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Distributing the missing third: growth and falling inequality in Uruguay 2009-2016

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Distributing the missing third: growth and falling inequality in Uruguay 2009-2016

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Abstract

Most personal income distribution studies present estimates that account for only a fraction of National Income, which prevents us from analyzing inequality and the distribution of growth in a coherent framework. To overcome this caveat, this paper presents inequality estimates accounting for the totality of National Income for Uruguay over the period 2009-2016. We assemble a database that, for the first time, combines all available income data from tax records, household surveys and a variety of ancillary sources, which is then scaled up in order to match National Income. Results show that inequality fell during the period, led by a moderate increase in the National Income share of the bottom 90%, in contrast with the decline in the shares of the top 10% and much moderate for the top 1%. Top 1%' share shows a decreasing pattern only when undistributed profits are imputed, showing that the inequality trend depends on the complex interplay of income allocation between household and firms. Even with falling inequality, around 45% of the income growth between 2009 and 2016 was accrued by the top 10%, whilst bottom 50% captured less than 14% of new income –a barely higher share than the top 0.1%–, hence widening the absolute incomes gap between groups.

Key words: Income inequality, National Accounts, tax records, developing countries, Uruguay.

JEL classification: D31, D33, E01

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Resumen

La mayoría de los estudios de distribución personal del ingreso presentan estimaciones que representan solo una fracción del Ingreso Nacional, lo que nos impide estudiar la desigualdad y la distribución del crecimiento en un marco coherente. Para superar esta limitación, este documento presenta estimaciones de desigualdad que dan cuenta de la totalidad del Ingreso Nacional para Uruguay durante el período 2009-2016. Creamos una base de datos que, por primera vez, combina todos los datos de ingresos disponibles de los registros tributarios, encuestas de hogares y una variedad de fuentes auxiliares, que luego es escalada al Ingreso Nacional. Los resultados muestran que la desigualdad disminuyó durante el período, liderada por un aumento moderado en la participación en el Ingreso Nacional del 90% inferior, en contraste con la disminución de la del 10% superior y una muy moderada reducción del 1% de mayores ingresos. La participación del superior del 1% superior muestra un patrón decreciente solo cuando se imputan ganancias no distribuidas, lo que demuestra que la desigualdad depende de la compleja interacción de la distribución de ingresos entre hogares y empresas. Incluso en el marco de disminución de la desigualdad, alrededor del 45% del crecimiento de los ingresos entre 2009 y 2016 fue acumulado por el 10% superior, mientras que el 50% inferior capturó menos del 14% de los nuevos ingresos, - una proporción apenas mayor que la del 0.1 superiorabsolutos entre grupos.

Palabras clave: Desigualdad de ingresos, Cuentas Nacionales, registros tributarios, países en desarrollo, Uruguay.

Clasificación JEL: D31, D33, E01

1 Introduction

Growth and personal income inequality are two of the most important dimensions of a country's economic performance. Although the relationship between them has been widely studied, data sources on which most research is based on are not consistent, since growth is studied using macro economic aggregates from National Accounts, whilst inequality estimates are mainly based on household surveys micro data[1], tax records or a combination o both. Moreover, personal inequality estimates depend not only on the incomes available in micro data bases, but also on the decisions of income allocation between firms and households and therefore on what can be observed in tax data and surveys. This decision depends in turn on taxation, and so it is not straightforward to establish a clear-cut border between households and firms. Thus, estimation's micro-macro inconsistency, coupled with the blurriness of the household-firm's border makes it difficult to properly address the question of how is economic growth distributed between income groups. In this article, we tackle these issues by distributing the totality of National Income for Uruguay. This allows us to discuss the importance of considering different income aggregates, showing how they affect income distribution estimates in a non-mechanic way, and also be able to answer the questions how growth was distributed between income groups.

Household surveys and tax data are a key input for any distributional study, yet they have significant drawbacks. They do not include all income sources and –in the case of tax data– do not account for the entire income distribution. Household surveys allow for a correct estimation of the incomes of most of the population, but might be subject to underreporting and undercoverage at the top of the income distribution (Bourguignon, 2015; Lustig et al., 2019). Conversely, the increasing use of tax records to measure income inequality shows improvements in terms of coverage of top incomes (Atkinson et al., 2011), but also has important caveats. For instance, changes in the tax system may entail incentives to alter the reported income through income shifting or deferring, tax avoidance or evasion, problems that may be particularly relevant in the short term (Burkhauser et al., 2012; Goolsbee, 2000; Piketty, 2003). Not surprisingly, different inequality-estimate producing institutions report heterogeneous and often divergent results. Ferreira et al. (2015) and Lustig et al. (2016) review the main sources of international information that analyze the evolution of inequality[2], concluding that different databases produces different results, both in levels and in trends, even when the welfare concept and inequality measures are held constant. This divergence increases when the estimation refers to an specific country and a short time frame.

[1] For a brief survey of this approach main results see Berg et al. (2018).

[2] CEPALSTAT, Income Distribution Database (IDD), LIS, PovcalNet, Socio-Economic Database for Latin America and the Caribbean (SEDLAC), "All the Ginis" (ATG), the World Income Inequality Database (WIID) and the Standardized World Income Inequality Database (SWIID).

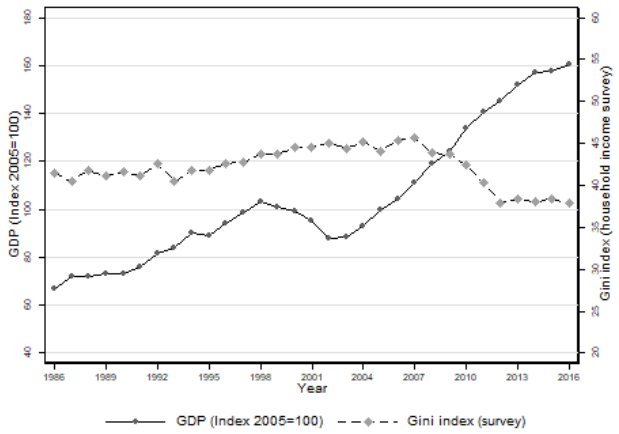
Some of the drawbacks of both household surveys and tax data can be tackled by considering the totality of National Income, which does not depend on the definition of taxable income and, by construction, refers to all possible income sources in the economy. Moreover, it represents a standardized income concept, internationally accepted and precisely defined by the System of National Accounts (United Nations, 2008). Yet the task of accounting for all remaining incomes is challenging since the gap between micro and macro based income estimates is large (Deaton, 2005).[3] Efforts to obtain income inequality estimations which are consistent with macro economic aggregates have been performed for Latin American countries in the past (Altimir, 1987), showing the difficulties and risks of such an exercise. More recently, following the Distributional National Accounts (DINA) methodology (Alvaredo et al., 2016), an increasing number of DINA-based estimations for both developed (Blanchet et al., 2019; Piketty et al., 2018; Garbinti et al., 2018) and developing countries (Piketty et al., 2017; Piketty and Chancel, 2017; Novokmet et al., 2018; Morgan, 2017) has emerged. We provide the first inequality estimates for Uruguay that account for the totality of National Income, hence contributing to this literature.

Although in the European context Uruguay might be considered a relatively high inequality country, historically it is has been among the least unequal countries in Latin America. After decades of unstable economic growth and recurrent economic crisis, it sustained an average annual growth rate of around 4.7% between 2004 and 2016[4]. This economic growth, coupled with a series of relatively large reforms both in the labor market and in the tax and transfers system put in practice by a center-left coalition in office from 2005 to 2020, turned into a significant decline in income inequality. These reforms included a major raise in the minimum wage, the restoration of centralized, collective wage bargaining, an expansion of both coverage and amount of non contributory cash transfers schemes, and introduction of a progressive income taxation (Amarante et al., 2014; Bucheli et al., 2013). Based on high-quality household surveys, studies have consistently shown that income inequality experienced a rapid decline between 2008 and 2012 –illustrated by around seven point fall in the Gini index, see Figure 1– followed by a relative stagnation from 2013 to 2016 (Cornia, 2014; Alvaredo and Gasparini, 2015; Gasparini et al., 2018).

[3]These gaps between national accounts and other data sources have been documented in both developing and developed countries. Deaton (2005) points out that surveys account for less than 60% of GDP on average, and that also exits divergences in the trends of consumption and incomes growth.

[4]After this point, growth rates were considerably lower, around 1-1.5%.

Figure 1: GDP and income inequality 1986-2016



Note. In the primary axis GDP is presented with GDP 2005=100, whilst percapita household income gini index (estimated based on the household survey) is depicted on the secondary axis. During the period 2009-2016, gini index droped by about 7 points, and National Income grew at a 5.5% rate.

Since 2008, the re-introduction of progressive income taxation in Uruguay has allowed to complement and contrast household survey-based estimations with tax data (Burdín et al., 2019). In general terms, overall inequality -measured with synthetic indexes such as the Gini or Theil- falls in estimations based on income tax data, though less steeply and from a higher level than in the survey. Conversely, top income shares show stability and slight increase in the end of the period in tax data of about 15-16% in 2009-2016, but a drop from 11.6 to 8% in the survey. This is consistent with findings for other countries and, moreover, it shows the increasing difficulties of the survey to capture top incomes adequately (Atkinson and Piketty, 2007).

Household surveys and the tax records account for just 30% and 55% of National Income respectively in Uruguay, and not more than 65% when combined, leaving a gap of over a third of unaccounted for income in inequality estimates. Thus, in this paper we estimate personal income inequality series accounting for all National Income, providing income distribution estimates for 2009-2016. This allows us to zoom in a short period with rapid economic growth and in which income inequality seem to have fallen. The aim in this study is to curve some of the main limitations of classic data sources by incorporating both taxed and non-taxed income, while allowing us to analyze inequality in a consistent way with the macroeconomic aggregates, which are taken as reference income aggregates.[5]

Estimations of factor and pre-tax national income inequality series are presented. DINA guidelines and all previous work done for countries and regions such as United States, France,

[5]This does not entail, however, assuming that the National Accounts provide precise approximations of the economy's income, but rather to assure harmonic micro-macro income definitions.

China, Russia, India, the Middle East and Brazil, heavily rely on detailed National Accounts as the cornerstone piece of information for the estimation of the series. However, Uruguay's National Accounts present very limited information. From 2006 on, estimations of national income are only based on the expenditure and production approaches, but not on the income approach. Moreover, estimates are presented by industries but not by institutional sector. This means that we do not know how much income is accrued by households, government or the corporate sector, nor do we know the labor or capital shares of national income. The only official aggregate reference point that we have is the national income estimation itself. This major drawback, however, is somewhat offset by the availability of high-quality tax and survey micro-data, as well as a wide range of administrative records on total revenues, deficits, firms' balance sheets, among others.

The estimation procedure consists of three major stages. In the first one, we combine all available income information from tax records and household surveys to account for the entire adult population. We start with tax data, which covers 75% of the adults aged 20 or more and add, using the survey, non earners and individuals with exclusively informal or untaxed incomes. We then impute all remaining informal or untaxed incomes from the survey to very similar individuals in the tax data in terms of incomes, sex, age and income sources. Population and incomes are then adjusted so that they match official estimations of total population projections, non contributory pensions, cash transfers, social security contributions, etc. This database accounts for around 60-65% of national income. In the second stage, we impute all remaining tax revenues (including indirect taxes and taxes on production) and social security deficits, as well as undistributed profits reported in firms' balance sheets. In the final stage, which is our benchmark series, we scale up proportionally labor, capital and mixed incomes in order to match aggregate estimates of National Income.

Results show that inequality fell during the period 2009-2016, led by a moderate increase in the share of the bottom 90%, in contrast to the decline in the shares of the top 10%. For our pre-tax national income benchmark series, top 10% share fell from 54.3% to 50.5%, whilst the bottom 50 grew from 9% to 11.2%. The Gini index depicts the same mild downward trend, with a fall of 0.03 points, departing from 0.65. These estimations should be considered with extreme caution, and are probably more informative in trend than in levels (as the international comparison suggests).

In spite of the fall in inequality over the period, new income generated was not evenly distributed. While around 40% of the income growth between 2009 and 2016 was accrued by the "middle 40", 46% was appropriated by the top 10%. The bottom 50% captured the remaining less than 14% of the new income, a share similar to the top 0.1% (12%), which is 500 times smaller in terms of population.

This general trend is observed in all the estimations stages, although at different levels,

with over 10pp difference in top 10%'s share estimation between first and third-stage estimations. As in similar studies, the large gap is mainly explained by undistributed profits (Fairfield and Jorratt De Luis, 2016; Flores et al., 2019), which represent 5-7% of national income.[6] This income source proves to be crucial as results are extremely dependent of it. Undistributed profits are important insofar they represent a saving mechanism for firms' owners, but its imputation is highly delicate since a proxy for firms' ownership is needed. In the case of Uruguay, a large part of the profits remain in the firms, which results in an extreme concentration of distributed dividens (over 90% to top 1% and 60% to top 0.1%), and does not necessarily represent a correct proxy for firms' ownership. That is why we use the sum of all taxable capital incomes as a proxy of firms' ownership, which still entails a large concentration of undistributed profits imputations but should be nevertheless considered a lower bound.

There are, however, some differences between imputation stages. Top 1%'s share increased in the tax-survey data base (first-stage estimations) by 1.5 percentage points, but decreased by approximately the same magnitude in the second and third stages. This is the result of the decreasing share of undistributed profits imputed, and of the increase in the distributed ones (leaving the total amount unchanged). This highlights the importance of understanding both what individuals receive as income and what happens with the distribution of labor and capital at the firm and national levels.

The contribution of this paper is threefold. First, we provide new personal income inequality estimates for Uruguay that overcome some of the drawbacks of previous studies (Burdín et al., 2019), by combining all available income information from the tax records and the household surveys, which entails not only adding informal workers and non-earner adults as in previous studies, but also imputing informal and untaxed incomes to the formal population. These imputed incomes include, in particular, owner occupied rental income, social and health contributions and cash transfers, which have a significant distributive impact. We believe this to be an important contribution in its own right. We also make these estimations fully consistent with national income estimates and show (i) the significant gap that exists between macro and micro-data and, more importantly, (ii) the non-mechanical effect of the decision of income allocation between firms and households on personal income inequality.

Second, by estimating the distribution of National Income, we are able to properly estimate the share of growth accrued by each income group. This analysis shows that even in the context of falling income inequality, the share of new income captures by top income groups is disproportionately high, hence increasing the absolute distance between groups.

Third, the case of Uruguay may be important as it is one of the few developing countries to undertake the effort of building DINA series, and hence, it may be informative of the

[6] In most countries, the share of undistributed profits is very high, between 4-10% Alvaredo et al. (2016), and there is evidence that it is growing (Flores, 2018)

methodological specificity, problems and possible solutions in such contexts. We adapted the DINA framework to a developing country with severe National Accounts information limitations, and with high informality rates compared to the rich countries. Even though all the estimates presented should be considered as preliminary, the methodological difficulties of this specific context may be important in similar ones.

The paper is organized as follows: in section 2, the main DINA definitions and data sources are described. In section 3, the estimation procedure is presented, and results are depicted in section 4. Section 5 concludes.

2 Definitions and data sources

2.1 Income definitions and unit of analysis

We estimate inequality series of factor and pre-tax national income for 2009-2016. Following DINA guidelines (Alvaredo et al., 2016), factor income refers to the sum of all income flows accruing directly or indirectly by the owner of production factors, before tax-transfers and social security payments. The main difference between factor income and pre-tax national income relies in the treatment of pensions, which are accounted on a distribution basis for the pre-tax national income and on a contribution basis for factor income. In the DINA framework, both factor and pre-tax national income must match national income by construction. The unit of analysis is individualistic adults or equal-split adults. In the equal-split series, income is divided among cohabiting adults ("broad equal split"), whilst in the individualistic series income is attributed to each individual income earner. In this paper, as most income from the tax data and the survey is attributed to a single individual, our series could be considered mostly individualistic.

The Uruguayan personal income tax is collected on an individual basis and households are not identified. Joint taxation by couples is allowed but rather rare (see 2.2.1). In the case of the household survey most incomes are attributed to different earners, but there are some exceptions, such as incomes form real estate ownership, as well as owner occupied housing rent, are reported by the household as a whole. In this paper, we split them equally within the adult members. In the case of non contributive child transfers (which are matched when possible or otherwise imputed), the same procedure is performed and incomes are distributed between all adults.

For the reasons described above, most incomes are attributed on an individualistic basis, though a few are equal-split. We believe that this unit of analysis definition is the most accurate description of reality that we can obtain given the data restrictions, but we should stress that is insufficient. In particular, due to the nature of tax records, we are not able to analyze household

incomes, which for some purposes is very important.

2.2 Data sources

2.2.1 Administrative micro-data

Due to the strong limitations in the information from National Accounts, the construction of the DINA series is based mainly on the microdata base of tax records for the period 2009-2016. This high-quality tax micro-data includes labor and capital incomes, as well as pensions.

In the case of labor income and pensions, the information comes from the social security records, so it includes the whole universe of workers contributing to the social security or pensioners, independently on whether they are net tax payers or not. Comparisons to the household survey and the population projections show that income tax records account for approximately 75% of adult population and 80% of workers. In this last case, the difference corresponds to informality (see Burdín et al. (2019) for details).

In the case of labor income, the sources considered taxable by income tax includes wages, salaries, commissions, overtime payments, vacation payments, annual leave, end of the year payments, per diem stipends not subject to return and any other payments received from employers. Unemployment, illness and maternity subsidies, accident insurance and unemployment benefits and child allowances are excluded from taxable income.

Capital incomes are divided into rents from real estate and lease and financial and profit rents. The second group includes all cash or in-kind rents coming from bank deposits and other financial assets, business profits and utilities distributed by those firms contributing to entrepreneurial income tax (IRAE), copyright among others. Banks, real estate agencies and institutions in charge of payments are set as withholding agents in most cases; if not, individuals need to file a tax return. The tax rates are depicted in table A.1 [7].

As a second source of information from tax records, in this work we use the balance sheets of the firms pay the corporate income tax (Impuesto a las Rentas de las Actividades Econòmicas, IRAE). Firms with annual revenues above USD 500.000 (4 million indexed units) are obliged to present annual balances (around 60% of registered firms), and pay 25% of IRAE over the net operating surplus.[8] These firms report their total profits, and as total distributed profits are provided by DGI, computation of total undistributed profits is straightforward.

To compute a DINA-based income inequality series, a wide range of auxiliary data sources

[7] In the case of capital income, they are exempt from the tax income those individuals having housing rents whose annual value is below USD 5.000 and public debt interests, gains obtained from private capitalization pension accounts and business profits distributed by firms with total annual revenue lower than USD 500.000 (4 million indexed units)

[8] Firms with annual revenues under USD 500.000 (4 million indexed units) pay a lump fix tax and are not required to submit a balance sheet.

are used. The first one corresponds to the administrative records of a non-contributory child allowances (Asignaciones Familiares-Plan de Equidad). This database includes the entire universe of non-contributory child allowances and the incomes are assigned to the adults of the household where the eligible children live. Finally, national personal property taxes are matched to the income tax database. Less than 10.000 pay this tax, which has a relatively low enforcement and that will be gradually eliminated in the next few years.

2.2.2 Household Surveys

The second source of micro-data comes from Continuous Household Surveys (Encuestas Continuas de Hogares, ECH) for the entire period (2009-2016). They collect information on socioeconomic variables and personal income for each member of the household. After-tax labor income includes cash and in-kind earnings for salaried workers, self-employed and business owners. Information is separately recorded for the main occupation and the remaining ones. Salaried workers are also asked on whether they contribute to the social security system for their whole earnings or they underreport, used to identify informal earnings from this data source.

Except for profit withdrawal in the case of self-employed and business owners, capital income is reported for the household as a whole, and, hence, individual information cannot be recovered. Interests, dividends, rents, benefits and imputed value of owner occupied rental income are gathered in separate questions. Capital income sources are reported on an annual basis; only imputed value of owner occupied housing is gathered for the month previous to interview.

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

2.2.3 National Accounts

In order to estimate distributional accounts in the DINA framework, it is necessary to construct income series fully compatible with national accounts concepts. Ideally, we should depart from detailed National Account estimations, but unfortunately that is not the case in Uruguay. Uruguay's National Accounts present estimations of national income based on the expenditure and production approaches, but not on the income approach . Moreover, estimates are presented by industries but not by institutional sector.[9]

This means that we do not know how much income is accrued by households, government

[9]The last time updated the income generation account was 2005, and estimations by institutional sector are not available since the late 1990's.

or the corporate sector, nor do we know the labor or capital shares of national income. The aggregate income estimations corresponding to the different primary income components are obtained from updated NAS estimations based on the household survey and secondary data sources (De Rosa et al., 2018). Thus, it is possible to use estimations of aggregate labor incomes (including social security contributions), the gross operating surplus, taxes net of subsidies and mixed income.

Thus, the only official aggregate reference point available over the period is the national income estimation itself. Moreover, only the Gross National Income aggregate are available, and unofficial estimations of capital depreciation (of around 8% of GDP) are used to compute Net National Income. Hence, the final estimation step (scaling up the income distribution estimated as from survey and tax data to national accounts totals) requires further work in this case.

2.2.4 Secondary data sources

Finally, a set of additional sources of information are used to estimate the total of taxes and income not incorporated in the sources previously described.First, the DGI provides us the total amount of taxed incomes and taxes for those cases in which earners cannot be singled out. This is the case of non-nominative shares, equities, securities, dividends or interests coming from bank deposits which are subject to the bank secrecy act. Approximately 40% of capital income throughout the period was non-nominative.

All remaining aggregate tax revenues are annually reported by DGI, broken down by individual tax. Local taxes, which have a significant component of property taxes, are reported by the National Planning Office (Oficina de Planeamiento y Presupuesto, OPP).

3 Estimation of DINA series

3.1 Overview of the method

In this section, a detailed explanation of the construction of the DINA series is presented. The estimation procedure is "bottom-up", consisting of three major stages depicted in Table 1.

In the first stage, for each income definition, we depart from the tax micro data and all formal and taxable labor and capital incomes plus pensions. This data source includes between 73% and 79% of the total population. We include the remaining population and their incomes using the household survey. The sustained growth in recruitment in this first stage is explained by the increase in the mass of income captured in administrative records, which may be due both to a reduction in the informality rate in the labor market in the period (from 32.2% in

2009 to 25.3% in 2016), as well as probable improvements in the administration of the tax that can generate better capture of other sources of income.

The second stage consists on imputing undistributed profits and all remaining taxes and social security deficits. These sources of income represent about 5-7% of national income, with variations depending mainly on undistributed dividends, which show larger fluctuations over time. Finally, in the third stage, labor incomes, capital incomes and mixed incomes are scaled up in order to match previous estimations of national income functional distribution. In this final stage, total incomes matches the national incomes total for the factor and pre-tax incomes. Table 1 shows the percentages by source imputed at this stage. Given the accuracy of tax records and survey to capture of labor income, at this point it is only necessary to impute approximately 2% in most years in this source. However, the imputations required to reach total national income for capital, mixed and other income are significantly higher.

Table 1: Overview of the imputation stages (% of national income from 1st to 3rd stage, 2009-2016)

Year	2009	2010	2011	2012	2013	2014	2015	2016
1st stage	62.7%	62.5%	63.3%	63.2%	65.4%	66.9%	68.8%	70.9%
2nd stage	67.0%	66.3%	66.2%	68.5%	69.0%	69.9%	70.8%	71.6%
3rd stage by source								
Labour income	4.4%	3.3%	3.4%	2.4%	2.2%	2.4%	1.8%	1.3%
Capital income	10.3%	5.9%	11.6%	12.3%	9.5%	5.9%	10.9%	15.2%
Mixed income	11.0%	11.0%	10.1%	8.7%	9.4%	9.5%	10.2%	9.2%
Other incomes	7.2%	13.6%	8.6%	8.1%	9.8%	12.3%	6.4%	2.7%

Note. Own elaboration based tax data, household surveys, National Accounts and secondary data sources described in Section 2. Each row of the first panel and the first row of the second panel depict the amount of incomes accounted for in every estimation stage, as percentage of National Income. First stage is the result of a combination of tax and survey data, the second one imputes other incomes (in particular undistributed profits), and the the final one scales up to National Income (by income source, also depicted in the lower panel).

In each stage of the imputation, we increase the distance from the original micro databases, which are, in our view, high quality data sets, and so they represent a very important reference point. The second stage is the distribution of these incomes plus the imputation of all incomes for which administrative totals exist or can be computed, and thus covering all possible income sources. In the final stage, incomes are scaled up and so they are consistent with the National Accounts but the resulting distribution incorporates the estimation of the components of the national accounts based on household survey and secondary data sources.

3.2 First estimation stage: the construction of the combined tax-survey micro database

We depart from the income tax micro-data and add the missing population and their incomes. We assume that the information provided by the income tax data source is accurate, in the sense that all the people that receive formal and taxed incomes are in the data base and that they do not under-report (although they may have informal or untaxed income). This assumption entails the usual evasion and elusion caveats.

Approximately 40% of total capital income is non-nominative, so is not possible to determine precisely the individuals who perceived this incomes. As a conservative imputation criterion they are imputed proportionally to the remaining capital incomes.

From household survey we incorporate individuals without taxable incomes. These include informal labor and capital incomes, owner occupied rental income, unemployment insurance, other incomes (for example, payments in kind) and transfers[10]. In the cases in which income is reported on the household basis and not separately recorded for each individual, it was split equally between all adults within the household. Additionally, interests from deposits are also included, which despite representing taxable income, is not available in tax records due to banking secrecy.

In this way, we add around 25% of total adult population from survey (see Table A.2). It is worth mentioning that in some years, the adjustment ratio to reach the total population is smaller than 100%. In those cases, incomes lost due to informal earners population reduction are redistributed among the same groups of earners.

Up to this point the data base accounts for those individuals with (i) exclusively formal and taxable incomes; (ii) exclusively informal or untaxed incomes or (iii) non earners. But informal or untaxed incomes accrued by people with formal and taxed incomes (that is, individuals in the tax records data base), are still missing. As a way of incorporating these incomes, from the household survey we identified the characteristics of the individuals who receive both taxed and informal incomes. Then, we distribute all informal and untaxed incomes perceived by these individuals among those with the same characteristics in terms of annual income, gender, age and formal income sources in tax records. The main caveat is that, which this procedure we are increasing the incomes of medium earners more than others.

Table A.4 shows the distributional changes generated by the incorporation of the different sources of income of the first stage. The imputation of non-nominative capital income increases the inequality present in administrative micro-data, which is later more than offset by the equalizing effect of informal income and transfers. In terms of top 1% share, the incorporation

[10]This includes both child transfers and other transfers. For the population with formal and taxed incomes, a distinction between them is made as it is possible to link with administrative micro-data on non-contributory child transfers. See bellow.

of incomes reduce 2 p.p. the initial levels of appropriation.

3.3 Second estimation stage: imputation of remaining taxes and undistributed profits

In Table A.5 totals to be imputed to the tax-survey database are depicted. Up to the first threshold, all incomes perceived by households have been considered. One of the sources of income not included in the first stage is undistributed dividends, that correspond to the primary income of the corporate sector and do not appear in tax record or surveys.[11] These incomes are part of the income sources of the owners of the firms, who can decide to maintain these incomes in the firm or distribute them as dividends due, among other reasons, to tax incentives.

The incorporation of undistributed profit into households implies, on the one hand, including incomes that are under the control of individuals and can generate new flows of income. Thus, in the DINA Guidelines (Alvaredo et al., 2016), undistributed profits are mentioned as income flows in the Hicksian sense, since they can make the owners wealthier. On the other hand, accounting for these revenues reduces the possible variations in the series of fiscal income caused by firm owners' decisions about the allocation of income, i.e. between keeping incomes at the firm level or distributing dividends. This is particularly relevant in the Uruguayan case, where only a few number of firms distributed dividends (De Rosa et al., 2018). The total amount of net undistributed profits is taken from firm's corporate tax records (see Figure 4). On average, this source of income represent more than 5% of national income in each year.

Additionally, the set of taxes that represent income that is not directly received by households must be imputed. National production taxes and corporate taxes are annually reported by the tax authority (DGI), as well as non-residents taxes and wealth transfers taxes, which were not present in the tax records. Product taxes net of subsidies and Social Security Deficits are reported by the Central Bank (BCU). Finally, local taxes are reported by the Planning Office.

Three different criteria were adopted to impute these incomes, depending on their nature: (i) proportional to total income, (ii) proportional to real estate incomes or (iii) proportional to capital income. In Table A.3, distribution of the three incomes over which imputations were performed, are depicted. Incomes distributed based on "real estate owner's incomes" are relatively small a distributed better than average, whilst the opposite happens with ones imputed based on capital income.

Nonresident income taxes, local taxes (other than production or property), social security

[11] Undistributed profits it is equal to the net operating surplus of non-financial and financial corporations, plus the property income that they receive from themselves and other sectors, minus the property income that they pay to themselves and other sectors (Alvaredo et al., 2016).

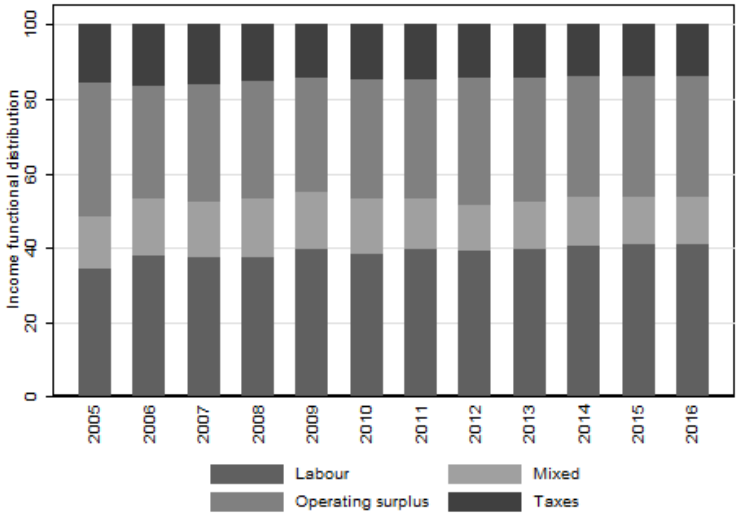
deficits and taxes on products net of subsidies were imputed proportionally to total individual income. Personal property taxes, which are a combination of local property taxes and patrimonial wealth transfers, are imputed proportionally to property income.

Finally, production taxes, corporate taxes and undistributed profits, are imputed proportionally to capital incomes. Due to the significant amounts that undistributed profits represent, the imputation criteria could have important distributional consequences. Imputing this large amount of incomes proportionally only to dividends would entail imputing more than 95% to the top 1%. Instead, we decided a rather conservative imputation criterion including all taxed capital incomes.

3.4 Third estimation stage: scaling up to National Accounts

Using all available information from tax micro databases, household surveys and all reported administrative totals on the second stage the gap to the national income is still around 30%. As mentioned before, there is no official data of functional distribution from the National Account System. To the scaling up process, we used previous estimations of the evolution of labor, capital, mixed income and taxes net of subsides in relation to national income depicted in Figure 2 (De Rosa et al., 2018). Thus, in this third stage we account for the total of income of the economy, coinciding with the national income of the NAS.

Figure 2: Factor income functional distribution 2005-2016



Note. estimations taken from (De Rosa et al., 2018) and updated until 2016 based on household survey data.

4 Results

4.1 The evolution of income distribution

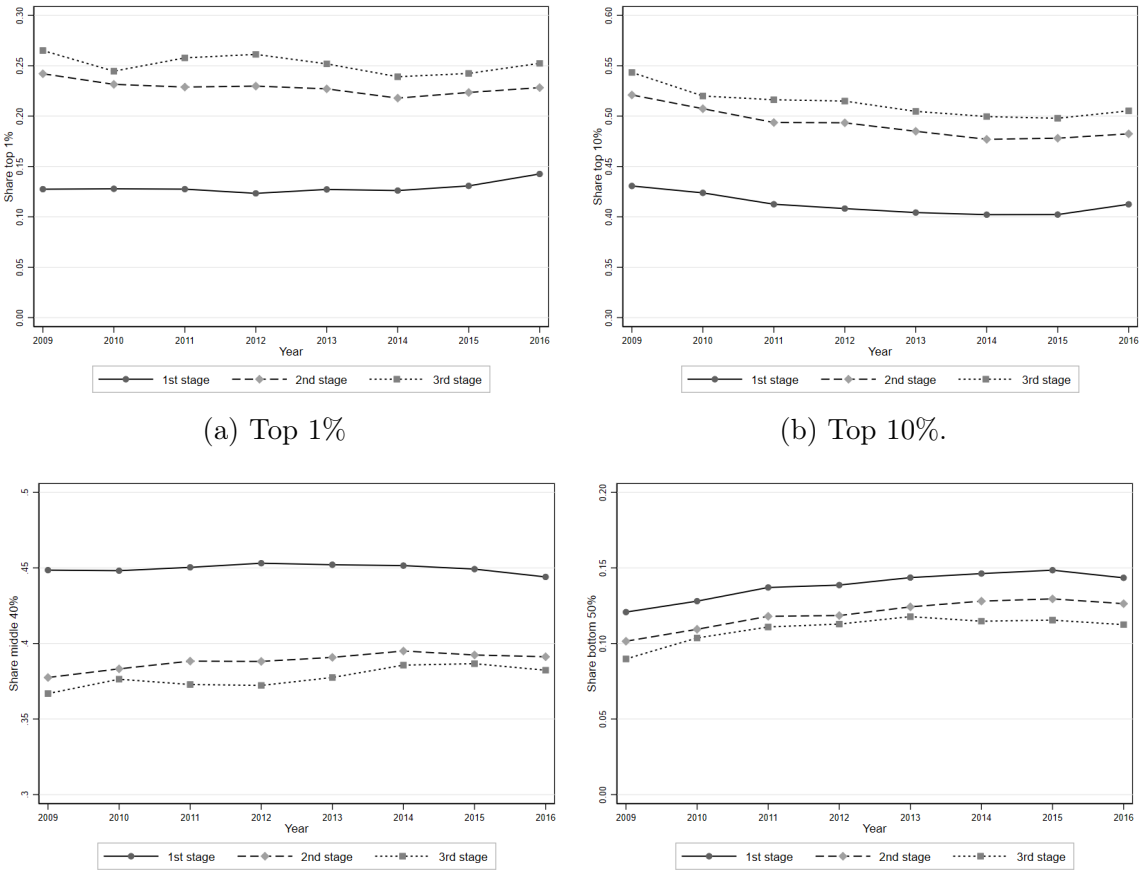
The evolution of pre-tax income distribution in the three imputation stages is depicted in Figure 3.[12] Two things are worth noting. Firstly, each imputation stage depicts different inequality levels as expected, as both imputations and scaling up increase the relative importance of capital incomes. The first stage, which is the result of the combination of tax data and household surveys, shows lower shares for top fractiles compared with the second stage, as taxes and undistributed profits are imputed to capital owners, inequality increases (see Table A.3). The second stage shows, in turn, less inequality than the third stage, because the capital incomes are scaled up by a higher proportion (see Table 1).

Secondly, the main estimated inequality jump occurs when imputing undistributed profits in the second stage. This highlights the importance of this aggregate and its variations to analyze changes in income inequality. It is also important since the scaling up incorporates almost 30% of National Income as shown in Table 1, and therefore could entail large variations in estimations, but in turn it only increases slightly income inequality.

While no major changes in trends are noticeable between the different imputation stages, some slight but important variations do appear. The general evolution depicted is one of falling inequality. Bottom 50% increases by over 2 p.p. in all estimations, and the top 10% falls between 2 and 4 p.p.. In the benchmark series (third stage estimation), bottom 50% increases by over 2 p.p., reaching 14.3%, and top 10% was 50.5% by the end of the period after falling almost 4p.p.. For middle 40%, however, the situation depends on the imputation stage. While for the benchmark series and for the second stage, middle 40% increases, it remains stable for in the tax-survey based series. In the case of the top 1% the trends change more visibly, with a clear increase of 1.5 percentage points in the first stage, but with a variation in the benchmark series of similar magnitude but opposite sign.

[12] Factor income distribution is presented in Figures A.1 and A.2 of the appendix. As expected, results are similar in trend but higher in levels, since this income definition is "prior" to social security contributions and pensions, showing consistently higher levels of concentration (e.g. around 2-3% for the top 1%), which is reasonable since over 25% of individuals in the database were 65 years or older.

Figure 3: Pre-tax income shares by imputation stage, 2009-2016



(a) Top 1%

(b) Top 10%.

(c) Middle 40%

(d) Bottom 50%.

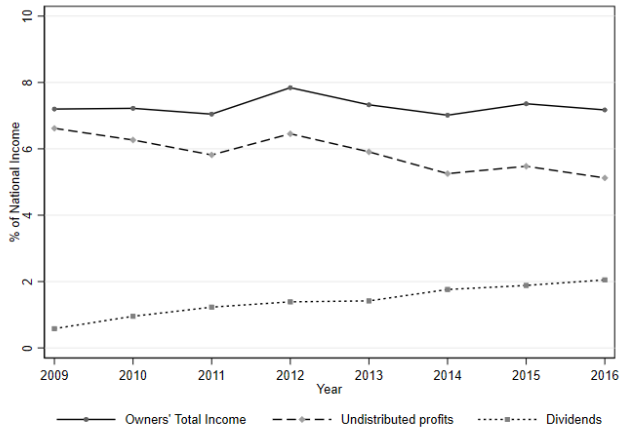
Note. Own elaboration based on tax records, household surveys and National Accounts (see Table A.6). First stage estimations are the result of the combination of tax data and household surveys. Second stage estimations include imputed undistributed profits and taxes, and in third stage estimations incomes are scaled up to National Income aggregates by income source. All estimations refer to pre-tax personal income distribution. Top 1, 10, middle 40 and bottom 50%'s shares depicted in panels a, b, c and d respectively.

This important differences in top income's shares can be explained by the evolution of undistributed profits. The evolution of the first stage top 1%'s share is consistent with similar estimations by Burdín et al. (2019), based on the same data and similar imputations procedures.[13] This trend is somewhat surprisingly turned upside-down by the imputation of undistributed profits of the second stage. The explanation lies on the changing size of the undistributed profits vis á vis the amount of distributed profits, depicted in Figure 4. As div-

[13]In earlier studies, top income shares of pre-tax income were around 15% and increasing to over 16% towards the end of the period. Here, estimations are around 2 percentage points lower, which is consistent with the changes performed in the present estimations. In particular, we included social security contributions, transfers and owner occupied housing rent, which have a redistributive effect. Furthermore, we imputed informal and untaxed incomes to the formal individuals, which have a much more important effect in the lower part of the formal population distribution. See Table A.4.

idends are taxed, they a appear in individual's tax records and therefore were considered in the survey-tax database. The amount of dividends increased during the period hence pushing top incomes' shares upwards. But this increase was mirrored by a decrease in undistributed profits, leaving the total amount of profits (as a percentage of National Income) unchanged[14]. Therefore, when undistributed profits are imputed, the increasing top 1%'s share is neutralized and even slightly reversed. This highlights the importance of considering both distributed and undistributed profits in inequality analysis, since what may appear as a surge in inequality, may only reflect a change in the decision of firm's managers to distribute dividends or keeping them at the firm level, hence affecting the inequality trend.

Figure 4: Owners' Income: undistributed profits and dividends, 2009-2016

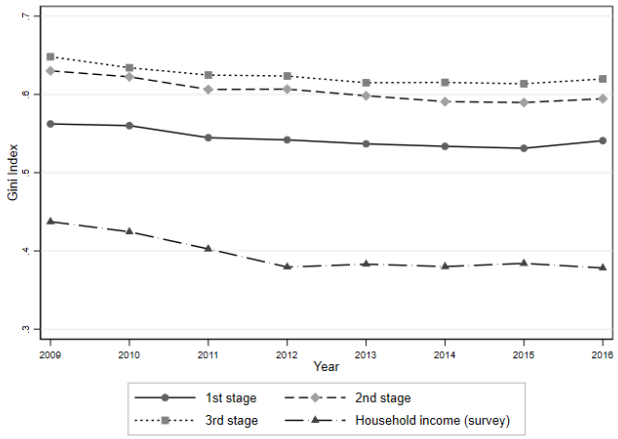


Note. Own elaboration based on tax data, household surveys, National Accounts and secondary data sources described in Section 2. Undistributed profits from corporate sector (excluding government), net of distributed profits and all taxes on firms, expressed as a share of National Income.

What are the implications of this exercise in terms of the narrative on what actually happened with income distribution in this period of allegedly falling inequality? To analyze the full distribution with a single synthetic index, Figure 5 depicts Household Survey based estimations and the three stage series of the Gini index. Consistent with these estimates, the evidence so far suggested that whilst inequality seem to have fallen very sharply according to household surveys, when considering tax records administrative data, inequality downturn was much milder (Burdín et al., 2019). The benchmark series, and even more clearly the intermediate step of the second stage, show –similarly to the household survey– a sharper decrease, although at a higher level. Overall, the key takeaway is that regardless of income income aggregate or data source considered, inequality did fall during the period, hence confirming previous evidence.

[14]It is worth noting that this stability in capital incomes is also observed from the macro economic viewpoint, depicted in Table 2.

Figure 5: Pre-tax Gini index by source and imputation stage, 2009-2016



Note. Own elaboration based on tax records, household surveys and National Accounts (see Table A.7). Household survey based Gini index depicted alongside the three estimation stages. First stage estimations are the result of the combination of tax data and household surveys. Second stage estimations include imputed undistributed profits and taxes, and in third stage estimations incomes are scaled up to National Income aggregates by income source. All estimations refer to pre-tax personal income distribution.

4.2 International comparison

By considering an homogeneous definition of income, DINA-based estimations facilitate the comparison of income inequality estimations between countries. However, despite the efforts for establishing clear and flexible inequality estimation methodology in the DINA guidelines (Alvaredo et al., 2016), the procedures entail heavy imputations which are not always performed in the same way. Therefore, country comparisons must –still– be done with utmost caution.

It is nevertheless informative to compare DINA-based estimates for top shares, which are depicted in Table 2 for a number of countries. According to these estimates, Uruguay is, together with other Latin American countries with available DINA-based estimates, a very high inequality country. It appears to be, somewhat surprisingly, almost as unequal as Brazil and Chile, and more unequal than reputedly unequal countries such as the US or India. Undoubtedly, this warns us not to blindly trust the results of inequality levels, but to stress the trend that DINA-based inequality series for Uruguay provide, as done in the previous section.

That being said, it is important to stress that most of the gap between top share's levels and previously known estimations (i.e. Burdín et al. (2019)), is the result of the imputation of undistributed profits. These profits where imputed in a conservative manner, and even if we missed the target for the imputation in the top 1% and somehow we are overestimating it, it is very unlikely that the imputation for the top 10% is wrong as well, insofar the vast majority of firm owners are located in this income group. Thus, if we believe that undistributed profits are a part of personal income in the hicksian sense, and hence should be accounted for, top 10%

share's estimate in the Uruguayan case is likely to be accurate.

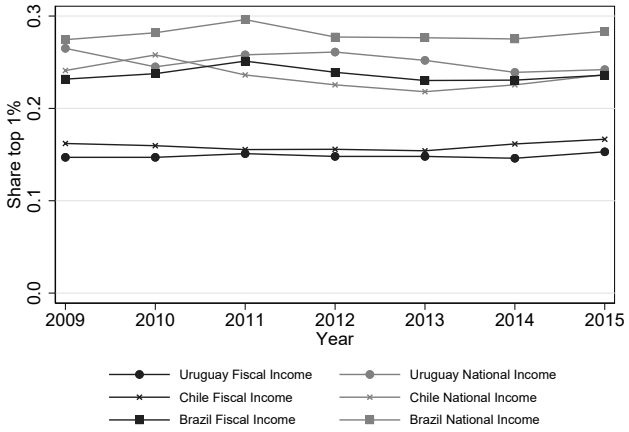
Table 2: Pre-tax National Income shares 2009-2015 (Top 1% and Top 10%)

Top 1%											
	Chile	Brazil	**Uruguay**	India	USA	China	Germany	France	Norway	Sweden	UK
2009	0.241	0.274	**0.265**	0.208	0.185	0.154	0.116	0.102	0.075	0.087	0.136
2010	0.258	0.282	**0.245**	0.212	0.198	0.151	0.120	0.108	0.078	0.100	0.118
2011	0.236	0.296	**0.258**	0.211	0.196	0.146	0.121	0.115	0.079	0.093	0.129
2012	0.226	0.277	**0.261**	0.213	0.208	0.138	0.124	0.104	0.078	0.090	0.121
2013	0.218	0.277	**0.252**	0.216	0.196	0.138	0.122	0.108	0.077	0.089	0.132
2014	0.226	0.275	**0.239**	0.213	0.202	0.137	0.123	0.108	0.078	0.089	0.124
2015	0.237	0.284	**0.242**	0.213		0.139	0.125	0.113	0.077	0.094	0.116
2016			**0.252**				0.125	0.112	0.086	0.085	0.119
Top 10%											
	Chile	Brazil	**Uruguay**	India	USA	China	Germany	France	Norway	Sweden	UK
2009	0.551	0.550	**0.543**	0.508	0.443	0.423	0.350	0.322	0.300	0.294	0.369
2010	0.556	0.552	**0.520**	0.522	0.458	0.426	0.356	0.326	0.305	0.310	0.343
2011	0.537	0.565	**0.516**	0.541	0.459	0.429	0.358	0.332	0.308	0.301	0.363
2012	0.533	0.554	**0.515**	0.550	0.471	0.415	0.362	0.322	0.307	0.297	0.359
2013	0.531	0.549	**0.505**	0.552	0.463	0.421	0.363	0.326	0.305	0.294	0.375
2014	0.541	0.546	**0.500**	0.561	0.470	0.413	0.366	0.326	0.306	0.294	0.353
2015	0.549	0.556	**0.498**	0.561		0.414	0.367	0.331	0.306	0.302	0.342
2016			**0.505**				0.368	0.330	0.317	0.292	0.346

Note. Uruguay: Own elaboration based on tax data, household surveys and National Accounts and secondary data sources described in Section 2. Rest of the countries: estimates from World Inequality Database, https://wid.world/

One way to try to make sense of the surprisingly similar estimates of Brazil and Chile, is to compare not only National Income estimates but also fiscal income series, which is done in Figure 6. It is interesting to see that while DINA-based estimates are very close each other, the situation differs regarding fiscal income, in which Brazil stands out. In Uruguay and Chile, where distribution of profits is taxed, there are bigger incentives to keep income at the firm (Flores et al., 2019). In contrast, the distribution of dividends is untaxed in Brazil (Morgan, 2017), which may help explaining why there is a much shorter gap between fiscal and national income series. Much more work is needed to properly understand these differences, but this preliminary evidence suggests that, in fact, the different taxation systems may distort the inequality level estimations if we only considered personal taxed income, i.e. fiscal income. As a preliminary conclusion, this Latin American comparison suggests that the "true" income distribution lies somewhere in the middle of fiscal and national income series, and that there is certainly a trade-off between considering all relevant incomes and the precision of the estimates.

Figure 6: Pre-tax National Income shares and Fiscal Income shares (Top 1% Uruguay, Brazil and Chile, 2009-2015)



Note. For Urugay: Pre-tax national income are the result of own elaboration based on tax data, household surveys and National Accounts and secondary data sources described in Section 2< fiscal income serie from (Burdín et al., 2019). For Chile and Brazil: estimates taken from World Inequality Database, https://wid.world/

4.3 The distribution of growth

One of the most important advantages of DINA based inequality analysis is that, by accounting for all national income, it provides full micro-macro consistency. This is relevant, in particular, for the analysis of growth and its distribution, since growth is typically measured in macroeconomic terms whilst inequality is analyzed from a microeconomic perspective. Thus, our benchmark distribution series makes it possible to analyze growth and inequality consistently.

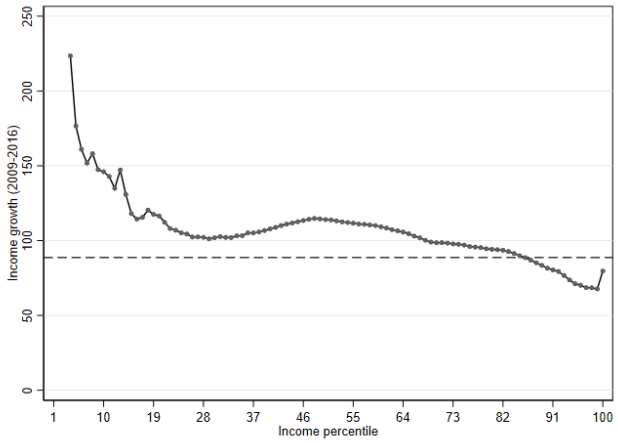
As commented above, between 2009 and 2016 Uruguay experienced both average income growth and falling income inequality. In Figure 7, the growth incidence curves for pre-tax National Income is depicted. They show the average growth rate by centile over the 2009-2016 period. Broadly speaking, the slope of the curve is - as expected - negative (with a hump around the median) meaning that income grew faster for the bottom 50% and the lower half of the middle 40% that for top earners, hence fueling the inequality downturn.

Up to the second decile, growth rates are very high. This is consistent with the fact that both economic growth and the wages policy entailed jobs creation and rapid labor incomes growth at the bottom. Nevertheless, analysis at the bottom is noisier than in the rest because there are incomes that go from zero to positive values, altering the number of income earners in lower centiles and creating artificially high income growth. Up to the sixth decile, income growth was over 100%, and it falls bellow the mean in the eight decile. Income growth falls thereon, with the exception of a small spike in the top 1%.

In Figure 8[15] the same pattern is observed. The concentration curves of the income

[15]Factor income is presented in Figure A.4.

Figure 7: Growth Incidence Curve by income percentile (National Income)



Note. Own elaboration based on tax data, household surveys, National Accounts and secondary data sources described in Section 2. Income growth from 2009 until 2016 depicted in y axis, by total pre-tax income percentile (x axis).

generated between 2009 and 2016 are systematically to the left of the Lorenz curve of the national income of 2009. That means that income growth had an equalizing effect with respect to the current income distribution in 2009.

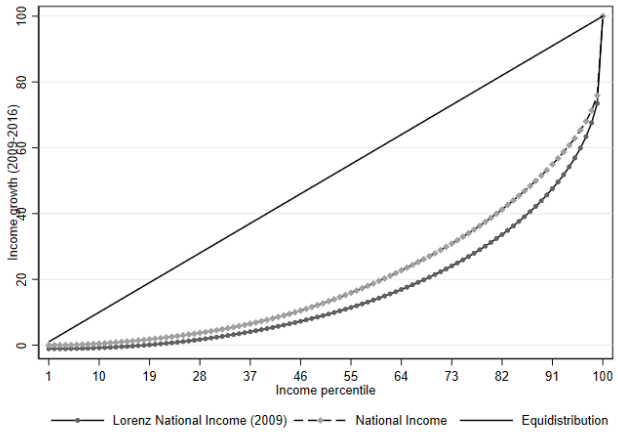
Growth incidence curves and concentration curves are fully consistent with what we have shown so far. The somewhat problematic feature of this analysis is that it refers to relative changes in income, not absolute. The fact that concentration curves are below the 45 line highlights the idea that although growth had an equalizing effect, it was not pro-poor in absolute terms. Note that even with a small growth rate of the top earners compared to the bottom 50%, given their base-scenario income is sufficiently high, their absolute growth may be significantly higher compared to the bottom earners. For instance, even in the extreme case of a perfectly flat growth incidence curve, i.e. an equal income growth with no changes in the distribution, each group will capture their exact share in the base scenario. This may be important because, even if distribution does not change, the distance in actual consumption or savings possibilities between groups keeps increasing as time goes by.

In Figure 9, pre-tax national income growth appropriation curves are depicted.[16] They show the share of growth, i.e. the share of the new income, captured by each centile. An opposite slope in absolute terms is observed, meaning that the higher individuals are in the income distribution, the larger is the share of growth they capture. The interesting feature of this particular shape is that it is observed during an income inequality reduction period.

An "equal growth share" line is depicted as well, showing how much income each centile should have captured if growth was even in absolute terms (in this case, 1%). By construction,

[16]Factor income Growth Appropriation Curves depicted in Figure 9.

Figure 8: Growth Concentration Curve by income percentile (National Income)



Note. Own elaboration based on tax data, household surveys, National Accounts and secondary data sources described in Section 2. The accumulated appropriation of pre-tax national income growth between 2009-2016 depicted in y axis, by total pre-tax income percentile (x axis). The lorenz curve represents this appropriation by percentile for pre-tax national income in 2009.

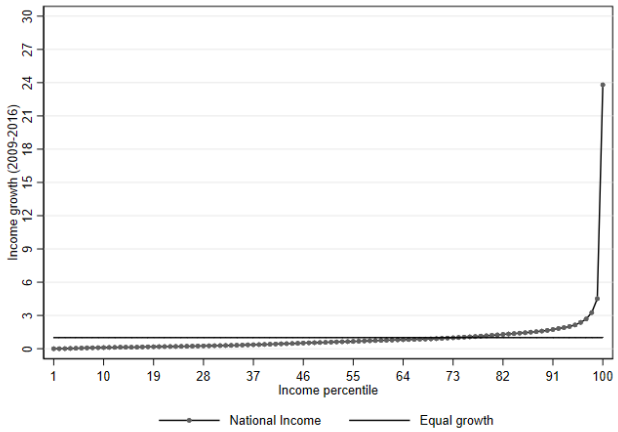
by comparing with this line we are comparing the new-income appropriation with the population share, that is, we are performing a per-capita growth analysis. Up to roughly the sixth decile, individuals captured less growth than their "equal share". From this point on, the share of income appropriated by the centiles surpasses that share, with a sharp increase in the top 1%. Thus, around the 60th centile individuals capture the average absolute share of growth, in the 95th they capture over twice their equal share, and for the top 1%, they get 24 times their equal share.

In Table 3, the same analysis is performed by income groups. In the first column, average growth is depicted, showing relatively larger growth rates average for the bottom 90 (and more so for the bottom 50), as shown in the GIC curve. In the second panel, the top 1% is broken down is smaller groups, showing a particularly good performance of the top 0.1%, with more rapid growth not only than the remaining top 1%, but also when compared with the whole top 10%.

In column 2 growth appropriation is depicted, showing that in terms of absolute growth capture, the winner seems be the top 10%, capturing 46% of the growth, whilst bottom 50% captures less than 14%. Middle 40% captures exactly 40% of the growth, the share it would get under a perfectly equal distribution of growth. Top 1 and 0.1% appropriate 24 and 12% of National Income growth. It is interesting to note that the top 0.1% accrues roughly the same amount of income that the bottom 50%, a group 500 times larger by construction.

Since the groups are of very different sizes, column 2 does not account the complete story. Column 3 shows that appropriation in terms of each groups "equal growth share", that

Figure 9: Growth Appropriation Curve by income percentile (National Income)



Note. Own elaboration based on tax data, household surveys, National Accounts and secondary data sources described in Section 2. Growth share (2009-2016) appropriated by each pre-tax income centile depicted in y axis. The share of theoretical equally distributed growth depicted as an horizontal line.

is, essentially weighting each appropriation share by the size of the group . Broadly speaking, bottom 50 gets less than one third of their equal growth share, middle 40 end up in a tie as mentioned above, and the top 10% gets over five and a half times more. As mentioned earlier, top 1% captures 24 times the even growth share, but most of that growth is accrued by the top 0.1%.

Table 3: Growth appropriation by income groups. National income 2009-2016

Income group	Income growth	Growth approp.	Growth approp. (equal growth)
Top 0.1%	77.8%	12.0%	11971%
Top 1%	74.8%	23.8%	2380%
Top 10%	66.1%	46.2%	462%
Middle 40%	101.6%	40.0%	100%
Bottom 50%	210.7%	13.8%	28%
Average	88.7%	100.0%	100.0%

Note. Own elaboration based on tax data, household surveys, National Accounts and secondary data sources described in Section 2.. The firs column depicts income growth captured by each income group, the second one shows each group's appropriated share, and the third one the share in terms of the group's population size.

This analysis shows the limits of the recent reductions in income inequality, which effectively shortened the gap in relative terms between income groups, but was not enough to neutralize the growing gap in terms of absolute income, which is of capital importance in terms of consumption and savings possibilities.

5 Concluding remarks

In this paper, we present estimations of National Income distribution for Uruguay over the period 2009-2016. The difference between these estimations and the ones presented in similar articles is that we could not depart from detailed National Accounts, and so we had to perform our estimations based on a bottom-up approach. We did so by combining high-quality tax and survey data -which represents our first estimation stage and is, in our view, an important contribution in its own right-, imputing all remaining income sources and then scaling up to national incomes in the second and third estimation stages.

After combining all possible income information from tax data, household surveys, social security contributions and scaling incomes up – when possible –to official administrative totals, we could only account for around 60-65% of national income. When we imputed undistributed profits and all remaining taxes (both local and national), we barely reached 70% of national income. It is the first time that such a database is built for Uruguay, and it accounts for literally every income source.

There are many possible reasons for this large gap with national accounts totals. The main suspect is informal and untaxed incomes from the survey. It is very likely that there is underreporting of incomes such as owner occupied rental income, and probably in others sources as well. Moreover, it may be the case that there are more undistributed profits than the ones reported by firms. But in any case, it is rather hard to conclude that these factors, even combined, can account for as much as 30% of national income. The other possibility is that micro-based estimations are accurate, but that National Income is over estimated. The absence of complete National Accounts series makes it very difficult to fully understand why such large differences emerge.

Given this large gap, we believe that at least in countries such as Uruguay, it would be wise to estimate both proper National Income inequality series and series based on careful combination of micro-data from tax records and surveys, and thus being able to account for distributional incidence of some of the more delicate imputations. In any case, further work is still required to fully understand this large gap and the best ways to deal with it. Thus, in this article we present estimations that account for all national income, and so they can be considered consistent and comparable with other DINA-based estimations, and we also present income distribution for intermediate estimation stages that do not account for all National Income but entail less distributive assumptions. Regardless of the income aggregate and data-source, we have shown that inequality did fall during this period.

Results presented in this paper should be considered preliminary. Future improvements on the methodology will provide more accurate estimations. In particular, a more careful treatment of indirect taxes imputation is important in order to better understand the effect of the tax-

transfers system. Furthermore, it is necessary to improve the imputation of undistributed profits, or at least to understand in depth its distributional implications. More generally, we need to better understand the relation between surpluses at the firm level and the way those incomes are accrued (or not) by households.

That being said, the article points out at the need to consider different income aggregates, and track inequality changes both in what we can see in our tax records and surveys, and what remains hidden within firms and, more generally, in National Income as a whole. We have shown that the imputation of these incomes does not have a mechanical effect on the inequality trend, and may change our understanding of its evolution. Moreover, and more importantly, we show how even in sharp inequality reduction periods, the distribution of growth is extremely concentrated given high baseline income concentration. This maybe particularly important in high inequality contexts, such as the observed in all Latin American countries, and highlights the need not only to boost economic growth, but also to dramatically improve its distribution.

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A Appendix

Table A.1: Income categories and tax rates of IASS and IRPF (cat. I and II)

Panel a) IRPF: Labour income			
2009-2011		2012-2016	
Annual income in BPC	Tax rate	Annual income in BPC	Tax rate
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 or more	25%	900-1380	25%
-	-	1380 or more	30%

Panel b) IASS: Pensions	
Annual income in BPC	Tax rate
0 - 96	0%
96 - 180	10%
180-600	20%
600 or more	25%

Panel c) IRPF: Capital income	
Capital income category	Tax rate
Interests of bank deposits in Uruguayan currency or UI (one year length or less)	3%
Interests of bank deposits in Uruguayan currency or UI (one year length or less)	3%
Interest, obligations and other securities (3 years or more length)	5%
Copyrights	7%
Profits, dividends and benefits	7%
Sports rights	12%
Participation certificates (issued by financial trusts)	7%
Remaining financial and mobiliary capital	12%
Real-estate capital	12%
Capital gains	12%
Dividends or benefits from IRAE contributors	7%
Imputed rents by non-resident entities	12%

Note. Own elaboration based on DGI.

Table A.2: 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

Note. Own calculations based on population projections (CELADE-INE, 2016), tax records (DGI) and household surveys (INE). Second and third columns depict total number of adults in the tax records, both in absolute terms and as percentage of total adult population. Fourth and fifth columns depict informal and zero-income adult population in the survey and added to the tax data. The last column shows the adjustment to the survey data necessary to match the total control population.

Table A.3: Distribution of incomes used for imputations (pre-tax national income by year and source)

	2009	2010	2011	2012	2013	2014	2015	2016
Total income								
Top 0.1%	3.5%	3.8%	4.1%	4.0%	4.5%	4.3%	4.8%	5.4%
Top 1%	11.4%	11.5%	11.8%	11.3%	11.9%	11.9%	12.4%	13.7%
Top 10%	42.4%	41.8%	40.7%	40.2%	40.0%	39.9%	39.9%	40.9%
Middle 40%	45.4%	45.4%	45.5%	45.8%	45.6%	45.5%	45.2%	44.7%
Bottom 50%	12.1%	12.9%	13.8%	13.9%	14.4%	14.7%	14.9%	14.4%
Capital income								
Top 0.1%	56.4%	55.3%	59.3%	57.2%	59.6%	54.7%	55.1%	54.2%
Top 1%	84.1%	83.0%	84.0%	84.0%	84.5%	83.7%	83.4%	83.2%
Top 10%	97.9%	97.8%	97.6%	97.6%	97.8%	97.5%	97.2%	97.0%
Middle 40%	1.9%	2.0%	2.2%	2.2%	1.9%	2.1%	2.5%	2.7%
Bottom 50%	0.2%	0.2%	0.3%	0.2%	0.3%	0.3%	0.3%	0.3%
Owner income								
Top 0.1%	5.4%	5.7%	5.1%	4.9%	4.9%	4.6%	5.9%	4.5%
Top 1%	13.9%	14.1%	12.3%	12.1%	12.1%	12.8%	13.9%	12.7%
Top 10%	37.9%	36.7%	34.6%	32.2%	32.2%	32.9%	34.0%	32.1%
Middle 40%	43.4%	43.5%	45.2%	45.9%	45.2%	44.0%	43.0%	43.8%
Bottom 50%	18.7%	19.8%	20.1%	21.8%	22.6%	23.0%	23.1%	24.1%

Note. Own elaboration based on tax data, household surveys, National Accounts and secondary data sources described in Section 2.

Table A.4: Income shares and Gini Index by imputation step and year (first stage)

Source of income	2009	2010	2011	2012	2013	2014	2015	2016
				Gini Index				
Formal	0.681	0.680	0.667	0.664	0.651	0.646	0.644	0.652
Imputed	0.683	0.682	0.670	0.668	0.654	0.651	0.648	0.656
Informal	0.625	0.623	0.613	0.613	0.603	0.601	0.600	0.608
Transfers	0.604	0.602	0.594	0.568	0.586	0.583	0.581	0.590
Other	0.564	0.561	0.551	0.527	0.542	0.537	0.536	0.546
Total	0.563	0.560	0.551	0.526	0.541	0.536	0.535	0.545
				Top 1%				
Formal	14.3%	14.4%	14.4%	14.3%	14.1%	14.0%	14.5%	15.7%
Imputed	14.8%	14.9%	15.2%	15.1%	14.8%	14.8%	15.4%	16.5%
Informal	14.1%	14.0%	14.3%	14.0%	13.9%	13.9%	14.4%	15.6%
Transfers	13.6%	13.6%	13.9%	13.0%	13.8%	13.6%	14.1%	15.2%
Other	12.4%	12.4%	12.4%	11.5%	12.3%	12.1%	12.6%	13.7%
Total	12.3%	12.4%	12.3%	11.6%	12.3%	12.1%	12.5%	13.7%
				Top 10%				
Formal	47.8%	47.6%	46.6%	46.2%	45.1%	44.7%	44.7%	45.8%
Imputed	48.2%	48.1%	47.2%	46.9%	45.7%	45.5%	45.4%	46.5%
Informal	45.5%	45.2%	44.5%	44.2%	43.5%	43.3%	43.3%	44.3%
Transfers	44.6%	44.3%	43.7%	41.9%	43.0%	42.7%	42.7%	43.8%
Other	42.2%	41.8%	40.9%	39.1%	40.1%	39.8%	39.9%	40.9%
Total	42.1%	41.8%	40.8%	39.1%	40.0%	39.7%	39.8%	40.8%

Note. Own elaboration based on tax data, household surveys, National Accounts and secondary data sources described in Section 2.

Table A.5: Imputed incomes in second stage (2009-2016)

	2009	2010	2011	2012	2013	2014	2015	2016
Net undistribiuted profits (a)	1.9%	1.7%	1.1%	1.4%	1.6%	1.0%	1.6%	1.5%
Production taxes (b)	13.8%	12.2%	12.4%	12.7%	12.4%	12.3%	12.5%	12.3%
Corporate taxes (c)	0.2%	0.2%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
Products taxes net of subs (d)	0.9%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.7%
Local taxes (e) – production	1.3%	1.2%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%
Local taxes (f) – property	0.3%	0.3%	0.2%	0.3%	0.2%	0.2%	0.2%	0.3%
Local taxes (g) – rest	0.2%	0.1%	0.2%	0.2%	0.1%	0.1%	0.1%	0.1%
Nonresident income taxes (h)	-6.1%	-5.5%	-5.5%	-4.8%	-4.5%	-4.9%	-4.7%	-5.5%
Non-considered personal property taxes (i)	-2.4%	-2.1%	-2.1%	-2.8%	-3.6%	-3.3%	-3.8%	-3.7%
Contributive system deficit (j) – pensions	4.0%	3.6%	2.9%	4.0%	2.8%	3.2%	3.6%	3.9%
Contributive system deficit (k) – transfers	10.4%	9.3%	8.8%	7.4%	9.2%	8.1%	7.4%	7.4%
Total distribiuted profits - abroad (m)	4.3%	3.8%	3.3%	2.6%	4.7%	3.2%	2.7%	1.9%
Imputed to factor income (a+b+c+e+f+g+h+i-m)	10.4%	10.1%	8.4%	10.3%	9.1%	8.2%	8.0%	7.2%
Imputed to pre-tax income (a+b+c+e+f+g+h+i+j-m)	4.3%	3.8%	2.9%	5.3%	3.7%	3.0%	2.0%	0.7%

Note. Own elaboration based tax data, household surveys, National Accounts and secondary data sources described in Section 2.

Table A.6: Pre-tax National Income shares by imputation step (first to third stage, 2009-2016)

	2009	2010	2011	2012	2013	2014	2015	2016
First stage								
Top 0.1%	4.1%	4.4%	4.7%	4.4%	4.9%	4.6%	5.1%	5.8%
Top 1%	12.7%	12.8%	12.8%	12.3%	12.7%	12.6%	13.1%	14.3%
Top 10%	43.1%	42.4%	41.3%	40.8%	40.4%	40.2%	40.2%	41.2%
Middle 40%	44.9%	44.8%	45.0%	45.3%	45.2%	45.2%	44.9%	44.4%
Bottom 50%	12.1%	12.8%	13.7%	13.9%	14.4%	14.6%	14.8%	14.3%
Second stage								
Top 0.1%	12.8%	12.2%	12.6%	12.6%	12.7%	11.3%	11.8%	11.9%
Top 1%	24.2%	23.2%	22.9%	23.0%	22.7%	21.8%	22.3%	22.8%
Top 10%	52.1%	50.7%	49.4%	49.3%	48.5%	47.7%	47.8%	48.2%
Middle 40%	37.7%	38.3%	38.8%	38.8%	39.1%	39.5%	39.2%	39.1%
Bottom 50%	10.2%	10.9%	11.8%	11.8%	12.4%	12.8%	13.0%	12.6%
Third stage								
Top 0.1%	13.5%	12.2%	14.0%	14.2%	13.8%	12.0%	12.4%	12.8%
Top 1%	26.5%	24.5%	25.8%	26.1%	25.2%	23.9%	24.2%	25.2%
Top 10%	54.3%	52.0%	51.6%	51.5%	50.5%	50.0%	49.8%	50.5%
Middle 40%	36.7%	37.6%	37.3%	37.2%	37.8%	38.6%	38.7%	38.2%
Bottom 50%	9.0%	10.4%	11.1%	11.3%	11.8%	11.5%	11.5%	11.2%

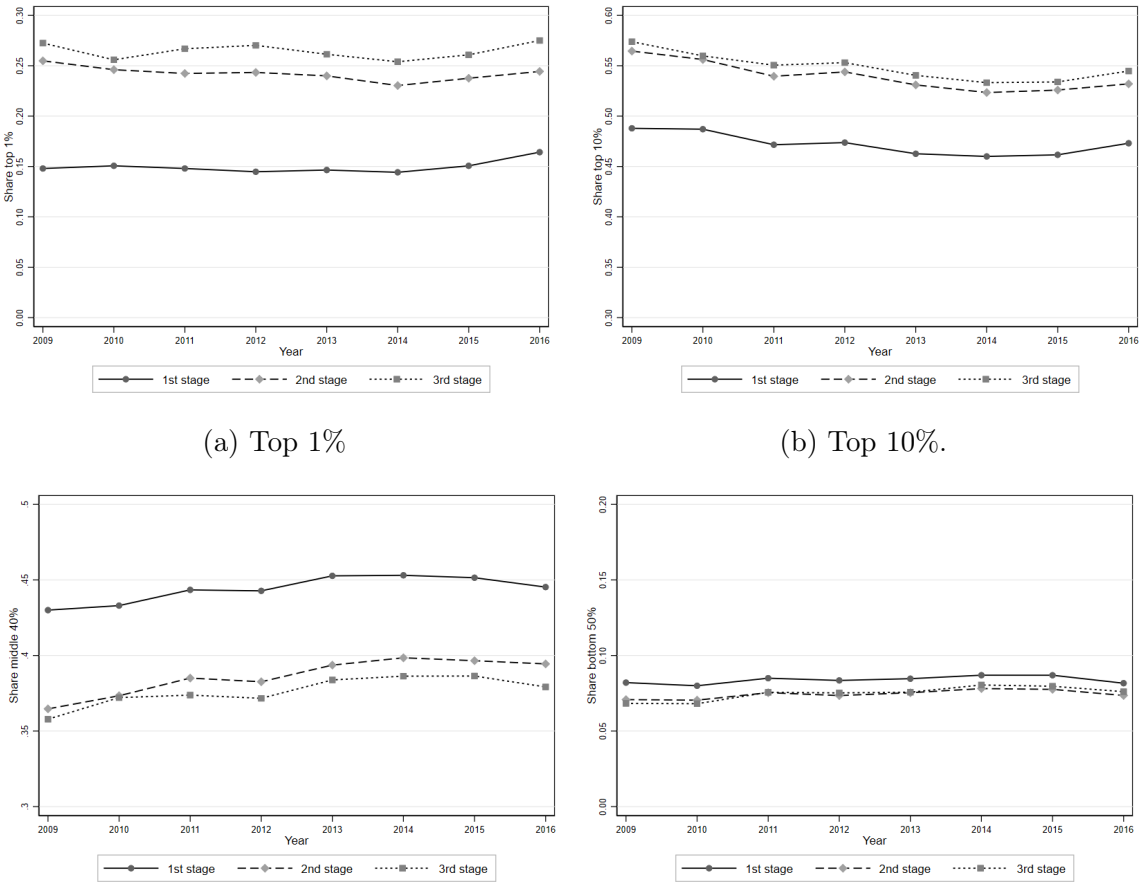
Note. Own elaboration based on tax data, household surveys, National Accounts and secondary data sources described in Section 2.

Table A.7: Gini Index by stage and year (DINA series) and Household Income Survey

	2009	2010	2011	2012	2013	2014	2015	2016
First stage	0.562	0.560	0.545	0.542	0.537	0.534	0.531	0.541
Second stage	0.630	0.622	0.606	0.607	0.598	0.591	0.590	0.594
Third stage	0.648	0.634	0.625	0.623	0.615	0.615	0.614	0.620
Household survey	0.437	0.424	0.403	0.379	0.383	0.380	0.384	0.378

Note. Own elaboration based on tax data, household surveys, National Accounts and secondary data sources described in Section 2.

Figure A.1: Factor income shares by imputation stage, 2009-2016



(a) Top 1%

(b) Top 10%.

(c) Middle 40%

(d) Bottom 50%.

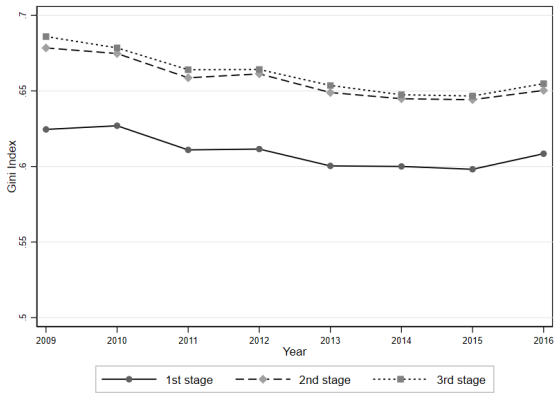
Note. Own elaboration based on tax records, household surveys and National Accounts (see Table A.8). First stage estimations are the result of the combination of tax data and household surveys. Second stage estimations include imputed undistributed profits and taxes, and in third stage estimations incomes are scaled up to National Income aggregates by income source. All estimations refer to factor personal income distribution. Top 1, 10, middle 40 and bottom 50%'s shares depicted in panels a, b, c and d respectively.

Table A.8: Pre-tax Factor Income shares by imputation step (first to third stage, 2009-2016)

	2009	2010	2011	2012	2013	2014	2015	2016
First stage								
Top 0.1%	4.7%	5.1%	5.3%	5.0%	5.4%	5.1%	5.7%	6.5%
Top 1%	14.8%	15.1%	14.8%	14.5%	14.6%	14.4%	15.1%	16.4%
Top 10%	48.8%	48.7%	47.2%	47.4%	46.3%	46.0%	46.2%	47.3%
Middle 40%	43.0%	43.3%	44.3%	44.3%	45.3%	45.3%	45.1%	44.5%
Bottom 50%	8.2%	8.0%	8.5%	8.4%	8.5%	8.7%	8.7%	8.2%
Second stage								
Top 0.1%	13.2%	12.6%	13.0%	12.9%	13.1%	11.6%	12.3%	12.4%
Top 1%	25.5%	24.6%	24.2%	24.3%	24.0%	23.0%	23.8%	24.4%
Top 10%	56.5%	55.6%	54.0%	54.4%	53.1%	52.3%	52.6%	53.2%
Middle 40%	36.5%	37.3%	38.5%	38.3%	39.4%	39.8%	39.7%	39.4%
Bottom 50%	7.1%	7.0%	7.5%	7.3%	7.5%	7.8%	7.8%	7.4%
Third stage								
Top 0.1%	13.6%	12.5%	14.2%	14.3%	14.0%	12.8%	13.5%	14.1%
Top 1%	27.2%	25.6%	26.7%	27.0%	26.1%	25.4%	26.1%	27.5%
Top 10%	57.4%	56.0%	55.1%	55.3%	54.0%	53.3%	53.4%	54.5%
Middle 40%	35.8%	37.2%	37.4%	37.2%	38.4%	38.6%	38.6%	37.9%
Bottom 50%	6.8%	6.8%	7.6%	7.5%	7.6%	8.0%	8.0%	7.6%

Note. Own elaboration based on tax data, household surveys, National Accounts and secondary data sources described in Section 2.

Figure A.2: Factor income Gini index by source and imputation stage, 2009-2016



Note. Own elaboration based on tax records, household surveys and National Accounts (see Table A.9). Household survey based Gini index depicted alongside the three estimation stages. First stage estimations are the result of the combination of tax data and household surveys. Second stage estimations include imputed undistributed profits and taxes, and in third stage estimations incomes are scaled up to National Income aggregates by income source. All estimations refer to factor personal income distribution.

Table A.9: Gini Index by stage and year (Factor Income series) and Household Income Survey

	2009	2010	2011	2012	2013	2014	2015	2016
First stage	0.625	0.627	0.611	0.612	0.600	0.600	0.598	0.608
Second stage	0.678	0.675	0.659	0.661	0.649	0.645	0.644	0.650
Third stage	0.686	0.678	0.664	0.664	0.654	0.647	0.647	0.655
Household survey	0.437	0.424	0.403	0.379	0.383	0.380	0.384	0.378

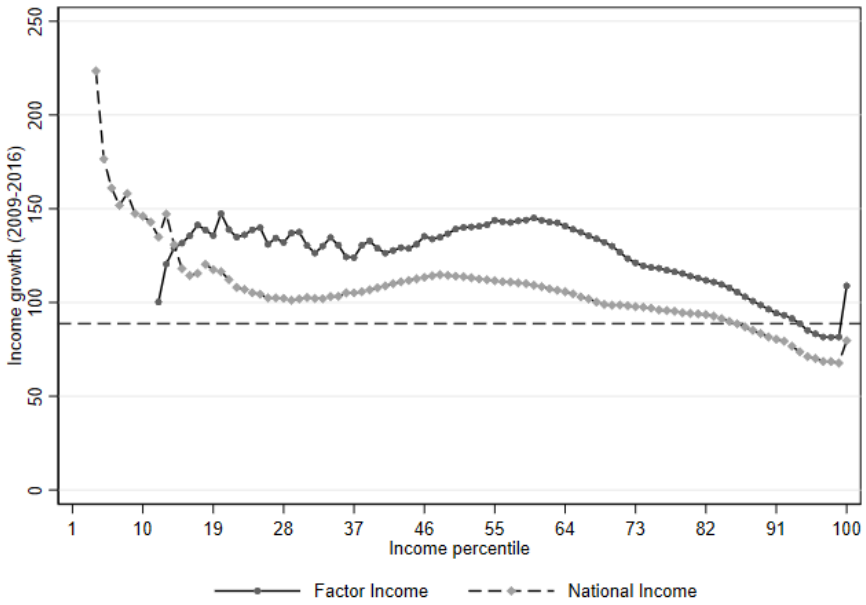
Note. Own elaboration based on tax data, household surveys, National Accounts and secondary data sources described in Section 2.

Table A.10: Evolution of dividends by year (nominative and non-nominative)

	2009	2010	2011	2012	2013	2014	2015	2016
Total	3680.4	6805.9	10091.5	12871.8	14824.9	20769.9	24461.0	29028.0
Nominative	2530.0	4130.0	5780.0	6790.0	9090.0	12614.0	15440.0	18990.0
Non-nominative	1150.4	2675.9	4311.5	6081.8	5734.9	8155.9	9021.0	10038.0
Year on Year change								
Total		84.9%	48.3%	27.6%	15.2%	40.1%	17.8%	18.7%
Nominative		63.2%	40.0%	17.5%	33.9%	38.8%	22.4%	23.0%
Non-nominative		132.6%	61.1%	41.1%	-5.7%	42.2%	10.6%	11.3%
Share of total								
Nominative	68.7%	60.7%	57.3%	52.8%	61.3%	60.7%	63.1%	65.4%
Non-nominative	31.3%	39.3%	42.7%	47.2%	38.7%	39.3%	36.9%	34.6%

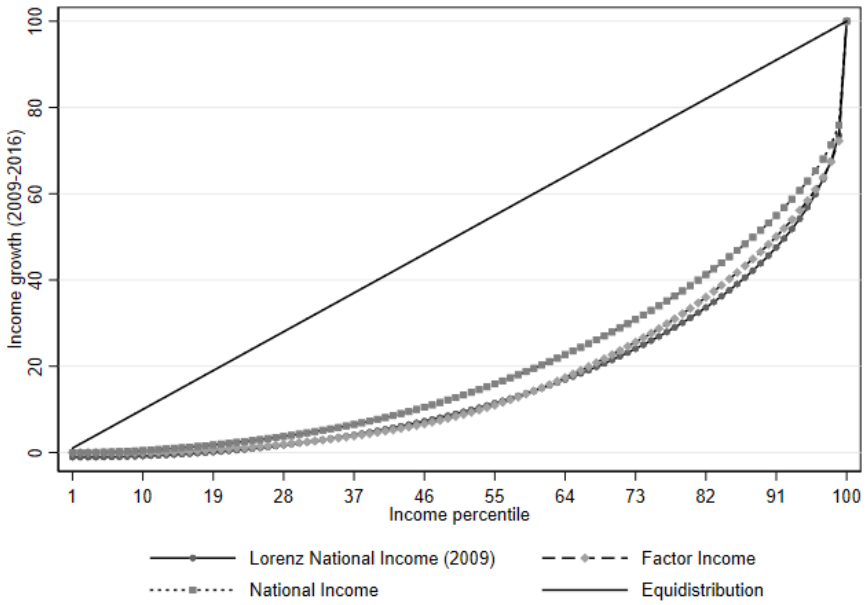
Note. Own elaboration based on tax data.

Figure A.3: Growth Incidence Curve by income percentile (Factor and National Income)



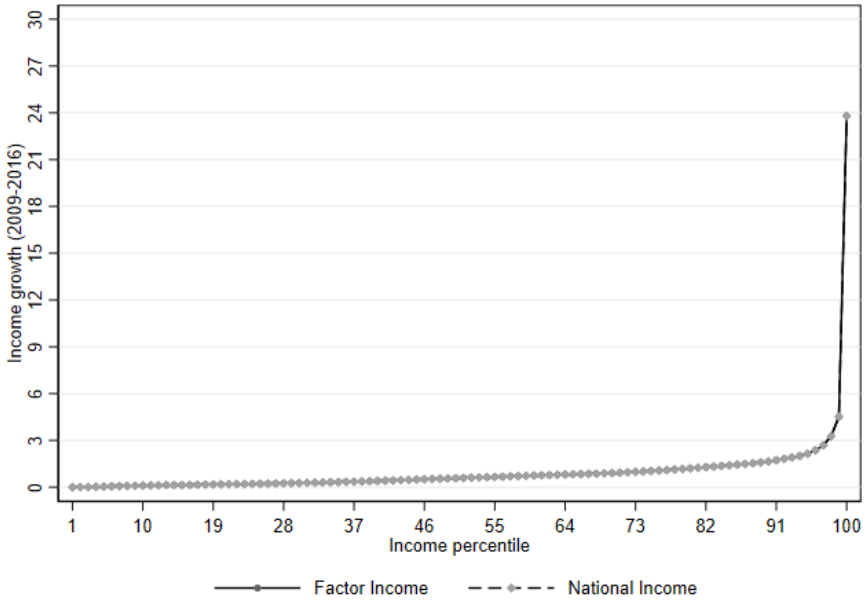
Note. Own elaboration based on tax data, household surveys, National Accounts and secondary data sources described in Section 2.

Figure A.4: Growth Concentration Curve by income percentile (Factor, National and Disposable Income)



Note. Own elaboration based on tax data, household surveys, National Accounts and secondary data sources described in Section 2.

Figure A.5: Growth Appropriation Curve by income percentile (Factor, National and Disposable Income)



Note. Own elaboration based on tax data, household surveys, National Accounts and secondary data sources described in Section 2.