50 - 90	0.219	0.215	0.208	0.207	0.198	0.196	0.193	0.193
90 - 99	0.173	0.172	0.172	0.170	0.168	0.169	0.172	0.173
Top 1	0.355	0.364	0.390	0.383	0.400	0.385	0.408	0.423

Source: Own calculations based on tax records (DGI) and household surveys (INE).

The fraction of between group inequality remains steady in the first decomposition for the Gini and Theil indices. However, the last rows of the table clearly convey a remarkable contrast: whereas inequality decreased for the 3 poorer groups (with 2013 to 2009 ratios being 95.7, 90.4 and 97.2% respectively), a sharp increase was going on at the top throughout the whole period (2013/09 ratio=1.13%).[10] When performing the same decomposition with harmonized ECH micro-data,

[9]Due to space constrain additional tables are not included in this document, but are available upon request to the authors

[10]These results also hold when considering only the original data with no further adjustments imputing bank

between group inequality falls and Gini and Theil indices fall monotonically in the four groups, with a larger fall at the (the 2016 to 2013 ratio is 92.4, 92.1, 86.3 and 67.0% respectively).

In the second variant we collapsed the first three groups into one category. In this case, the "explanatory power" of between groups inequality also grew, highlighting an increasing distance in the two groups average income. At the same time, this exercise yields, again, a sharp contrast between the 2009-2016 decreasing inequality trend of the bottom 99% (6% fall) and the opposite movement at the top 1% (20% increase). Similar results are obtained from the Theil index decomposition. Again, this result diverges from findings on ECH micro-data where, as in the case of the first exercise, both the between groups proportion and within each group inequality present a large fall.

Table 7: Inequality decomposition among income groups (bott. 99%-top 1%), 2009-2016

	2009	2010	2011	2012	2013	2014	2015	2016
Gini index	0.574	0.570	0.565	0.561	0.554	0.552	0.552	0.560
Between	0.125	0.125	0.129	0.126	0.126	0.125	0.131	0.141
Within	0.449	0.445	0.435	0.435	0.427	0.427	0.421	0.419
Overlap	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Between (%)	21.8	21.9	22.9	22.4	22.8	22.7	23.8	25.2
Within (%)	78.2	78.1	77.1	77.6	77.2	77.3	76.2	74.8
Overlap (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bottom 99	0.524	0.519	0.510	0.508	0.499	0.498	0.494	0.497
Top 1	0.355	0.364	0.390	0.383	0.400	0.385	0.408	0.423

Source: Own calculations based on tax records (DGI) and household surveys (INE).

Thus, decreasing inequality at the bottom 99% (jointly considered or split into 3 groups) coupled with an increase in the concentration at the top 1% is consistent with trends observed in ECH and its reduced capacity to reach the rich. This finding is mirrored in the falling ECH/DGI average income ratio at the top 1% presented in b). Whereas the inequality reduction in harmonized ECH was led by the 90-99% and top 1% groups, the opposite happened in DGI, with equalisation mainly occurring at the bottom 50 and 50-90% groups.

Whereas in DGI data the mild inequality reduction reflects an offsetting fall in the 99% against an increasing concentration at the top, that results in increased/stable shares, at ECH the inequality reduction is also fed by a better distribution in all groups (with larger reductions at the top). The latter can result from richer households increased refusal rates or underreporting. To conclude this subsection, three comments are noteworthy. First of all, the evolution of inequality at the bottom 50% rules out the possibility of DGI trends being driven by the formalization process.

deposits, non nominative and undistributed profits).

Secondly, and more important, the evolution of inequality at the top 1% is consistent with the observed divergence in the DGI versus ECH share of this group. Thirdly, DGI figures suggest that the inequality fall of the 99% took place coupled with an increase in inequality at the top led by increasing earnings in this part of the distribution.

4.2 The composition of income

The last subsection concluded that the main diverging point refers to inequality and average income at the top. Two different patterns emerged: one depicted by ECH, where inequality fall has been led by top groups, and other by DGI micro-data, where the reduction has been mainly occurring at the bottom. This evolution also highlighted that in the two cases the redistributive power of income taxation has been constant and that similar trends are observed in pre and post tax income. Thus, the role of income sources can explain part of the story, particularly considering the ability of tax records to better capture capital income. We based the current analysis in the four income sources described in Section 3.1: labour, pensions, mixed income (i.e., liberal professionals earnings) and capital income (property rents, bank deposits profits and other items).

Table 8 depicts the results of the Lerman and Yitzhaki (1985) Gini index income source decomposition, where k represents the corresponding source, G is the within source Gini index, R reports the correlation among each income source and total Gini; *share* represents the contribution of each source to overall inequality and; *change* is the marginal effect of a 1% increase.

Our findings corroborate that labour earnings are the most extended income source, accounting for approximately two thirds of total income. In turn, the share of pensions is slightly above 20% and capital income exhibits a growing share throughout the whole period but, similarly to other studies based on tax records micro-data (8), it never surpasses 10%. As expected, capital income is the most unequally distributed income source (with a Gini index very close to 1), followed by pensions (which probably is related to the number of individuals not being pensioners). Labour income inequality presents a slight fall whether the other two sources remain almost steady. R values clearly show that, in spite of its tiny share, capital income is the source most associated to the richer strata. Differently to the inequality ranking, labour earnings occupy the second place and are very close to capital, whereas pensions halve the degree of correlation and present a substantial fall at the end of the period.

As a result, the contribution of capital income to inequality is almost twice its share and it grows 50% throughout the whole period at expense of slight decrease of the other two sources. Finally, the negative marginal contribution of pensions to inequality indicates their equalizing effect, whether the remaining two sources exhibit a positive contribution to inequality, with an increasing effect in the case of capital and the opposite trend in regard to labour.

The findings presented in the previous paragraphs closely relate to the source composition

Table 8: Inequality decomposition by income source. 2009, 2013 and 2016. (DGI Pre-tax income

	Year	2009	2010	2011	2012	2013	2014	2015	2016
Sk	Labour	0.695	0.695	0.712	0.678	0.684	0.684	0.674	0.677
	Pensions	0.228	0.230	0.203	0.226	0.222	0.219	0.222	0.218
	Capital	0.066	0.063	0.073	0.085	0.083	0.087	0.093	0.095
Gk	Lab	0.707	0.707	0.689	0.694	0.684	0.681	0.679	0.686
	Pensions	0.818	0.812	0.822	0.809	0.812	0.812	0.812	0.810
	Capital	0.992	0.992	0.992	0.982	0.985	0.987	0.990	0.989
Rk	Labour	0.860	0.862	0.870	0.850	0.851	0.851	0.846	0.854
	Pensions	0.443	0.428	0.369	0.413	0.401	0.392	0.397	0.389
	Capital	0.889	0.881	0.894	0.897	0.892	0.894	0.904	0.904
Share	Labour	0.736	0.743	0.757	0.713	0.719	0.717	0.701	0.708
	Pensions	0.144	0.140	0.109	0.135	0.131	0.126	0.130	0.123
	Capital	0.101	0.097	0.115	0.133	0.132	0.138	0.151	0.151
Change (%)	Labour	0.041	0.048	0.044	0.035	0.035	0.033	0.027	0.031
	Pensions	-0.084	-0.090	-0.094	-0.091	-0.091	-0.093	-0.092	-0.095
	Capital	0.035	0.034	0.042	0.048	0.049	0.052	0.058	0.057

Source: Own elaboration based tax records (DGI) and household surveys (ECH).

of the different population groups. In fact, (Table 9) analyzes the four income groups previously considered, uncovering the expected pattern . At the bottom 99%, the largest share corresponds to labour earnings and pensions, with a slight but increasing participation of mixed and capital income. Meanwhile, the latter two sources equalize labour earnings at the top. This predominance of capital income at the richest strata has been highlighted by the top incomes literature as a distinctive feature of developing countries, since in the developed world, executives compensations and high salaried workers have a larger participation at the top (8).

At the same time, it is worth pointing out the substantial increase of capital income at the top throughout the whole period. Since this income source presents higher underreporting rates than labour earnings, this evolution might in turn contribute to explain the deterioration of ECH in capturing earnings at the top. As a matter of fact, our estimations show that whereas in harmonized ECH the top 1% receives 37% of total capital income, this figure rises to 62% in DGI micro-data.

In line with previous studies on wage differentials, when opening the income distribution by source and gender, our estimations show that the participation of women in total and labour income decrease with the quantile (Figure 4, panel a)), ranging from more than 50% below the median to 25% at the highest percentile. Estimations by Atkinson et al. (14) for eight high income countries find similar results. The presence of women is larger among pensioners, probably due

Table 9: Pre-tax income distribution by source and fractile. 2009, 2013, 2016. (DGI micro-data)

	Labor income	Pensions	Mixed income	Cap. income
		2009		
Bottom 50%	53.6%	45.0%	0.0%	1.3%
50-90%	72.3%	25.4%	0.1%	2.2%
90-99%	76.1%	18.1%	0.7%	5.1%
Top 1%	59.4%	3.3%	6.5%	30.8%
		2013		
Bottom 50%	51.9%	46.3%	0.0%	1.8%
50-90%	74.9%	22.6%	0.1%	2.5%
90-99%	75.0%	18.6%	0.8%	5.7%
Top 1%	51.3%	3.3%	6.0%	39.4%
		2016		
Bottom 50%	50.4%	47.6%	0.0%	2.0%
50-90%	75.3%	22.4%	0.1%	2.3%
90-99%	74.7%	18.3%	0.6%	6.4%
Top 1%	49.4%	2.3%	5.5%	42.8%

Source: Own elaboration based tax records (DGI) and household surveys (INE).

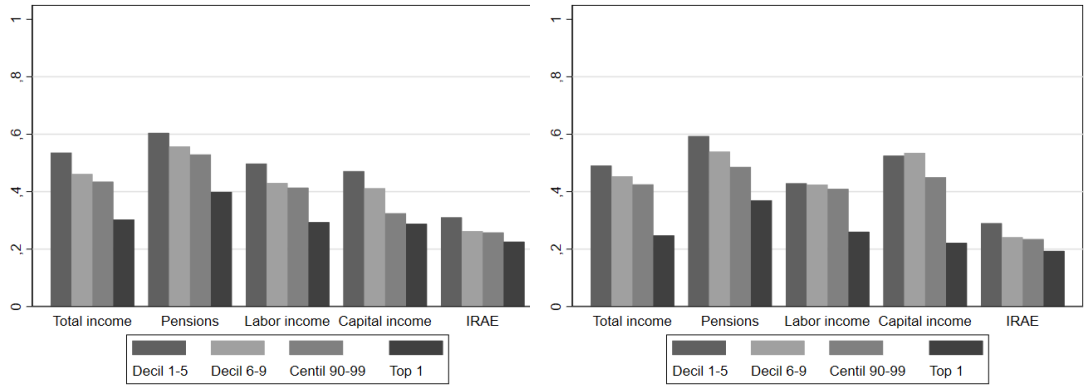
to life expectancy patterns, but it reflects the same declining pattern, although differences are smaller (60% and 40% respectively). Conversely, the presence of women is scarcer among mixed and capital income receivers. Considering the distribution of income instead (panel b) results are very similar, although in most cases women's share is even lower, probably reflecting their relative disadvantage within categories.

To conclude this analysis, we briefly comment on the effective tax rates paid by income source and income centile (5). As a whole, it can be noticed that total labour earnings depict a progressive scheme, with the minimum taxable income above the median, and respectively reaching 15% at the highest centile and rising to 18% at the top 0.1%. Conversely, capital income rates are steady until percentile 80 and decrease thereafter.

The reasons under this decline refer to the different tax rates within this source depicted in Table A.1: at the top, the relative share of profits increases and this sub-source faces a lower rate than property rents and bank deposits. As a result, tax rates effectively paid by the top 1% are lower, In turn, the same pattern holds for the top fractiles (0.5 and 0.1%). This regressive capital income taxation scheme affects total effective rates. Even when they are progressive for the first 99 percentiles, they fall from 11.5% for the top 1% to 9.5% for the top 0.1%.

Although these effective rates are relatively low when compared to OECD countries, they double the ones found for Colombia (8). In regard to the potential simulation exercises to inform further tax reforms it is worth pointing out that, consistently with its lower outreach capacity of the higher strata and particularly of capital income, ECH depicts a progressive pattern at the top fractiles with higher effective rates (12.2% for the top 1% to 13.6% for the top 0.1%) than the

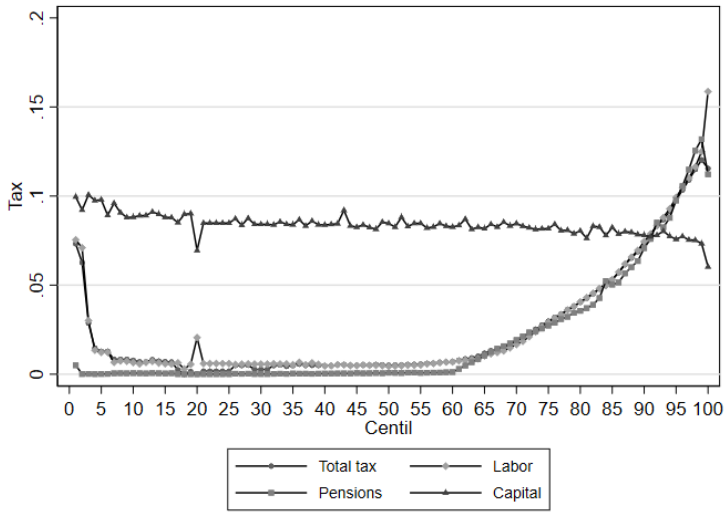
Figure 4: Proportion of female earners and women's income share by source and income fractile.



(a) % of women (b) Women's income share

Source: own calculation based on tax records (DGI).

Figure 5: Effective tax rates by income source



Source: Own calculations based on tax records (DGI).

ones obtained from DGI micro-data.

4.3 Income mobility patterns

The previous subsections presented an overview of the recent evolution of inequality among income receivers in Uruguay without focusing on individual trajectories. However, if there is enough mobility, individuals might occupy different positions in the income distribution across their lives or within a particular span. Hence, assessing whether top income positions are persistent or merely transitory states provides an additional dimension to the normative evaluation of a particular inequality level.

To address this topic, we exploit the panel structure of DGI micro-data. However, given the short period under study, it is worth stating that rather than providing a complete picture of intra-generational mobility, our main purpose here is to provide some evidence on how mobility varies across the income distribution, focusing on top income positions.

As stated in 3.3, to meet that purpose, we first estimate average persistence rates (β coefficients) and standard transition matrices to determine the extent of absolute and positional mobility across the income distribution. Then, we explore the extent of persistence in top income positions holders. Finally, we analyze the distributional effect of income mobility Shorrocks (47, 48).

4.3.1 Mobility patterns, top income holders and inequality

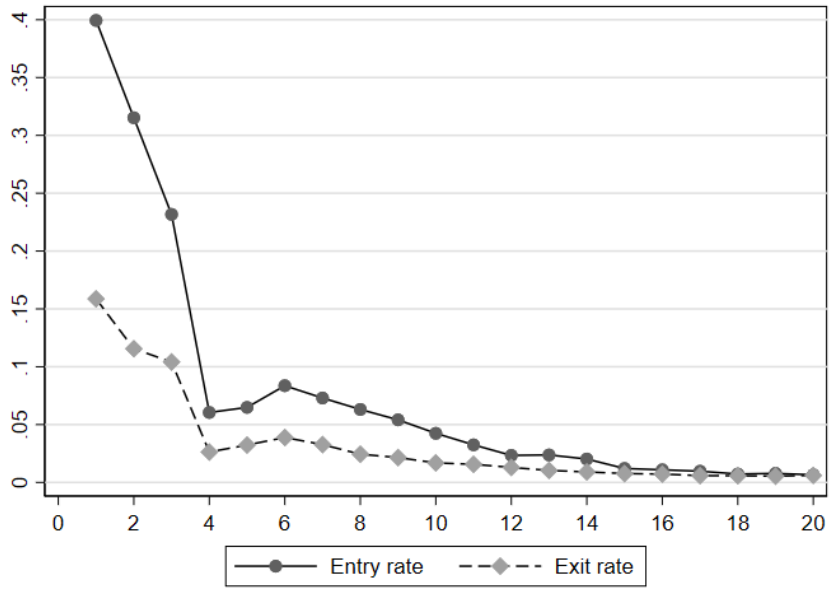
To conduct the mobility analysis, we restricted the sample to the balanced panel, i.e., those individuals reporting positive incomes in the eight years, leading to exclude 56% of observations. [11] To assess whether mobility patterns relate to the evolution of the income distribution, we also split the sample in sub-periods according to the ongoing inequality trends (2009/2013 and 2013/2016).

Annual entry and exit flows comprise approximately 7% and 5% of individuals in the panel respectively (Table A.9). Flows decrease with age and show no particular pattern when disaggregated by gender. As expected, retired individuals exhibits lower entry and exit rates. Self-employed workers and capital income earners present higher inflows, probably reflecting increasing employment formality and the expansion of the personal income tax system, respectively.

To assess panel flows patterns according to individuals' position in the income distribution, we built total pre-tax income vintiles under two calculation procedures. The first one was based on the longitudinally-averaged total income in real terms at 2016 prices. Instead, in the second

[11] Individuals with zero or negative income in at least one period were also excluded. Burdín et al. (21) compare the balanced and unbalanced panel for 2009-2012 in terms of individual characteristics and income. As expected, to balance the panel introduces a moderate bias toward older individuals, pensioners and top income earners.

Figure 6: Entry and exit rates by income groups



Source: own calculations based on DGI. Entry and exit rates depicted for 2013, identical results for the remaining years.

one, we used individuals' income at the time of entry. In the two cases, entry and exit rates are decreasing in income, particularly until the fourth vintile (Figure 6).

4.3.2 General mobility patterns

We first estimated average absolute and positional correlations (β coefficients) disagreggating by gender and period (Tables 10 and A.10). Considering the whole period, the average absolute persistence rate is 0.6, with slight variations by gender (0.62 for women and 0.58 for men). Disaggregations for shorter periods of time yield, as expected to larger coefficients. In spite of that, a remarkable result is that when comparing sub-periods of similar length, persistence rates are lower during the inequality reduction. Thus, after 2013 estimations, yield to extremely high values indicating very low mobility levels. An interesting feature relies in the fact that even when β coefficients are very high and almost converge after redistribution ceased, in the period of inequality reduction the gap among women and men widened in favour of the latter.

However, ranking based estimations yield approximately 25% higher immobility rates in the 2009-2016 estimations (0.75,76 and 0.74 for the entire population, women and men respectively), suggesting that increased income was not necessary translated in re-ranking. A second feature of this group of estimations is that, even when the negative association among persistence and inequality reduction still holds, differences across sub-periods become more subtle. At the same time, gender variation was also reduced. The precedent estimations provided a picture for the

Table 10: Intragenerational elasticity. Log of income 2016-2009

	Log of income (final year)					
	2009/2016	2009/2012	2010/2013	2011/2014	2012/2015	2013/2016
Log of income (initial year)	0.603***	0.682***	0.764***	0.764***	0.785***	0.830***
	(0.00113)	(0.00112)	(0.00121)	(0.00139)	(0.00154)	(0.00127)
Observations	1,040,140	1,040,140	1,040,140	1,040,140	1,040,140	1,040,140
R-squared	0.502	0.627	0.696	0.688	0.692	0.674
			Women			
Log of income (initial year)	0.621***	0.710***	0.785***	0.795***	0.808***	0.845***
	(0.00148)	(0.00147)	(0.00150)	(0.00166)	(0.00168)	(0.00145)
Observations	542,810	550,263	545,563	545,656	543,403	541,025
R-squared	0.528	0.655	0.723	0.724	0.724	0.707
			Men			
Log of income (initial year)	0.581***	0.648***	0.732***	0.719***	0.750***	0.835***
	(0.00173)	(0.00172)	(0.00200)	(0.00233)	(0.00277)	(0.00187)
Observations	495,587	489,181	482,111	483,585	479,467	477,069
R-squared	0.461	0.567	0.652	0.632	0.639	0.640

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Source: own calculations based on tax records (DGI).

overall population, without digging into differences by income strata. Transition matrices allow for comparing incomes classes, with the principal diagonal providing information on persistence rates, understood as the proportion of individuals remaining in their initial income fractile. We observe a markedly increasing pattern of persistence in the upper half of the income distribution. Interestingly, approximately 70% of individuals in the 10th decile in 2009 remain in that position six years later. This is more than three times higher than the persistence rate exhibited by those in the 5th decile. Mobility matrices by gender and sub-period can be found in Tables A.11, A.13 and A.14. As in the general estimations there are scarce differences by gender, although persistence rates among women are higher in the lower strata and the reverse relation holds above the median. Differences by sub-period also reinforce the regression analysis results, with higher mobility, particularly at the top decile and vintile in the period of inequality fall versus the subsequent years (persistence rates at the top decile were 75.2 and 79.7 and rose to 87.4 and 90.7 at the top ventile).

One interesting feature of the DGI data is to provide longitudinal information of the income source composition at the individual level. In Table 12, we analyze the extent of income mobility for different income sources, reporting summary mobility indicators from deciles transition matrices. The degree of persistence is heterogeneous across different income sources, and rankings vary depending on the mobility index considered. However, capital income is the most immobile income source. Wage and salary workers' income appear to occupy an intermediate position in terms of mobility. Differences by gender do not appear to be salient, although, as in the general estimations, men seem to be more mobile.

Table 11: Transition matrix, 2009-2016

	2016											
2009	Decil 1	Decil 2	Decil 3	Decil 4	Decil 5	Decil 6	Decil 7	Decil 8	Decil 9	Decil 10	Top 5	Top 1
Decil 1	32.9%	24.9%	11.1%	9.5%	8.7%	6.8%	4.9%	3.5%	2.4%	1.2%	1.0%	1.0%
Decil 2	36.9%	35.7%	8.7%	6.6%	4.8%	3.6%	2.4%	1.7%	1.1%	0.6%	0.4%	0.5%
Decil 3	7.9%	24.0%	26.6%	9.7%	6.7%	5.0%	3.6%	2.6%	1.7%	0.8%	0.7%	0.9%
Decil 4	6.9%	5.9%	33.6%	23.0%	12.7%	7.9%	5.3%	3.7%	2.3%	1.1%	0.9%	1.1%
Decil 5	5.2%	4.4%	6.9%	31.6%	20.7%	12.7%	8.2%	5.6%	3.5%	1.5%	1.2%	1.4%
Decil 6	3.5%	2.7%	5.9%	7.4%	28.7%	21.7%	13.6%	9.3%	5.4%	2.1%	1.6%	1.8%
Decil 7	2.5%	1.1%	4.1%	5.8%	7.5%	26.8%	25.5%	14.9%	9.1%	3.0%	2.0%	2.1%
Decil 8	1.8%	0.6%	1.8%	4.0%	5.8%	7.8%	24.1%	30.6%	17.9%	5.6%	3.3%	2.8%
Decil 9	1.3%	0.4%	0.9%	1.6%	3.4%	6.0%	8.6%	20.8%	40.6%	16.5%	8.1%	4.9%
Decil 10	1.1%	0.3%	0.6%	0.7%	1.0%	1.8%	3.7%	7.3%	16.1%	67.6%	80.7%	83.7%
Top 5	0.5%	0.1%	0.3%	0.3%	0.4%	0.5%	0.9%	2.6%	3.7%	40.7%	64.9%	77.9%
Top 1	0.1%	0.0%	0.1%	0.1%	0.1%	0.1%	0.2%	0.3%	0.4%	8.6%	15.7%	52.2%

Source: own calculations based on tax records (DGI).

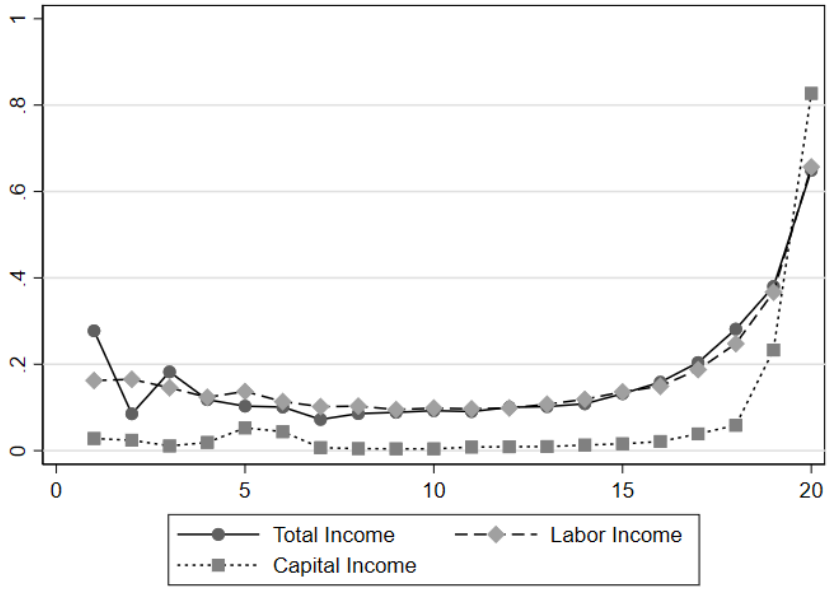
Table 12: Income mobility indexes, 2009-2016

	Total income	Labor income	Employees	Self employed	Capital	Pensions
Atkinson inmobility ratio	0.30	0.37	0.37	0.56	0.59	0.27
Determinant index	0.88	0.90	0.90	0.96	0.90	0.78
Shorrocks' MET - Prais	0.75	0.78	0.78	0.90	0.97	0.77
Average jump	1.36	1.59	1.59	2.48	2.33	1.21
Women						
Atkinson inmobility ratio	0.27	0.35	0.34	0.56	0.69	0.28
Determinant index	0.84	0.88	0.87	0.96	0.89	0.76
Shorrocks' MET - Prais	0.74	0.77	0.76	0.90	0.98	0.77
Average jump	1.25	1.50	1.46	2.47	2.62	1.24
Men						
Atkinson inmobility ratio	0.34	0.40	0.39	0.57	0.53	0.27
Determinant index	0.87	0.92	0.92	0.95	0.87	0.79
Shorrocks' MET - Prais	0.76	0.80	0.79	0.90	0.96	0.78
Average jump	1.49	1.68	1.65	2.55	2.21	1.18

Source: own calculations based on tax records (DGI).

Figure 7 plots persistence rates computed from vintile transition matrices of labor, capital, and total income. In this case, the persistence rate is computed as the fraction of individuals remaining either in the same or an adjacent position in the income distribution. Persistence rates increase monotonically from the 10th vintile onward. While labour income mimics the pattern of total income, capital income exhibits a more irregular pattern, since this source becomes noticeable at the top of the distribution. Persistence rises rapidly in top sectors, surpassing labour income at the top 5%.

Figure 7: Persistence rates 2009-2016 (% at same or adjacent position)



Source: own calculations based on DGI.
Notes: Vintiles of labor, capital and total income computed in 2009.

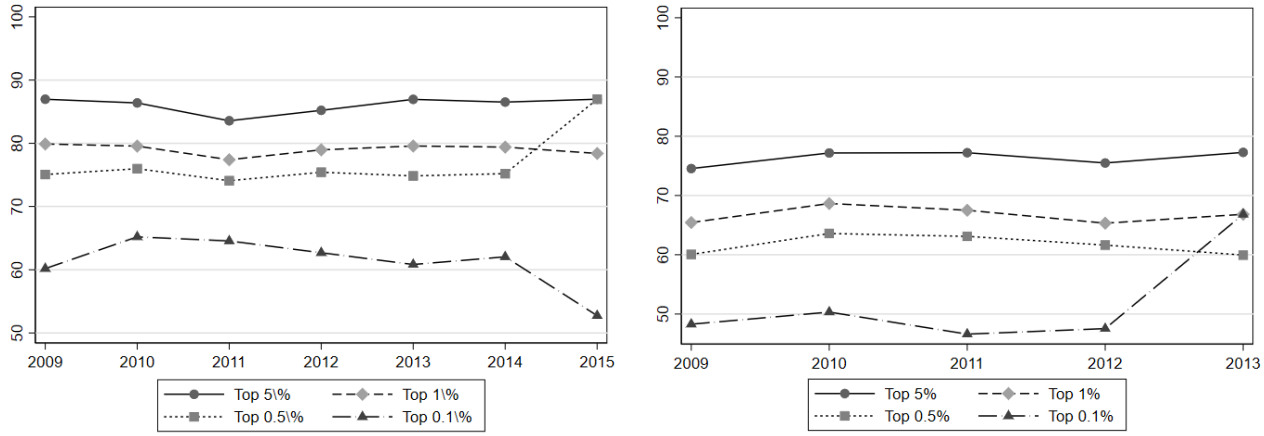
4.3.3 Income mobility at the top

In this section, we analyze the extent of positional mobility in more detail, focusing particularly on movements in and out top income groups. Fractile transition matrices indicate that approximately, 70% of individuals located in the bottom half of the initial distribution of total income remain in the same position in 2016. Barely 1% of these individuals are able to enter into the top 10%. From those in the top 1% in 2009, only 8% moves downward to the bottom 90% in 2016. Positional changes mainly occurred within the top 10%.

Figure 8 plots the probability of remaining in top income fractiles (top 5%, 1%, 0.5% and 0.1%) after one (panel a) and three years (panel b). Annual persistence rates appear to be very stable during the period and above 50% in all cases, rising to more than 70% for the first three groups. The probability of remaining in the top 5% after 1 year is around 90% and 80% for the

top 1%. Persistence rates after 3 years are lower but remain high and stable, except for the top 0.1% that rises at the end of the time span considered. No remarkable differences by gender are found (A.3).

Figure 8: Persistence rates in top income fractiles



(a) Persistence after 1 year

(b) Persistence after 3 years

Source: own calculations based on DGI.
Notes: Persistence rates after three years is unconditional on fractile membership after one and two years.

The resulting persistence rates for top income groups are in line with previous estimates for developed countries. For instance, the probability of remaining in the top 1% after one year is 78% for Germany (36). The persistence rate of staying in the top 0.1% is about 70%, 60%, and 67% for Germany (2001-2006), Canada (1988-2000) and France (1998-2003) respectively ((36); Saez and Veall, 2005; Landais, 2009). In the case of Ecuador, Cano (2014) reports average persistence rates of 70% and 60% for the top 1% and top 0.1% respectively. Persistent rates decrease as long as tinier top fractiles are considered. As Jenderny (36) points out, this may not necessarily indicate lower persistence in income positions at the very top. There may also be a mechanic effect related to the fact that we are comparing persistence rates across groups of different size. To account for this problem and compare equal-size groups, we compute deciles of total income in 2009 restricted to the top 1%, 0.5% and 0.1%. Similarly to Jenderny (36), in Figure A.4 we plot the fraction of individuals who do not move downward between 2009 and 2016. That fraction appears to be increasing with the position in the initial distribution within each fractile: individuals of the richest deciles are less likely to move downwards than remaining fractile members.

4.3.4 Distributive effects of income mobility

Finally, we analyze whether income mobility contributes to reduce long-term income concentration. If annual income partly reflects transitory shocks, we would expect to observe less income

inequality when income is measured over a longer time period. Hence, we compare top income shares and inequality indices (Gini y Theil) computed using both annual and the longitudinally-averaged income of each individual. Results are presented in Table 13. The extent of top income mobility appears to be quite modest: a reduction of 0.3 and 0.6 percentage points in the top 1% and top 0.1% income share respectively. Overall, the equalizing effect of income mobility is limited: a reduction of 2.3 p.p. in the Gini coefficient and 6 in the Theil index. In this case, there are not substantial differences by sub-period.

Table 13: Annual and average income inequality comparison

	2009-2016			2009-2013			2013-2016		
	Annual	Permanent	Dif (%)	Annual	Permanent	Dif (%)	Annual	Permanent	Dif (%)
Bot.50%	0.159	0.172	-7.6%	0.155	0.161	-3.7%	0.165	0.170	-2.9%
50%-90%	0.445	0.445	-0.2%	0.445	0.444	0.2%	0.445	0.444	0.2%
Top 10%	0.120	0.118	1.4%	0.121	0.121	0.1%	0.117	0.117	0.6%
Top 5%	0.155	0.152	1.8%	0.157	0.157	0.2%	0.151	0.151	0.3%
Top 1%	0.079	0.076	4.5%	0.079	0.078	1.9%	0.079	0.078	0.5%
Top 0.1%	0.043	0.037	16.2%	0.043	0.040	7.7%	0.043	0.040	6.4%
Gini	0.523	0.502	4.2%	0.529	0.519	1.8%	0.514	0.506	1.5%
Theil	0.600	0.539	11.2%	0.612	0.584	4.8%	0.576	0.552	4.3%

Source: own calculations based on tax records (DGI).

5 Final remarks

As in most Latin American countries, previous studies assessing per capita household income from ECH have shown that Uruguay underwent a substantial inequality fall between 2009 and 2013 (). However, analyses for other Latin American countries assessing top income shares present a conflicting picture and cast doubts on the depth and breadth of the inequality (). To address this issue, we assessed primary income inequality and mobility patterns among the adult population aged 20 and more based on personal income DGI tax records micro-data and comparable ECH micro-data. Having access to micro-data in the two cases allows for computing and compare both synthetic indices and top shares. Even when levels are substantially higher at DGI micro-data, we found that synthetic indexes calculated on the two databases experienced a statistically significant reduction (although milder in DGI tax-records) in the period 2009-2013 and remained stable after that. At the same time, the income share accrued by the top 1% remained stable or even grew in tax micro-data whereas it fell according to ECH based calculations. 80% of top income holders are male and half of their income comes from capital or are liberal professionals. The 1% income share found in this study is higher than most countries included in the World Inequality Database, except for the remaining Latin American countries, United States, and South

Africa. Analysing the percentile thresholds in the two databases shows that until the top 10%, ECH captures primary income correctly with a 90% ECH to DGI ratio. However, the lower limit and average income of the upper 1% ECH/DGI ratios have been falling throughout the whole period, which might be consistent with underreporting rates and refusal rates growth in ECH as a rapid income increase was taking place. Additionally, at DGI data the income source composition of the top strata presents a growing share of capital income, consistent with the worsening of ECH reporting rates at the top. Moreover, by comparing the evolution of inequality at the bottom 99% (as a whole or by sub-groups) versus the top 1%.,it can be noticed the findings reported in the previous paragraphs are consistent with the patterns of inequality decrease in each data-source. In fact, whereas in ECH higher income strata experienced higher equalisation levels and led the downwards trend observed in 2009-2013, the inequality reduction at DGI resulted from the low and middle strata (notably the 50-90%) overcompensating a trend towards increased inequality throughout the whole period at the top. By the end, the inequality reduction at the bottom 99% could not offset the increase at the top. Unlike in DGI data, at ECH the inequality reduction was higher at the top than at the bottom 99%. The substantial inequality reduction observed at the top (33% across the whole period) is consistent with its impoverished capacity to reach the more well-off households. Besides, in DGI micro-data the proportion of between groups inequality remained steady or grew depending on the group definition, whereas in ECH it fell reflecting a higher convergence of groups average income. To sum up, in the case of Uruguay, the inequality reduction detected in household survey based synthetic indices trend though milder is robust to the data-source and at DGI micro-data resulted from movements at the bottom 99% of the distribution. The apparent contradiction between the stability of top income shares and the evolution of Gini and Theil indices calls into discussion several issues related to what kind of inequality is sought to reduce, and broader topics such as the relevance of analysing stratification on the basis of a wider scope of variables. It also puts forward the relevance of monitoring and renewing the ways in which household survey gather information and the need to articulate this information with other valuable datasources such as tax data. The income tax has a moderate redistributive effect, reducing two percent points of the Gini index) and 10% the upper fractiles share. Although it is overall progressive, capital income tax rates effectively paid are regressive at the top. The information provided by DGI allowed to analyse persistence rates along the income distribution by building a panel for 2009-2016. Our findings indicate a high persistence, particularly among those who occupy top income positions. For example, in line with Jendermy (2016) findings for Germany, the average probability of staying at the top 1% in the next year is around 80%. Our findings also suggest that over the seven years considered, income mobility has very meagre equalizing effects. Thus, annual cross-sectional inequality measures are a good approximation to long run inequality.

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A Appendix

Table A.1: Capital incomes tax rates

Income capital	Tax rate
Interests corresponding to bank deposits in Uruguayan currency more than one year lenght and debt titles interests-3 years or more	3%
Interests corresponding to bank deposits in Uruguayan currency less than one year lenght	5%
Dividends and utilities	7%
Housing and mobiliary capital rents	12%
Others rents (sportpersons royalties, author royalties, everlasting rents)	12%

Source: own elaboration based on DGI (2019).

Table A.2: Labor income tax rates

Income bracket (BPC)	Tax 2009-2011	Income bracket (BPC)	Tax rate 2012-2016
0-84	0	0-84	0
84-120	10	84-120	10
120-180	15	120-180	15
180-600	20	180-600	20
600-1200	22	600-900	22
>1200	25	900-1380	25
		>1380	30

Source: own elaboration based on DGI (2019).

Table A.3: Pensions tax rates

Pension income bracket (BPC)	Tax rate
0-96	0
96-180	10
180-600	20
>600	25

Source: own elaboration based on DGI.

Table A.4: Income threshold by fractile, 2009-2016

	2009	2010	2011	2012	2013	2014	2015	2016
Mean	7,711	9,885	11,727	12,925	14,465	14,519	13,717	14,115
P50	4,173	5,401	6,611	7,296	8,449	8,574	8,166	8,315
P90	16,639	21,137	24,534	27,107	29,845	29,826	27,693	28,229
P99	51,488	64,990	75,889	83,947	90,048	90,614	85,670	89,084
P995	71,273	89,879	104,658	115,418	124,411	127,750	120,874	129,563
P999	152,646	195,161	234,337	249,884	276,572	284,969	279,407	323,495
P9995	214,476	280,035	335,945	352,553	382,714	404,714	407,687	483,031
P9999	509,210	636,527	795,509	888,552	1,014,507	1,080,096	1,144,089	1,427,661
Mean top 0001	1,504,618	2,030,844	2,919,147	2,879,033	3,730,341	3,149,241	3,465,832	3,569,248

Source: own elaboration based on tax records (DGI).

Table A.5: Number of taxpayers by income source

		2009	2010	2011	2012	2013	2014	2015	2016
Labor income	Total	1,187,913	1,183,629	1,237,034	1,222,505	1,272,881	1,297,408	1,313,961	1,310,285
	Taxpayers	315,300	347,001	395,207	416,318	471,838	510,567	753,705	770,127
Employed	Total	1,127,943	1,111,782	1,161,260	1,143,757	1,190,855	1,216,827	1,253,834	1,237,214
	Taxpayers	276,664	300,461	345,480	363,546	416,530	454,957	706,868	715,150
Self employed	Total	51,024	53,489	55,676	54,958	57,956	57,998	40,509	51,705
	Taxpayers	28,760	30,405	31,823	31,684	33,653	34,957	36,533	44,843
Irae	Total	3,504	3,607	3,687	3,899	4,016	4,128	3,970	4,338
	Taxpayers	3,173	3,253	3,348	3,503	3,619	3,676	3,516	3,826
Pensions	Total	639,540	661,366	627,764	684,320	690,830	698,594	709,216	715,801
	Taxpayers	102,136	112,445	111,787	137,988	148,749	158,991	170,184	173,867
Capital	Total	261,765	298,431	323,035	390,660	445,263	385,352	586,851	656,789
	Taxpayers	255,697	293,041	318,012	386,745	441,457	380,569	582,905	652,258
Dividends	Total	3,134	3,437	4,539	5,297	5,933	6,752	8,473	9,339
	Taxpayers	3,134	3,437	4,539	5,297	5,933	6,752	8,473	9,339
Real state rents	Total	55,205	55,089	57,759	58,600	61,102	66,076	70,032	73,771
	Taxpayers	50,829	50,711	54,800	57,212	59,969	65,028	69,196	72,905

Source: own elaboration based on tax records (DGI).

Table A.6: Non nominative capital incomes as a share of total capital incomes

	Total							
	2009	2010	2011	2012	2013	2014	2015	2016
Interests corresponding to bank deposits in Uruguayan currency or UI, more than one year lengh in local financial institutions	99,8%	100,0%	97,5%	100,0%	100,0%	100,0%	100,0%	100,0%
Interests for bank deposits to one year or more, in Uruguayan currency with no indexation clause	99,9%	100,0%	98,3%	100,0%	100,0%	100,0%	100,0%	100,0%
Obligations and other debt titles interests-3 years or more	41,2%	34,2%	48,1%	96,2%	74,6%	97,6%	91,1%	79,6%
Remaining financial and mobiliary capital rents	62,9%	52,2%	47,4%	59,2%	54,4%	44,3%	49,1%	48,1%
Dividends and utilities	31,3%	39,3%	42,7%	47,2%	38,7%	39,3%	36,9%	34,6%
Sportpersons royalties	10,4%	2,5%	54,0%	8,8%	13,4%	-11,8%	0,9%	-4,4%
Author royalties	-73,0%	-73,7%	-51,8%	-70,0%	-63,0%	-62,4%	-64,3%	-64,3%

Source: own calclulation based on tax records (DGI)

Table A.7: Owners' withdrawals - added individuals, 2009-2016

Year	Withdrawing profits	Top-labour income earners	Additional individuals	Additional individuals (% tax records)	Tax record	Survey population
2009	1070	3284	1552	0.09%	1721207	759168
2010	1611	2747	1034	0.06%	1722902	742245
2011	2150	3015	1350	0.08%	1758779	696426
2012	2280	3291	1390	0.08%	1793012	686455
2013	2975	3470	1435	0.08%	1852341	685052
2014	3430	3800	1611	0.08%	1928833	674913
2015	5107	4183	1865	0.10%	1916230	690735
2016	6448	5002	2202	0.11%	1923850	707894

Source: own elaboration based on firms' tax records (DGI).

Table A.8: Inequality indexes, pre and post-tax, by source, 2009-2016

	Gini Index				Theil Index			
	Tax records		Harmonized survey		Tax records		Harmonized survey	
Year	Pre-tax	Post-tax	Pre-tax	Post-tax	Pre-tax	Post-tax	Pre-tax	Post-tax
2009	0.574	0.554	0.481	0.459	0.712	0.638	0.451	0.401
2010	0.570	0.550	0.468	0.447	0.710	0.635	0.409	0.366
2011	0.565	0.543	0.452	0.432	0.730	0.658	0.375	0.336
2012	0.561	0.537	0.430	0.411	0.709	0.611	0.319	0.288
2013	0.554	0.531	0.432	0.412	0.711	0.638	0.331	0.296
2014	0.552	0.529	0.429	0.409	0.676	0.606	0.329	0.293
2015	0.552	0.530	0.429	0.408	0.706	0.637	0.338	0.299
2016	0.560	0.537	0.423	0.402	0.734	0.663	0.320	0.284

Source: own calculations based on household survey (INE) and tax records (DGI).

Table A.9: Entry and exit rates by individuals' characteristics

	Entries							Exits						
	2010	2011	2012	2013	2014	2015	2016	2009	2010	2011	2012	2013	2014	2015
Total	9.9%	8.0%	6.5%	5.7%	4.9%	4.2%	3.8%	2.7%	3.0%	3.4%	3.8%	4.4%	5.8%	8.7%
Men	9.8%	7.9%	6.4%	5.7%	4.9%	4.2%	3.3%	2.7%	3.0%	3.4%	4.0%	4.7%	6.2%	9.5%
Women	10.0%	8.0%	6.6%	5.7%	4.9%	4.1%	3.5%	2.7%	2.9%	3.3%	3.6%	4.1%	5.3%	7.7%
<25	29.7%	27.0%	24.0%	23.1%	21.4%	19.9%	19.0%	2.0%	2.5%	3.4%	4.4%	6.1%	9.8%	16.9%
25-35	10.9%	8.0%	5.8%	4.6%	3.7%	2.6%	1.5%	2.1%	2.4%	3.0%	3.8%	4.9%	7.0%	11.3%
35-45	8.5%	6.5%	5.1%	4.1%	3.1%	2.3%	1.4%	2.0%	2.2%	2.8%	3.4%	4.2%	5.8%	9.3%
45-55	7.0%	5.2%	4.3%	3.5%	2.7%	2.0%	1.5%	1.8%	2.1%	2.5%	3.0%	3.6%	4.8%	7.5%
55-65	7.9%	5.2%	4.0%	3.5%	2.7%	2.3%	1.8%	1.7%	1.8%	2.1%	2.1%	2.6%	3.2%	4.5%
>65	2.9%	2.0%	1.4%	1.4%	1.2%	1.3%	2.3%	5.1%	5.4%	5.1%	5.1%	4.5%	4.6%	5.0%
Labor	12.9%	10.4%	8.7%	7.6%	6.5%	5.5%	4.9%	2.0%	2.4%	3.0%	3.7%	4.7%	6.8%	11.1%
Employed (+ 1)	3.5%	2.6%	1.4%	1.2%	1.2%	3.2%	3.3%	0.6%	0.9%	1.4%	1.0%	1.3%	2.0%	11.3%
Employed	10.8%	8.9%	7.1%	6.0%	5.2%	3.3%	2.8%	1.2%	1.4%	1.9%	2.5%	3.5%	5.8%	9.4%
Self-employed	14.2%	11.5%	9.9%	8.6%	7.3%	6.4%	5.7%	2.3%	2.8%	3.5%	4.3%	5.4%	7.5%	12.1%
Both	9.0%	6.7%	4.9%	4.2%	3.1%	5.8%	9.1%	2.1%	2.4%	2.6%	2.6%	3.4%	4.2%	7.2%
Pensions	5.0%	3.5%	2.6%	2.4%	2.1%	2.0%	1.8%	4.2%	4.3%	4.2%	4.2%	3.9%	4.0%	4.3%
Capital	5.3%	7.0%	4.6%	3.8%	2.8%	3.8%	8.0%	5.8%	1.7%	2.7%	2.9%	3.5%	2.4%	4.4%

Source: own elaboration based on tax records (DGI).

Table A.10: Intragenerational elasticity. Ranking of income 2016-2009

	Percentile of income (final year)					
	2009/2016	2009/2012	2010/2013	2011/2014	2012/2015	2013/2016
Percentile of income (initial year)	0.747***	0.836***	0.857***	0.861***	0.873***	0.862***
	(0.000699)	(0.000596)	(0.000547)	(0.000550)	(0.000535)	(0.000532)
Observations	1,040,140	1,040,140	1,040,140	1,040,140	1,040,140	1,040,140
R-squared	0.611	0.739	0.773	0.777	0.783	0.769
			Women			
Percentile of income (initial year)	0.763***	0.848***	0.871***	0.880***	0.887***	0.874***
	(0.000925)	(0.000780)	(0.000716)	(0.000708)	(0.000708)	(0.000697)
Observations	542,810	550,263	545,563	545,656	543,403	541,025
R-squared	0.629	0.750	0.787	0.796	0.797	0.788
			Men			
Percentile of income (initial year)	0.737***	0.826***	0.851***	0.849***	0.858***	0.846***
	(0.00105)	(0.000910)	(0.000837)	(0.000854)	(0.000818)	(0.000791)
Observations	495,587	489,181	482,111	483,585	479,467	477,069
R-squared	0.581	0.704	0.743	0.742	0.754	0.746

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table A.11: Transition matrix, women: 2009-2016

	2016											
2009	Decil 1	Decil 2	Decil 3	Decil 4	Decil 5	Decil 6	Decil 7	Decil 8	Decil 9	Decil 10	Top 5	Top 1
Decil 1	34.5%	18.5%	10.5%	7.7%	7.6%	6.7%	4.9%	3.3%	2.2%	1.1%	2.9%	6.0%
Decil 2	18.0%	31.7%	23.0%	10.7%	6.3%	5.1%	3.5%	2.4%	1.4%	0.8%	1.9%	3.8%
Decil 3	27.8%	36.1%	16.7%	7.2%	4.8%	3.7%	2.5%	1.7%	1.0%	0.5%	1.4%	2.9%
Decil 4	6.0%	5.6%	34.8%	20.2%	13.8%	7.7%	5.1%	3.7%	1.9%	1.1%	2.5%	4.8%
Decil 5	5.0%	3.8%	5.3%	39.3%	19.5%	11.4%	7.4%	4.4%	2.6%	1.3%	2.6%	5.2%
Decil 6	3.4%	2.5%	4.5%	5.8%	33.9%	23.0%	12.0%	8.1%	4.5%	1.9%	3.6%	6.8%
Decil 7	2.1%	1.0%	3.0%	4.7%	6.1%	29.3%	27.2%	14.2%	9.0%	3.0%	4.0%	6.9%
Decil 8	1.4%	0.4%	1.1%	3.0%	4.9%	6.8%	25.8%	32.0%	18.3%	6.1%	4.9%	6.6%
Decil 9	0.9%	0.2%	0.5%	0.9%	2.5%	5.0%	8.1%	22.3%	40.7%	18.2%	9.8%	8.8%
Decil 10	0.6%	0.1%	0.3%	0.4%	0.6%	1.4%	3.2%	7.7%	18.2%	65.8%	63.8%	42.1%
Top 5	0.7%	0.1%	0.2%	0.3%	0.3%	0.5%	0.9%	2.7%	4.5%	40.3%	52.5%	41.9%
Top 1	0.4%	0.1%	0.1%	0.1%	0.1%	0.2%	0.3%	0.4%	0.6%	8.9%	15.4%	26.9%

Source: own elaboration based on tax records (DGI).

Table A.12: Transition matrix, men: 2009-2016

	2016											
2009	Decil 1	Decil 2	Decil 3	Decil 4	Decil 5	Decil 6	Decil 7	Decil 8	Decil 9	Decil 10	Top 5	Top 1
Decil 1	26.3%	24.8%	10.5%	9.8%	8.7%	6.5%	4.9%	3.8%	2.4%	1.2%	4.8%	9.7%
Decil 2	43.0%	31.8%	7.2%	5.1%	4.0%	2.9%	2.1%	1.7%	1.0%	0.5%	1.7%	3.3%
Decil 3	9.8%	23.0%	30.6%	12.2%	8.5%	6.2%	4.6%	3.4%	2.2%	1.0%	3.0%	5.9%
Decil 4	7.5%	7.1%	25.7%	23.0%	13.2%	8.8%	6.4%	4.7%	2.7%	1.2%	2.9%	5.5%
Decil 5	4.8%	5.6%	8.9%	26.8%	19.2%	13.0%	9.4%	6.6%	4.2%	1.6%	3.4%	6.3%
Decil 6	3.0%	3.7%	7.5%	8.6%	26.4%	19.8%	14.5%	9.5%	5.3%	1.9%	3.3%	5.5%
Decil 7	2.0%	1.8%	5.1%	6.4%	8.3%	26.2%	23.8%	15.1%	8.8%	2.8%	3.7%	5.8%
Decil 8	1.5%	1.1%	2.5%	5.2%	6.1%	8.3%	23.1%	29.7%	17.3%	5.2%	4.9%	7.2%
Decil 9	1.0%	0.6%	1.2%	2.1%	4.4%	6.5%	8.1%	18.6%	41.2%	15.8%	8.9%	8.9%
Decil 10	0.8%	0.4%	0.6%	0.8%	1.1%	1.7%	3.0%	6.8%	14.6%	68.3%	62.0%	38.9%
Top 5	0.6%	0.3%	0.4%	0.5%	0.5%	0.7%	0.9%	2.6%	3.6%	40.1%	50.0%	35.4%
Top 1	0.3%	0.2%	0.1%	0.2%	0.2%	0.2%	0.3%	0.5%	0.6%	8.3%	12.8%	21.6%

Source: own elaboration based on tax records (DGI).

Table A.13: Transition matrix, 2009-2013

	2013											
2009	Decil 1	Decil 2	Decil 3	Decil 4	Decil 5	Decil 6	Decil 7	Decil 8	Decil 9	Decil 10	Top 5	Top 1
Decil 1	51.1%	11.8%	10.4%	9.8%	8.0%	5.9%	4.0%	2.6%	1.5%	0.7%	0.5%	0.6%
Decil 2	29.8%	50.9%	7.6%	5.8%	4.2%	2.9%	2.0%	1.2%	0.8%	0.3%	0.2%	0.2%
Decil 3	5.6%	29.0%	28.1%	9.3%	6.1%	4.2%	3.0%	1.9%	1.1%	0.5%	0.3%	0.4%
Decil 4	4.9%	3.2%	39.8%	24.5%	11.3%	6.8%	4.3%	2.8%	1.6%	0.7%	0.5%	0.5%
Decil 5	3.6%	2.3%	5.7%	37.1%	24.6%	11.9%	7.1%	4.3%	2.4%	1.0%	0.7%	1.0%
Decil 6	2.1%	1.5%	4.1%	6.3%	33.4%	26.2%	13.4%	7.8%	3.9%	1.3%	1.0%	1.1%
Decil 7	1.2%	0.6%	2.4%	3.7%	6.2%	31.1%	31.2%	14.5%	7.0%	2.0%	1.3%	1.3%
Decil 8	0.8%	0.4%	1.1%	2.2%	3.7%	6.4%	26.8%	38.1%	16.4%	4.1%	2.2%	1.6%
Decil 9	0.5%	0.2%	0.4%	0.8%	1.8%	3.4%	6.3%	22.3%	49.9%	14.3%	6.0%	3.0%
Decil 10	0.5%	0.2%	0.3%	0.5%	0.6%	1.0%	1.9%	4.4%	15.4%	75.2%	87.4%	90.4%
Top 5	0.3%	0.1%	0.2%	0.2%	0.3%	0.3%	0.5%	1.4%	2.3%	44.4%	73.2%	86.3%
Top 1	0.1%	0.0%	0.1%	0.0%	0.1%	0.1%	0.1%	0.2%	0.3%	9.0%	17.1%	63.4%

Source: own elaboration based on tax records (DGI).

Table A.14: Transition matrix: 2013-2016

	2016											
2013	Decil 1	Decil 2	Decil 3	Decil 4	Decil 5	Decil 6	Decil 7	Decil 8	Decil 9	Decil 10	Top 5	Top 1
Decil 1	45.2%	36.4%	6.4%	4.8%	3.5%	2.2%	1.3%	0.7%	0.5%	0.5%	0.5%	0.6%
Decil 2	27.7%	49.4%	7.9%	3.1%	1.9%	1.1%	0.6%	0.3%	0.2%	0.1%	0.1%	0.2%
Decil 3	7.8%	5.3%	66.2%	14.8%	5.5%	2.9%	1.6%	0.8%	0.5%	0.3%	0.4%	0.6%
Decil 4	6.3%	3.6%	7.1%	55.7%	16.1%	5.9%	2.8%	1.5%	0.7%	0.4%	0.4%	0.6%
Decil 5	4.5%	2.3%	4.8%	9.6%	51.1%	16.7%	6.3%	3.0%	1.2%	0.6%	0.6%	0.8%
Decil 6	3.1%	1.3%	3.4%	5.1%	11.2%	49.6%	16.8%	6.5%	2.4%	0.8%	0.7%	1.1%
Decil 7	2.1%	0.8%	2.0%	3.3%	5.2%	12.4%	49.7%	17.9%	5.5%	1.2%	0.9%	1.2%
Decil 8	1.6%	0.5%	1.1%	2.0%	3.2%	5.2%	13.9%	51.6%	18.3%	2.6%	1.4%	1.5%
Decil 9	1.0%	0.3%	0.7%	1.0%	1.7%	3.0%	5.3%	13.9%	59.4%	13.6%	4.2%	2.5%
Decil 10	0.8%	0.2%	0.4%	0.6%	0.6%	1.0%	1.8%	3.7%	11.2%	79.7%	90.7%	90.8%
Top 5	0.4%	0.1%	0.2%	0.2%	0.2%	0.3%	0.6%	1.2%	2.1%	44.6%	77.3%	87.7%
Top 1	0.1%	0.0%	0.0%	0.1%	0.1%	0.1%	0.1%	0.2%	0.3%	9.1%	17.5%	66.9%

Source: own elaboration based on tax records (DGI).

Table A.15: Transition matrix within top 10%, 2009-2016

	2016									
2009	91	92	93	94	95	96	97	98	99	100
91	19.3%	16.2%	15.3%	13.3%	10.2%	8.1%	7.3%	4.5%	3.5%	2.4%
92	21.5%	15.3%	13.9%	12.7%	11.1%	8.9%	5.9%	5.1%	3.3%	2.4%
93	13.4%	21.6%	14.1%	13.3%	11.6%	8.9%	7.1%	5.2%	3.1%	1.7%
94	8.7%	12.0%	22.0%	15.0%	12.4%	10.4%	8.8%	5.1%	3.5%	2.1%
95	5.6%	8.2%	10.9%	21.7%	17.9%	12.4%	9.9%	7.0%	4.3%	2.3%
96	3.0%	4.8%	6.6%	9.6%	20.8%	22.0%	13.8%	9.7%	6.3%	3.5%
97	2.5%	2.5%	4.1%	6.7%	9.5%	20.9%	24.7%	15.4%	9.5%	4.2%
98	1.5%	2.2%	2.5%	3.9%	5.2%	9.3%	21.2%	30.1%	17.4%	6.7%
99	1.2%	1.8%	1.9%	2.5%	3.1%	5.0%	8.1%	22.2%	37.6%	16.7%
100	0.8%	1.2%	1.6%	2.5%	2.2%	3.3%	3.5%	5.7%	18.2%	61.0%

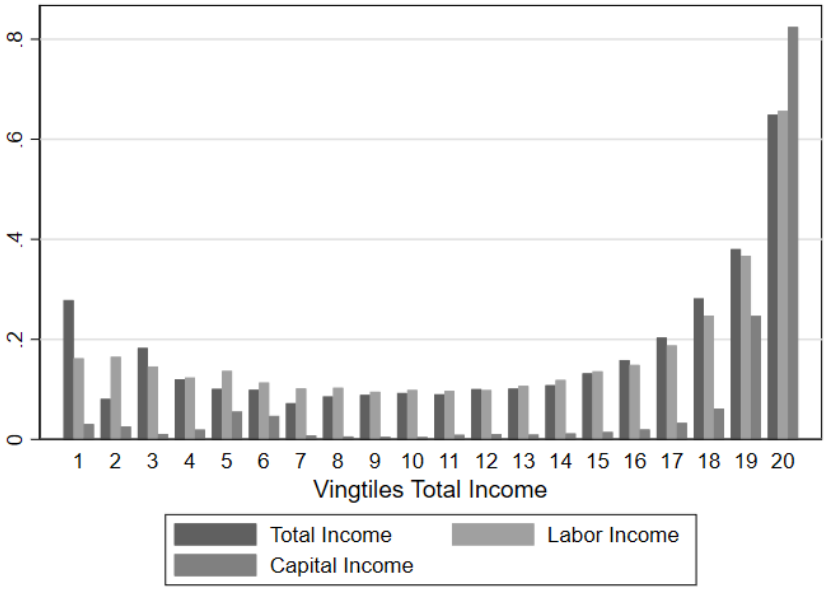
Source: own elaboration based on tax records (DGI).

Table A.16: Income Mobility indexes (top 10%)

	Total income	Labor income	Employees	Self employed	Capital	Pensions
Atkinson inmobility ratio	0.42	0.45	0.45	0.62	0.61	0.36
Determinant index	0.89	0.96	0.96	0.93	0.97	0.72
Shorrocks' MET - Prais	0.83	0.84	0.84	0.92	0.92	0.81
Average jump	1.76	1.78	1.78	2.63	2.50	1.49
Atkinson inmobility ratio	0.42	0.45	0.43	0.62	0.61	0.36
Determinant index	0.89	0.95	0.94	0.93	0.97	0.71
Shorrocks' MET - Prais	0.82	0.84	0.84	0.92	0.92	0.79
Average jump	1.77	1.81	1.72	2.75	2.55	1.48
Atkinson inmobility ratio	0.42	0.44	0.42	0.62	0.60	0.36
Determinant index	0.88	0.93	0.93	0.86	0.95	0.77
Shorrocks' MET - Prais	0.84	0.85	0.84	0.94	0.92	0.82
Average jump	1.74	1.73	1.62	2.56	2.45	1.50

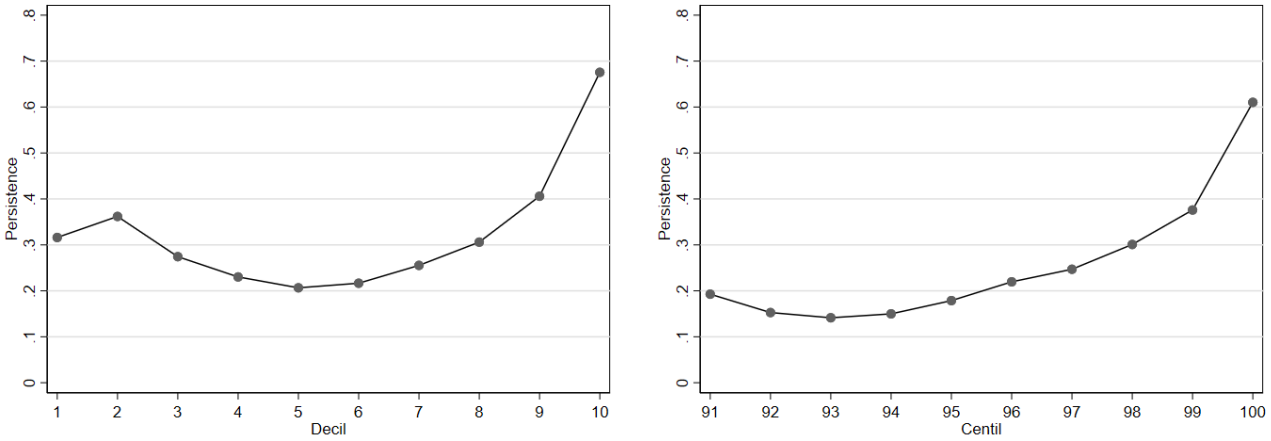
Source: own elaboration based on tax records (DGI).

Figure A.1: Mobility by income source, 2009-2016



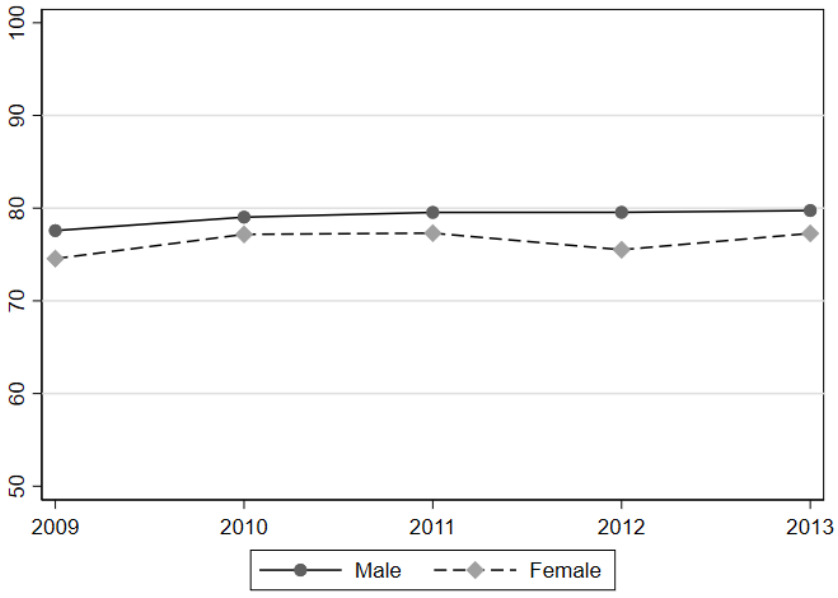
Source: own calculations based on DGI.

Figure A.2: Persistence rate by deciles and centiles of the top 10%



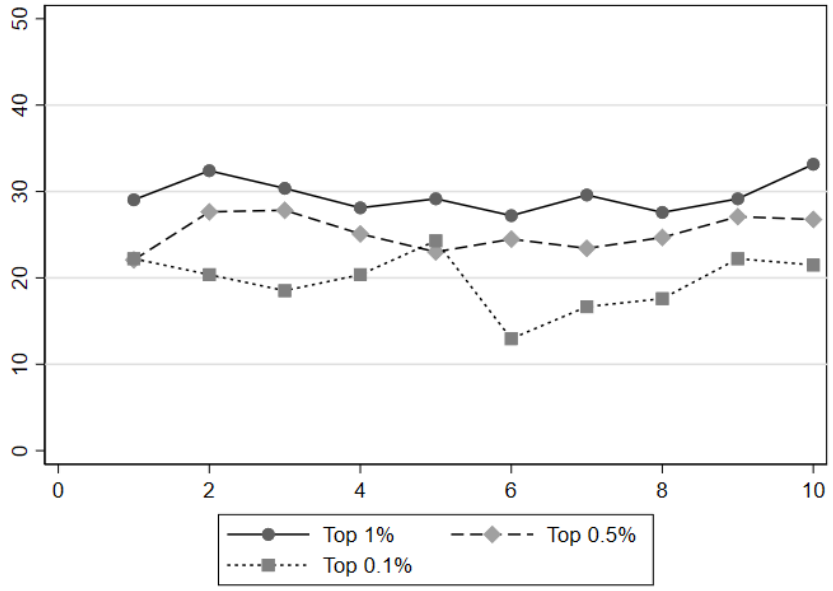
Source: own calculation based on tax records (DGI).

Figure A.3: Persistence rates after 1 year by gender (top 1%)



Source: own calculations based on DGI.
Notes: Persistence rates after three years is unconditional on fractile membership after one and two years.

Figure A.4: Fraction of individuals who do not move downwards, 2009-2016.



Source: own calculations based on DGI.
Notes: Deciles of total income of the Top 1%, 0.5% and 0.1%, computed in 2009 and 2016.