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Accumulation, inheritance and wealth distribution: first estimates of the untold half.

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Accumulation, inheritance and wealth distribution: first estimates of the untold half.

Mauricio De Rosa*

Abstract

While wealth accumulation and its distribution are arguably two of the key drivers of overall economic inequality and of major importance in their own right, very little is known about them in the developing world. I contribute to filling this gap by providing micro-macro consistent series of aggregate wealth and its distribution in Uruguay. The country's balance sheet, which is not estimated by official institutions, is constructed for the first time by combining a wide array of data sources, reaching a wealth to income ratio of 500%. Private wealth distribution is then estimated based on the capitalization method, taking stock of combined survey-tax-national accounts micro-data, resulting in a top 1% of 38-40%. Estimates are systematically compared with results based on the estate multiplier method, real estate wealth tax, household wealth survey and *Forbes* billionaires list. Moreover, the inheritance flow is estimated, reaching 9-10% throughout the period, consistent with a 60% inheritance stock. These estimates represent the first coherent and comparable depiction of wealth and its distribution for a Latin American country, hence providing insights to a completely unknown reality thus-far.

Key words: wealth distribution, wealth to income ratios, capitalization method, tax records, national accounts, developing countries, Uruguay.

JEL Classification: D31, E01, E22

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Resumen

Si bien la acumulación de riqueza y su distribución son posiblemente dos de los fundamentos clave de la desigualdad económica y de gran importancia por derecho propio, se sabe muy poco sobre ellas en el mundo en desarrollo. Contribuyo a llenar este vacío brindando series micro-macro económicamente consistentes de la riqueza agregada y su distribución en Uruguay. La riqueza neta del país, que no es estimada por instituciones oficiales, se construye por primera vez combinando un amplio abanico de fuentes de datos, alcanzando un ratio riqueza-renta del 500%. Se estima la distribución de la riqueza privada por medio del método de capitalización, tomando en cuenta los microdatos combinados de encuestas, impuestos y cuentas nacionales, lo que da como resultado una participación del 1% superior de 38-40%. Las estimaciones se comparan sistemáticamente con los resultados basados en el método de las herencias, registros de impuesto inmobiliarios, la encuesta de riqueza de los hogares y la lista de multimillonarios de *Forbes*. Además, se estima el flujo de herencias, que alcanza un 9-10% a lo largo del período, consistente con un stock de herencia del 60%. Estas estimaciones representan la primera descripción coherente y comparable de la riqueza y su distribución para un país latinoamericano, por lo que brindan información sobre una realidad completamente desconocida hasta el momento.

Palabras clave: distribución de la riqueza, relación riqueza/ingreso, método de capitalización, registros tributarios, cuentas nacionales, países en desarrollo, Uruguay.

Código JEL: D31, E01, E22

1 Introduction

There is a sharp contrast between the evidence on wealth accumulation, inheritance and distribution gathered in the past decade for a handful of developed countries and the scarce estimates available for the rest of the world. The bar is set high by the literature, which provides wealth distribution estimates based on a variety of methods and sources (e.g. Saez and Zucman (2016); Alvaredo et al. (2018); Garbinti et al. (2017)), as well as inheritance's flow and stock (e.g Piketty (2011); Alvaredo et al. (2017)), which are at the same time consistent with national wealth estimates (Piketty and Zucman, 2014; Blanco et al., 2021), hence providing a full account of wealth dynamics, both micro and macro-economically. I contribute to close this widening gap by estimating the first fully consistent wealth to income ratios, inheritance flow and wealth distribution estimates for a Latin American country. A wide array of surveys, detailed personal income tax micro-data, cadaster, national accounts, owner-decedent micro-data and firms' balance sheets are carefully combined to provide a consistent overview of wealth level, composition, personal distribution and inheritance for Uruguay.

The Uruguayan case is an interesting laboratory of the Latin American setting for being by all accounts the least unequal country in the region income-wise (De Rosa et al., 2020; Lustig et al., 2011), hence it is likely to provide a lower bound for wealth concentration as well.[1] Much has been discussed about inequality in Latin America in light of the significant social, political and economical changes that the region has witnessed. Income inequality seems to have experienced a downturn since the early 2000s, in the context of vigorous economic growth and redistributive public policies (Cornia, 2014; Gasparini et al., 2018), followed by halt and in some cases reversion of that trend since 2015. The question of whether these patterns are the result of poor performance of household surveys is still ongoing, with mixed results depending on the country, as the evidence based on income tax records (Alvaredo and Londoño Velez, 2014; Alvaredo, 2010; Morgan, 2017; Atria et al., 2018; Burdín et al., 2022) and Distributional National Accounts (De Rosa et al., 2020) accumulates. This new stream of evidence points out at capital incomes and their extreme concentration as a source of both the divergent trends in inequality estimates, and to the high income inequality level itself. Understanding wealth distribution is thus particularly important in the region, yet there has not been any real progress thus-far. Uruguay is one of the cases for which income inequality reduction is confirmed by survey, tax and DINA based estimates (Burdín et al., 2022; De Rosa et al., 2020; De Rosa and Vilá, 2020) hence enabling to study wealth distribution in this particular context and better understand inequality dynamics under a consistent framework.

As in most of the developing world and even in many rich countries, there are no National Accounts' estimates of the national balance sheet. Therefore, in this article wealth to income

[1] For an overview of Uruguayan background data, see Appendix A.1.

ratios are estimated based on a wide range of secondary sources, including cadastral administrative data, prices of land and housing properties, firm's tax records, Central Bank financial data, among others. These estimates, although imperfect, follow in line with the tradition of aggregate wealth estimation by independent scholars of the 17th to early 20th century (see Piketty and Zucman (2014) for a brief review). Results show that wealth to income ratio is around 500%, comparable to what is observed in developed economies where it is around 500-700% (Piketty and Zucman, 2014). Public net wealth is positive but decreasing, from 50% at the beginning of the century to around 25% by the end of the period. Gross domestic capital is 30 pp higher than net national wealth as a result of a negative net foreign asset position. Approximately half of Household's wealth are financial assets (including ownership of the private corporate sector), while housing reaches 100-150% of national income. These estimates, although highly preliminary and subject to further improvement, are extremely important since there are no official aggregate wealth estimations for Uruguay, nor for most of the developing world.

The capitalization method, on which the main distributional estimates are based, consists on estimating individual net wealth by capitalizing personal capital incomes, based on capitalization factors for each type of wealth that are equivalent to the inverse of their macro rate of return. Capital incomes are mainly drawn from a high quality tax records micro-data –which covers 75% of adult population– merged and combined with firm's tax records, household survey data and national accounts. This capital incomes database is the result of the Distributional National Accounts (DINA) estimates for Uruguay's national income distribution (De Rosa and Vilá, 2020), hence providing income-wealth consistency, both at the micro and macro levels. Private personal wealth inequality is relatively stable over the period 2009-2016, reaching very high levels: over 38-40% of net private wealth is owned by the wealthiest 1% and top 10%'s share is around 77-79%. These estimates would locate Uruguay as a relatively high wealth inequality country compared to France, closer to Spanish or US's estimates. To address the main caveat of the capitalization method, i.e. the assumption that rates of return are the same for all individuals –and in particular are independent of wealth–, I perform simple sensitivity analysis, showing that it does not affect main estimates substantially, except for very top shares under some strong assumptions. Moreover, I characterize wealth owners in terms of age and gender, showing that men have higher wealth for all age groups (with little evidence of life-cycle accumulation patterns) and represent 70-80% of top fractiles. I also document a high correspondence between wealth and total income distributions for top fractiles.

Inequality estimates are triangulated with four other empirical approaches to provide greater certainty about the overall conclusions. First, main results are compared with the Wealth Household Survey (*Encuesta Financiera de los Hogares Uruguayos*, EFHU) of 2013, which covers similar assets as the ones estimated with the capitalization method. Top 10%

is 9 percentage points lower in the survey, with most of this difference being explained –as expected– by the top 1 and top 0.1%. Moreover, the different concentrations profiles are explained by wealth composition rather than by distribution of each asset: contrary to the capitalization method, in the wealth survey, the least unequally distribute asset – housing – represents the bulk of wealth. Second, I use data on *Forbes* billionaires list to compare the very top wealth holders of the capitalization method data, showing very similar net wealth levels and briefly analyzing their mobility patterns. Third, an administrative real-estate owners decedent's dataset is constructed, which allows me to estimate urban and rural real estate distribution (urban and rural) based on a simplified version of the estate multiplier method (Alvaredo et al., 2018; Berman and Morelli, 2021), which essentially entails weighting the decedent population by the average mortality rate. Results show that real estate wealth top 10%'s share is around 40-45% in the lower bound estimates, and can reach up to 60% under more flexible assumptions. Top 1%'s share reaches around 25-30%, whilst top 0.1% is stable around 10%. When considering urban properties only, it shows higher concentration for the top 10 a 1% than in the capitalization method (10 and 7 percentage points, respectively), but 1 point lower for the top 0.1%. Fourth, the top 0.1% real estate share is calculated based on a real estate tax, which covers a small fraction of the population (a little over 0.3%), resulting in a top 0.1% of 1-2%, slightly under the estate method's and less than half of the main housing capitalization method-based results.

Based on the real-estate owners decedent's dataset, I compute the inheritance flow, i.e. the total value of inherited real estate wealth as a share of national income, which reaches around 3%, consistent under different set of assumptions with a 9-10% total inheritance flow. This result is important in light of Atkinson's point that, "the extent of aggregate inheritance can have major economic and social consequences. A society where each year people can expect to receive in inheritance a sum of around a fifth of total income is very different from one where the sum is around a fiftieth" (Atkinson, 2018, p. 165). Following the approach suggested in Alvaredo et al. (2017), a steady-state inheritance stock of approximately 60% is estimated under the assumption that the inheritance flow is stable over a generation and taking official estimates of savings rates.

The contribution of this article is threefold. First, it is a contribution to the wealth to income ratios estimation and wealth accumulation literature (Piketty and Zucman, 2014; Blanco et al., 2021; Artola and Estévez, 2017; Del Castillo, 2017), which in this case comes not from National Accounts but from own estimates. Second, it provides estimates of wealth distribution based on combined survey-tax-national accounts data (De Rosa and Vilá, 2020). This makes these estimates comparable with the growing literature on wealth distribution (Saez and Zucman, 2016; Alvaredo et al., 2018; Martínez-Toledano, 2020; Garbinti et al., 2017; Kopczuk, 2015) and fully consistent both in the micro-macro and income-wealth levels (WIL, 2021).

Moreover, it contributes to the methodological debate on the different empirical approaches for the estimation of wealth distribution and the relative drawbacks of the capitalization method (Kopczuk, 2015; Bricker et al., 2015; Fagereng et al., 2016; Saez and Zucman, 2016). Third, it provides inheritance flow's and stock estimates, (Piketty, 2011; Schinke, 2012; Piketty et al., 2014; Alvaredo et al., 2017; Atkinson, 2018), which locates Uruguay closer to the Kotlikoff-Summers (Kotlikoff and Summers, 1981; Kotlikoff, 1988) corner in their 1980s controversy with Modigliani (Modigliani, 1986, 1988). Beyond these three points, by providing consistent micro-macro estimates of the most important features of the wealth accumulation and distribution process, I argue that the whole is more than the sum of its parts.

The rest of the article is organised as follows. Section 2 discusses the literature on wealth to income ratios, inheritance and wealth distribution. Section 3 presents the definitions and the methodological approach, while section 4 describes the data sources used throughout the article. The wealth to income ratio series and the composition of National and Private Wealth is presented in section 5. Wealth distribution estimates are presented in section 6, with a characterisation or wealth holders in terms of age, sex and location in the income distribution, as well as triangulation with other empirical approaches. The inheritance flow and stock are discussed in Section 7, and finally section 8 concludes.

2 Related literature

In this section, the main strands of literature to which this study dialogues with are discussed. In the section 2.1, a macroeconomic approach is taken and hence the literature on wealth to income ratios, followed by the one which focuses on inheritance –especially on the estimation and evolution of flow and stock of inheritance in countries with available estimates. Section 2.2, in turn, focuses on the literature on personal wealth distribution.

2.1 Wealth to income ratios and the flow and stock of inheritance

The level of aggregate wealth of a given economy is usually expressed as the wealth to income ratio, i.e. how many times net aggregate national or private wealth (see Section 3) represent in terms of net national income. In Piketty and Zucman (2014), the wealth to income ratio for a set of rich countries (including Australia, Canada, Italy, Germany and Japan) was estimated based on balance sheet since the 1970, as well as a longer run perspective for United Kingdom, the United States and France, with estimates that start in the early XVIIIth century (these estimates were later updated by Bauluz (2019). They document three main findings: (i) an increase in the wealth to income ratios since the 1970s, from 200-300% to 400-600% in the 2010s; (ii) a U-shapped pattern for the handful of countries with long run series and (iii) the

changing nature of wealth, with a decreasing share of agricultural land and a sharp increase in housing and other domestic capital. In Piketty et al. (2019), national accounts, survey and tax data are combined to account for the wealth to income ratios in China between 1978 and 2015. They find that while the national wealth to income ratio grew from 350% to 700% in the period, public ownership decreased from 70 to 30%.

Regarding inheritance, the Kotikloff-Summers-Modigliani controversy that raged throughout the 1980s is to this day a reference point, since it still shapes much of the wealth and inheritance debate, i.e., the debate of whether self-made wealth or inheritance are the key drivers of personal wealth distribution. On one side, Modigliani argued that wealth distribution was essentially determined by life-cycle accumulation (Modigliani, 1986, 1988), whilst Kotlikoff and Summers stressed the capital role of inheritance (Kotlikoff and Summers, 1981; Kotlikoff, 1988). Both sides tried to show that the aggregate level of inheritance in total wealth was either very low or very high, hence proving their respective points. Modigliani argued that the inheritance's share was as low as 20-25%, while Kotikloff-Summers estimated a share of 80-90% or even more, hence arriving to opposite conclusions based on essentially the same data, i.e. United States' data on the inheritance flow (inheritance as a share of national income) of the early 1960s, and so the debate resulted in no clear conclusion. The main reason for the contradictory conclusions was that in Modigliani's estimates, past inheritance flows were not capitalized, while in the case of Kotikloff-Summers' they were (Piketty and Zucman, 2015). This difference, over the length of a generation (approximately 30 years) leads to dramatically different results.

In the last decade new evidence has been accumulated, and it seems that the true answer lies somewhere in the middle, although closer to the Kotikloff-Summers' corner, which makes sense given the extreme zero-capitalization assumption of Modigliani's estimates. Moreover, and as importantly, this novel evidence shows that the inheritance share has not been stable over time or regions. Broadly speaking, this literature finds an inheritance's U-shaped pattern over the XXth century in European countries, while being less pronounced for the United States. The relative importance of inheritance may be studied by the evolution of the inheritance flow, i.e. total wealth inherited from one generation to the next each year as a share of national income, or alternatively by the stock of inherited wealth as a share of aggregate wealth. Both macroeconomic aggregates are naturally interrelated.

In an article that reinvigorated the inheritance discussion, Piketty (2011) documents this typical U-shaped pattern for the annual flow of inheritance in France, which was about 20–25% of national income prior to World War I, down to around 15% by 2010, after a significant reduction to less than 5% in 1950. Following this thread, Atkinson (2018) estimates the inheritance flow in the United Kingdom. In particular, he poses the question of what the evolution of the inheritance flow had been in the context of increasing wealth to income ratios. He finds a downturn after reaching 15-20% levels prior to the First World War, and a slight increase

since the 1970s, to levels close to 10%. He shows that, although both countries present similar patterns, the increase in the United Kingdom's case is less marked than the one in France. Karagiannaki (2015) examines size, composition and distribution of inherited wealth in United Kingdom as Atkinson (2018), but zooming in in the 1985-2010 period. She finds a substantial increase in the flow of inheritance, particularly after 2000, driven by housing. Its distribution was more unequal than wealth distribution in the living population, but it is counterbalanced by the increase in the percentage of individuals receiving inheritance. Karagiannaki (2017), on the other hand, finds that inheritances received by inheritors accounted for 30% of the increase in their wealth on average, but had no major effect on overall wealth inequality. Schinke (2012) documents for the German case a U-shape pattern of the flow of inheritance and gifts of 15% of national income in 1911, down to 2% in the mid XXth century and back to over 10% in the present.

Other studies focused on the stock of inheritance in aggregate wealth instead of the flow. Piketty et al. (2014) dig deeper in the French case, by estimating the stock of inherited wealth in Paris from 1872 to 1927, based on data on inheritance and matrimonial property regimes, finding that it was over 70%. The unique data set they employ allowed them to divide decedents in rentiers (individuals with smaller wealth than the capitalized value of their inherited wealth) and savers (who consumed less than their labor income), hence providing more meaningful and accurate estimations of the stock of inheritance. Alvaredo et al. (2017) find that the inherited wealth's share in total private wealth in France, the United Kingdom, Germany and Sweden is estimated was around 2010 approximately 50-60% and rising, after a fall to 30-40% in the 1950-80 period, down from 70-80% before World War I. In the case of the United States, the share of inherited wealth is higher in the present, which contrasts with the situation in the early XXth century where it was lower than Europe's, circa 50-60%[2]. For the Uruguayan case, Agustoni and Lasarga (2019) compute the share of directly inherited gross real estate wealth, i.e. properties directly inherited, excluding the ones bought with inheritance money or sales, of around one third of aggregate wealth for that year. This restrictive definition of inheritance is nevertheless informative as a lower bound. Moreover, based on the same data and even with this inheritance definition, Sanroman and Santos (2021) find that inheritance is the most important determinant of wealth inequality in the Uruguayan case. They find based that household's average wealth is 23% higher in households who inherited real estate, and 32% higher for those who inherited businesses.

The inherited flow and stock are two interrelated variables, but difficult to estimate together due to data limitations (more on this in section 3). Alvaredo et al. (2017) present

[2]Somewhat contradictory to this findings, Wolff and Gittleman (2014) do not find evidence of a "boom" of inheritance in the US, based on Survey of Consumers Finances (SCF) from 1989-2007, although they do report that about 30% of households expect to receive a wealth transfer over their lifetime, accounting for 40% of their wealth.

simplified macroeconomic approach for computing the share of inherited wealth in total aggregate wealth based on the flow of inheritance in national income, which reveals consistent results with the more data-intensive approach of Piketty et al. (2014) commented above, hence providing a simple bridge between inheritance flow and stock (Piketty and Zucman, 2015). A recent example is the study for the Swedish case by Ohlsson et al. (2020), who also arrives at the same U-shape pattern conclusion regarding the inheritance flow in the last century, from over 10%, down to around 4-5% and then back to 8%. Based on the approach proposed by Alvaredo et al. (2017), he computes the stock of inherited wealth based on the estimated flow, finding that it was as high as 80-100% prior to World War I, down to over 20% in 1950 and now around 40% and slowly rising.

2.2 The personal distribution of wealth

As with the case of the estimation of inheritance, much progress has been made in recent years regarding wealth distribution, after decades of being neglected by the discipline, although with some important exceptions such as Atkinson's continuous work throughout the years (Atkinson and Harrison, 1978). In very broad terms, studies show that in rich countries half of the population owns no more than 5% of total wealth, whilst the wealthiest 10% holds between 60 and 90% as summarized by Piketty (2014).

The alternative methodologies and data sources undertaken by the literature to study personal wealth distribution include (i) data on estates at death, multiplied-up to yield estimates of the wealth of the living; (ii) wealth household surveys; (iii) wealth taxes data; (iv) "rich lists" or (v) the capitalization method, which estimates underlying wealth by capitalizing individual's capital incomes (Saez and Zucman, 2016). These different methodologies and data sources often do not provide consistent estimations, and thus the debate of trends in wealth inequality, especially around its evolution in the last few decades, is still active (Kopczuk, 2016).

Most estimations agree that there was a sharp decline in wealth concentration in rich countries following World War I, but the extent of its recovery after the 1970-80s is still disputed. The debate rages especially in the case of United States, where it is not yet clear if wealth concentration has increased or not. In contrast with previous estimations (Kopczuk and Saez, 2004), Saez and Zucman (2016) show a dramatic increase in wealth concentration, particularly at the top of the distribution, with a top 0.1% share reaching 22%, rising from a 7% in 1978. Kopczuk disputes this, arguing that "the survey-based and estate tax methods suggest that the share of wealth held by the top 1 percent has not increased much in recent decades, while the capitalization method suggests that it has" (Kopczuk, 2015, p. 48). But there are also controversies regarding results provided by the same methodologies, as exemplified by the replication exercise by Sutch (2017), who questions estate-multiplier based conclusions by Piketty

(2014). In the European front the debate is less intense, in particular due to more abundant and higher quality historical data. Estimations for France and the United Kingdom depict an increase in wealth concentration in the last few decades, but much milder than the American case (Alvaredo et al., 2018; Piketty et al., 2006; Garbinti et al., 2017), and similar evidence is found for norther European countries and Spain (Martínez-Toledano, 2020; Bricker et al., 2016; Fagereng et al., 2016; Roine and Waldenström, 2009).

Other thread of studies aim to analyze wealth inequality worldwide relaying on the combination of a variety of information sources. Davies et al. (2011) use National Accounts, wealth surveys and secondary sources of a sample of (mostly) developed countries to fit a model that allows them to estimate level a distribution of wealth in the remaining countries. They find that the Gini index varies between 0.6 and 0.8. Worldwide, the wealthiest 10% controls over 70% of total wealth. These estimates were updated and unimproved in Credit Suisse's reports from 2010 until 2021 (see last available Shorrocks et al. (2021)), which include survey based estimates for Uruguay and Chile.[3] These reports include both the addition of large countries (e.g. China and India), as well as correction of the right tail of the distribution based on rich lists such as the ones compiled by Forbes or Fortune magazines (Davies et al., 2017). This approach is also used for the adjustment of the right tail of the United States' Survey of Consumers Finances distribution by Vermeulen (2018) with similar results.

For the rest of the world the evidence is very scarce, which is particularly true for Latin America, as recent surveys show (Zucman, 2019; Benhabib and Bisin, 2018). Due to insufficient data, there are almost no studies regarding wealth distribution for developing countries. Torche and Spilerman (2006), use capital incomes drawn from household surveys to analyze certain asset distributions for sixteen Latin American countries, including Uruguay. They estimate business and housing wealth distributions, and find that the former is extremely concentrated (for instance, in Uruguay, 99.5% of total assets are held by the wealthiest 10%) while housing is relatively better distributed (the top 10% owns 25% of it in Uruguay and near 40% in Bolivia and Mexico). For land, which is considered a proxy of total wealth distribution, they use census data and estimate a Gini index of around 0.8 for Uruguay in the period 1970-2000. More recently, Bauluz et al. (2020) study land inequality based on census and survey data, finding top 10% share of 60-70% for countries such as Ecuador and Guatemala. Evidence for Uruguay is scarce, yet growing. Amarante et al. (2010) studied wealth inequality based on capital incomes from household surveys, arriving to similar results than the ones in Torche and Spilerman (2006). This data base, however, is not best suited for wealth distribution since capital incomes are poorly captured by regular household surveys, specially at the top of the distribution (WIL, 2021). Sanroman and Santos (2021) and Agustoni and Lasarga (2019) present estimates on wealth distribution for 2013 based on the wealth household survey, with

[3]Uruguayan estimates are based on the same survey used in this article, see section 4

a gini index of 0.75.[4]

3 Definitions and methodology

This section presents the main definition of wealth following the System of National Accounts, which I will use throughout the reminder of this study. It also presents the main features of the capitalization and the estate multiplier methods, extensively used in the wealth inequality literature summarized above, and discusses the adaptations required in the present setting.

3.1 Baseline definitions

3.1.1 Aggregate net wealth

Following the concepts discussed in Piketty and Zucman (2015) and the Distributional National Accounts guidelines (WIL, 2021), which are in turn based on the System of National Accounts balance sheet's definitions, private wealth W_t is defined as the net wealth (assets minus liabilities) owned by households.[5] These assets include "all the nonfinancial assets—land, buildings, machines, etc.—and financial assets—including life insurance and pensions funds—over which ownership rights can be enforced and that provide economic benefits to their owners" (Piketty and Zucman, 2015, p. 1309). Corporations are included in private wealth through the market value of equities and corporate bonds.

In its basic decomposition, private wealth can be decomposed in housing assets, business assets (and other non-financial assets), financial assets and liabilities (WIL, 2021). National wealth W_{nt} results from the addition of private and public wealth –which may be divided in the same broad categories. It is also equivalent to to the sum of domestic capital and net foreign assets, as depicted in equation 1.

$$W_{nt} = W_t + W_{gt} = K_t + NFA_t \tag{1}$$

W_{nt}, W_{gt} and W_t represent net national, public and private wealth respectively, K_t domestic capital and NFA_t net foreign asset position. For most rich countries, national wealth tends to be equivalent to private wealth since net government wealth W_{gt} is in the present close to zero (Piketty and Zucman, 2014). As for the second equivalence, it is interesting to note that,

[4] De Rosa (2018, 2019) are earlier attempts to estimate wealth distribution in Uruguay based on the capitalization method. Results presented in this article represent an extended and improved version of such estimates.

[5] To be more precise, private wealth is the sum of personal wealth, i.e. wealth owned by households, plus wealth of non-profit institutions serving households (NPISH). As this institutional sector is usually very small and –as in the Uruguayan case– often included in household sector estimates, I do not make a distinction between the two in this study.

intuitively, as all national financial assets and liabilities must cancel out (including the property of corporations), national wealth W_{nt} is equivalent to the sum of all non-financial assets owned by household, corporate and government sectors, plus the net foreign asset position.

This intuitive result depends on the valuation of the corporate sector, which can be market or book value based. Both valuations are equivalent when Tobin's Q is equal to one. It this is not the case, it means that if one wants to estimate the market value of national wealth, it is necessary to impute a residual corporate wealth component (i.e. the difference between the two). These differences are important for interpreting results, but in the Uruguayan setting, which close-to non-existing trade markets, it is safe to assume $Q = 1$.

With Y_t being the national income, the private and national wealth to income ratios (β_t and β_{nt}) are hence defined as:

$$\beta_t = \frac{W_t}{Y_t}, \beta_{nt} = \frac{W_{nt}}{Y_t} \tag{2}$$

I estimate both to understand the aggregate national wealth together with its private-public split, but –more importantly– because personal wealth distribution estimates are going to refer to private wealth, i.e. the sum of all net wealth of individuals in the distributional estimates must add-up to W_t.

3.1.2 Inheritance flow and stocks

One of the main variables of interest in this study is the flow of of inherited wealth in national income b_y. Equation 3 expresses b_y as a function of the mortality rate m, total bequests B_t^*, and the ratio between average wealth of decedent and living population μ. According to this intuitive relation, b_y increases if a higher percentage of individuals pass away, if the dead are wealthier in relation to the living, or if society as a whole has a higher level of wealth.

$$b_y = \frac{B_t^*}{Y_t} = m * \mu * \beta_t \tag{3}$$

Ideally, this inheritance flow should also include gifts *inter-vivos* (which can be included in B_t^*), but in this case we will only account for bequests given data restrictions discuessed in section 4. This may not be as problematic in this particular setting, since there are is no inheritance tax which could generate incentives to estate-planning.

Finally, we define φ as the share of inherited wealth in aggregate private wealth, with W_B being the accumulated stock of inherited wealth over a generation.

$$\varphi = \frac{W_B}{W_t} \tag{4}$$

Assuming that, from a strictly accounting viewpoint, all wealth comes either from savings

or from inheritance, following Alvaredo et al. (2017) one could express φ as a function of net savings rate s and inheritance flow b_y. As pointed out in the article the "difficulty is that we typically do not know which part of the aggregate saving rate s comes from the return to inherited wealth, and which part comes from labour income (or from the return to past savings). Ideally, one would like to distinguish between the savings of inheritors and savers (...), but this requires microdata over two generations." (Alvaredo et al., 2017, p 246). If we only have macro data on s and b_y, and by assuming that the propensity to save is on average the same whatever the income sources, φ can be computed as:

$$\varphi = \frac{b_y + \varphi \cdot \alpha \cdot s}{b_y + s} \tag{5}$$

Re-arranging:

$$\varphi = \frac{b_y}{b_y + (1 - \alpha) \cdot s} \tag{6}$$

In equation 6, α is the capital share, so a fraction α of the saving rate s is attributed to the return to inherited wealth, and a fraction $(1 - \alpha)$ to the return to past savings. Intuitively, equation 6 shows that the share of inherited wealth depends on the relation between the inheritance flow b_y and the savings rate s.

There are naturally a number of caveats. The first one is that this is a steady state formula, and so average long-term values need to be computed, of around 30 years (the standard length of a generation), and in any case real-world economies may not be close to the steady state for prolonged periods of time. The second is that equation 6 tends to underestimate true φ, because individuals who have only labour income tend to save proportionally less than those who have large inherited wealth and capital income, which is not the assumption in this setting.

However, it allows to compute φ's trend very well, when compared to estimations based on better data (Alvaredo et al., 2017). Thus it may be used to get a sense of the relative importance of inheritance in aggregate wealth (Piketty and Zucman, 2015), and has been used as a simplified approach to overcome an otherwise impassable obstacle (see for instance the recent application of Ohlsson et al. (2020) for Sweden discussed in section 2.2).

3.2 The capitalization method

There is a set of possible methodologies and data sources that may be used to study personal (private) wealth distribution: (i) data on estates at death, multiplied-up to yield estimates of the wealth of the living; (ii) wealth household surveys; (iii) wealth taxes data; (iv) "rich lists" or (v) the capitalization method.

The main wealth distribution estimates in this article are based on the capitalization

method, recently applied by Saez and Zucman (2016) for the United States[6], and the remaining ones will be used (when possible), as robustness checks. There are several reasons to choose the capitalization method as the methodological workhorse in this setting. First, it provides the best balance between asset and time coverage. As discussed bellow in section 4, the wealth survey has information on a larger number of assets but only for one year, whilst the estate multiplier method presents a longer time span but only provides real estate distribution estimates. In any case, as it will be discussed below, adding more assets does not substantially change wealth distribution estimations in the wealth survey, and the estate multiplier method's estimations only add two years to the time series. Therefore, the capitalization method is better as it provides estimates of a complete wealth distribution estimation, both time and assets-wise. Second, as discussed in section 4.2.1, wealth is estimated based on capital incomes distribution, which are part of DINA-based income distribution estimates, hence providing a full individual income-wealth database, compatible with the DINA framework. This income-wealth database is an important product in its own right, since it allows to study the dynamics of income growth and distribution together with wealth distribution and accumulation. Finally, the capitalization method is likely to be better suited for top shares estimation (Piketty, 2015), which are particularly important in wealth distribution analysis.

The method consists on estimating individual net wealth by capitalizing personal capital incomes, using capitalization factors for each type of wealth which are equivalent to the inverse of their rate of return. Essentially, if for certain individual i, the amount of wealth p that she owns (w_{ip}) yields (r_p) providing her with an income flow (k_{ip}) (eq. 7), then it is possible to trace back the wealth stock by applying a capitalization factor (f_p), equivalent to the inverse of its rate of return (eq. 8).

$$k_{ip} = r_p * w_{ip} \tag{7}$$

$$w_{ip} = k_{ip} * f_p \tag{8}$$

Being:

$$f_p = 1/r_p$$

The method has some important drawbacks. The most relevant one refers to the fact that it is assumed that for each type of wealth w_p, the capitalization factor f_p is the same for all individuals. This may not be the case, as individuals may face different rates of return r_p, thus biasing the estimations. One possible bias is associated with idiosyncratic returns, that is,

[6]The method was originally proposed by Robert Giffen in 1913 (Fagereng et al., 2016), and applied for instance for the United Kingdom by Atkinson and Harrison (1978).

that identical individuals in terms of observable characteristics face different rates of return for the same assets. Furthermore, it is possible that returns are positively correlated with wealth, which is argued to be a "more serious concern" (Saez and Zucman, 2016). If return rates rates r_p are larger for higher income individuals, then their actual capitalization factors f_p should be lower than those used in the method. Therefore, the capitalization method is mechanically overestimating wealth concentration at the top.

Estimates of r_p and f_p should be estimated considering eq. 8, that is, estimating the rate of return of each type of wealth by comparing total wealth W_p with the sum of the capital income flows (eq. 9).

$$f_p = W_p / K_p \tag{9}$$

Being:

$$W_p = \sum w_{ip}, K_p = \sum k_{ip}, W_t = \sum W_p$$

One of the most important advantage of this procedure is that it provides full micro-macro consistency between wealth distribution estimations and aggregate estimations. To assure this, I follow the Distributional National Accounts guidelines (WIL, 2021) and compute return rates matching aggregate income and wealth components for four assets and liabilities: housing assets, business (and other non-financial) assets, financial assets, and liabilities.

3.3 The estate multiplier method

3.3.1 The standard application of the estate multiplier method

The estate multiplier method has been perhaps the most commonly used method for studying wealth distribution, especially in historical perspective (Piketty et al., 2006; Alvaredo et al., 2017). It is based on estate tax data, which is a way to observe wealth of individuals at the moment of death, and therefore is considered a sample of the entire population. Naturally, it is not a random sample and so it is weighted by the inverse of individual's mortality rate, hence providing a personal wealth distribution of the living population (Piketty and Zucman, 2015). Its basic inputs are estate tax records, individual mortality rates, as well as population and a wealth control totals, to account for the wealth of individuals bellow the estate tax threshold.

Provided there is data on estate tax from an inheritance tax or similar, the challenge usually lies in applying an adequate mortality rate. These mortality multipliers could in principle be relevant, but the actual extent to which they affect inequality estimations is still debated (Alvaredo et al., 2017; Saez and Zucman, 2016; Kopczuk, 2015). Sex and age specific mortality rates are hence needed and usually available in estate tax data, and also some proxy of the level

of wealth (e.g. income or education) since mortality can be affected by individual's wealth. Finally, wealth control total is taken from national accounts balance sheets and population totals from official estimates of adult population.

3.3.2 The simplified estate multiplier method

As will be discussed in section 4, almost none of these data inputs are available in the Uruguayan case, at least not in the way they are in recent studies such as the ones summarized in section 2. To begin with, there are no national accounts balance sheets, so the first step is to estimate a private and household's real estate wealth total. Moreover, the personal wealth data used in this article comes from administrative registry of decedents with properties, but with virtually no information of the decedents themselves. Therefore, weighting them by their specific (inverse of) probability of passing is not possible in this context.

However, as Alvaredo et al. (2017) show, at least in the case of the United Kingdom the weighting process, i.e. the transformation from decedents to living population analysis does not change levels or trends of top wealth shares. In other words, estimates of decedent's wealth distribution with respect to the wealth of individuals when passing, and estimates of living population wealth distribution with respect to aggregate household's wealth, entail almost identical results. This is further explored by Berman and Morelli (2021), showing that it also holds for Australia, France, Italy, Korea and the United States. Moreover, they also show formally under what conditions this is the case, concluding that it is possible to use average mortality rates and obtain similar results than using detailed ones. Assuming that the same holds for the Uruguayan case, I will consider that the decedent population is an adequate sample of the entire population that only differs in that they are wealthier on average than the rest. Therefore, by adjusting their wealth downwards, this sample could be used to estimate living population's real estate wealth distribution.

The procedure for estimating real estate wealth top shares is therefore the following: (a) depart from the decedents personal wealth micro data; (b) weight them by (the inverse of) the average probability of passing; (c) adjust their wealth downwards to account for decedent's higher wealth in relation to the living population; (d) compute top wealth shares based on this weighted and adjusted data, with respect to estimated aggregate household real estate wealth W^r_{ht} and total adult population (20 or more years). Thus, in steps (a) and (b), we expand decedent individuals to account for the entire living population in terms of number of people. As individuals are likely to be wealthier at the time of death due to life-time accumulation, their real estates is corrected by μ in stage (c), which is the ratio of average wealth of decedents in relation to the living population of equation 3. Once weighted and adjusted, top real estate shares can be computed by comparing the wealthiest individuals with aggregate household's

real estate wealth W^r_{ht}.

4 Data

In this section, the main data sources are described. Section 4.1 provides an overview of the data sources, with a brief description of each (further details depicted in the appendix, when indicated), while section 4.2 documents the procedures to adjust them.

4.1 Overview of the main data inputs

For the estimation of both wealth to income ratios, real estate inheritance flows and the set of personal wealth distribution estimates, a wide variety of data sources was used. Some of them have been used in recent years, such as the income tax records, but some are completely novel and were gathered specifically for this study. Thus, departing from the the main data sources listed in Table 1, the challenge from a data view point is to construct the overall picture under a unified coherent framework.

Table 1: Main data sources summary

	Years	Source	Observations
Personal income tax data	2009-2016	DGI	75% of adult population
Personal wealth tax data	2009-2016	DGI	Paid by less than 1% of indivs.
Firm's tax records	2009-2016	DGI	Univ. of copr. tax paying firms
Household survey	1986-2020	INE	Nationally representative
Wealth household survey*	2013	UR	Nat. rep., high inc. over-sampled
National Accounts	1988-2020	BCU	No balance sheet. Exp. approach except 2012, 2016
Cadastral administrative data	1999-2018	DNC	Univ. of urban and rural prop. (cad. value)
Registry of decedent's property	2007-2015	DGR	Universe of owner decedents
Real estate transactions	2009-2018	INE-DGR	Housing prices evolution
Demographic statistics	2007-2015	INE	Population totals decedents by age-sex
Financial sector data	2009-2016	BCU	Exchange rates and household's liabilities

Notes: Acronyms in Spanish: *Dirección General Impositiva*, DGI; *Instituto Nacional de Estadísitica*, INE; *Banco Central del Uruguay*, BCU; *Dirección Nacional de Catastro*, DNC; *Dirección General de Registros*, DGR; *Ministerio de Ganadería, Agricultura y Pesca*, MGAP; *Universidad de la República*, UR; *Ministerio de Economía y Finanzas*, MEF. (*) Wealth survey (EFHU) was a joint effort of UR, MEF and BCU.

Personal income tax records. The personal income tax record is a high quality administrative micro-database reported by the Tax Authority (*Dirección General Impositiva*, DGI) covering approximately 1,800,000 individuals, that is, around 75% of Uruguay's total adult population. In addition to individual labour incomes and pensions, it also contains information about age, gender and industry. Capital tax records in Uruguay refer to 12 capital income

categories (taxed at flat rates of 7 or 12%), which may be aggregated in dividends and utilities, land and housing rent and financial incomes. The database also includes capital gains, which are taxed when the gain is realised. For a detailed description of the database, see (Burdín et al., 2022).

Personal wealth tax records. The micro-database provides data on this tax by which only real estate is taxed. It is a progressive real estate tax, with rates that originally ranged from 0.7% to 2.75%. However, the rates have a decreasing schedule which started in 2008 and ends in 2022, when a single tax rate of 0.1% will exist. In the period, rates ranged from approximately 0.7% to 1.85%.[7] The enforcement is relatively low as compared to other taxes, and very few individuals actually pay it (some 8,500 individuals, just over 0.3% of the adults).

Firms' tax records. The micro-database is provided by the Uruguayan Tax Authority and it refers to the universe of firms under the corporate taxation scheme, which excludes very small businesses. Over 100,000 firms are are present in this database every year. Firms are complied to report their total assets and liabilities, as well as the amount of profits.

Household Wealth Survey. The Household Wealth Survey (EFHU in its Spanish acronym) is a relatively under-exploited survey. It was conducted by the Central Bank, the Ministry of Finance and Uruguay's National University (BCU, MEF and UR). It surveyed 3,490 households and it is representative of the whole country. It over-samples relatively richer households, from the fourth and fifth income quantiles and households with business property (Ferre et al., 2016). It includes all financial and non-financial assets and liabilities of households, and also provides information about their financial behaviour. There is until the moment only one wave covering all assets and liabilities for 2013, and two additional ones with only a set subset of variables (which were not used). Descriptive statistics of the main asset types are depicted in Table A.7.

Household Income Survey. The Household Survey (ECH in its Spanish acronym) is a comprehensive survey of households characteristics. It is conducted uninterruptedly since 1981 by the National Institute of Statistics (INE). It is nationally representative since 1986, with a large sample of over 30,000 households.[8] It accounts for a detailed desegregation of income sources for each member of the household and the household as a whole. In particular, it includes owner occupied housing income, rents from real estate properties (both housing and land), profits in various types and interests from deposits and other financial assets.

[7] For more details see art. 45, T. 14 of *Texto Ordenado 1996*.
[8] Recall that Uruguay's population is around 3.400.000 individuals.

National Accounts. National Accounts are produced by the Central Bank, covering –in their current publications– from 1988 onward. They include aggregate GDP and National Income, as well as data on savings and investment. From the perspective of the requirements of this study, there are two major things it does not include. First, it does not include –and never has– a balance sheet, hence aggregate wealth of the country is completely unknown. Second, it has only recently presented desegregated information by institutional sectors for 2012 and 2016, but not for the remaining years (their publication was discontinued in 1999). It represents the single most challenging data restriction for the adequate study of wealth to income ratios and its distribution.

Cadaster data. Cadastre data was provided by *Dirección Nacional de Catastro* or DNC in it Spanish acronym, which is part of the Finance Ministry of Uruguay. Among other tasks, they collect and update data on the universe of urban and rural properties of the country. Information on each property is documented in publicly available cadastral identity cards (*cédula catastral*), which present a wide variety of property characteristics, as can be seen in the example of Figure A.1. In particular, it presents information on a number of fields that allow to identify unequivocally each property (more on this in 4.2.2), the type of property (rural or various types of urban properties), its size and the cadastral value for the present and last four years. A micro-data set with the series of cadastral value of each property for 1999-2018 was build for this research by the DNC, for a total number of 242.431 rural properties and 1.383.868 urban properties (see list of variables in Table A.1).

Registry of decedents' property. Information on the properties held by each individual are registered by the *Dirección General de Registros*, or DGR in Spanish. Information of changes in property ownership and estates is published regularly by the State's official newspaper (*Diario Ofcial*), as can be seen in the example depicted in Figure A.34. The data set provided for this study has all deceased individuals who owned properties in the 2007-2015 period. For each owner, therefore, the whole set of properties they held at death is available. The value of the properties is not present, but a set of property characteristics is, so it may be merged to cadaster data. Between 5.500 and 8.800 individuals are present in the owner decedents data base, as depicted in Table A.10. The average number of properties they held when dying is for most years 3-4, and the median is in all cases 1 property. The maximum number of properties held can vary from slightly over 90 to several hundred.

Real estate transactions. Market prices by squared meter by region and neighbourhoods in Montevideo were constructed based on INE's reports on housing market based on

DGR data. In the case of Rural properties, the yearly publication by the Ministry of Agriculture (*Dirección de Estadísticas Agropecuarias - Ministerio de Ganadería, Agricultura y Pesca: DIEA-MGAP* in its Spanish acronym) with market prices by department was used.

4.2 Adjustments to key data

4.2.1 The capital incomes database

The first step to perform the capitalization method, is to ensemble a data base with all capital incomes, accounting for the full adult population. The database used is estimated following Distributional National Accounts guidelines (WIL, 2021) as much as possible. The full DINA-based income distribution estimation procedure can be found in De Rosa and Vilá (2020). In a nutshell, we depart from a tax-social security dataset which accounts for 75% of the adult population, and complete it accounting for informal and untaxed incomes, as well as population with zero incomes. This first step of the combination is fully documented in Burdín et al. (2022), and includes the use of a sub-sample of tax-survey matched individuals to correct incomes. This is later scaled up by income components to household income aggregates, followed by an imputation of undistributed profits according to a two alternative proxies of capital income ownership: (i) the sum of taxed capital incomes and from tax records and untaxed capital incomes (such as dividends) from the survey, and (ii) using matched firms-individuals data to identify possible owners. An additional adjustment, is that a stream of liabilities is simulated, to match the aggregate (negative) D4-S14 and distributed to approximately replicate liabilities distribution from the household wealth survey.[9] The resulting capital incomes distribution is depicted in Figures A.18 to A.20.

4.2.2 Unified Inheritance microdata

As discussed in section 3.3, the standard requirements for this sort of study involve some estate tax data, household's wealth control totals from National Accounts balance sheets, and population control total. The only data input readily available in the Uruguayan case is the population estimates by age, since Uruguay has official population estimations based on census data provided by the National Statistics Institute (INE in Spanish).

Meanwhile, there is no inheritance tax and no balance sheet, and so a substitute needs to be found for the former and the latter needs to be estimated. Balance sheets were never estimated by the Uruguayan Central Bank, which only reports the government sector balance

[9]The distribution of liabilities was approximately 46 and 39% for bottom 50 and middle 40% of total net worth; 15% for top 10% excluding the top 1%; and 4% for the top 1%.

sheet and the net foreign asset position of the country in the balance of payments. Moreover, since the 1974 there has been no inheritance tax. The only tax paid on estates is the *Impuesto a las Transmisiones Patrimoniales* or ITP in its Spanish acronym, which is a flat tax of 3-4% on all real estate transactions, including bequests but also sales and gifts. Unfortunately, this tax only reports data on individuals receiving the estate and with no information on decedents. Therefore, it is impossible to aggregate estate tax data at the inidividual level based on ITP.

This study is based on two main administrative data sources. The first one is Cadastre data on the universe of urban and rural properties, with a wide set of characteristics including size and cadastral value for the 1999-2018 period. The second one is an decedent-owners' registry with all decedents who owned properties between 2007 and 2015. Both data sets are based on public information but were constructed especially for this study. These two data sets can be merged, thus allowing to analyze decedents real estate wealth. Each of them, together with supplementary data and the merging-adjusting procedures performed are described in this section.

Cadaster property values. The cadastral value of a property may be modified for three reasons. The most common one is the annual update of cadastral values done by the DNC, which is based on a combination of the evolution of the general price index, and the cost of construction index (IPC and ICC in their Spanish acronyms). The second and third reasons are related to changes in the buildings within the properties (e.g. additional rooms are build in a given house). These changes can be detected if the property is sold or if there is a general inspection and revaluation of properties in the region.

An example of a property for which the cadastral value has been re-valuated is presented in Figure A.3, depicting a spike in the value and a smooth evolution thereafter. While this type of revaluation is not uncommon, they do not seem to generate any discontinuities in the aggregate evolution of cadastral value, which presents a smooth evolution for both rural and urban properties as depicted in Figure A.6. Regional re-valuations could be a more serious concern if they entailed a generalized increase in cadastral values of a given region, but they were extremely scarce and of limited reach in the period, and no effects are visible while considering smaller geographical subdivisions.[10]

The unified real estate-decedents database Following the discussion of section 3.3, the basic input required is a data set with deceased individuals and the real estate wealth they held at the moment of death, valued at market prices. This basic input results from the merging of the two data sets previously described and of a number of adjustments, which are discussed

[10]The country is divided in 19 departments. Evolution of cadastral aggregate value for all of them is depicted in Figure A.4, showing no discontinuities.

hereafter.

In order to construct a data set with individual real estate wealth of the decedent population, it is first necessary to merge the data from DNC (with cadastral value of properties) and DGR (with dead owners of properties). The merging is performed at the property level, based on the data existing in both data sets.

In the case of urban properties, in order to single out a property, three different variables need to be considered, as depicted in Figure A.2: the department, the locality within the department and the number of the property.[11] The reason why the property number by itself is not enough, is because the numbering starts over in each locality of each department. Two more variables are needed to adequately identify a single property: unit, in the case of apartment buildings (each unit representing a flat within the building) and block, which is used in some specific localities of recent urbanization to subdivide properties. The unit variable is available in both data sets, but the block is only available in Cadastre data, hence it was not used in the merging. In the case of rural properties, the merging is simpler since to single out a property, it is only necessary to provide number and department. Figure A.36 shows that when the two data sets are merged based on these variables, 78-80% of dead individuals in DGR's raw data are merged, corresponding to 72% of rural owner-property observations and 84% of urban owner-property observations.

As depicted in Figure A.36, between 14 and 22% of each years' total decedents are accounted for. Thus, if we assume that the decedents in the DGR data are in fact the wealthiest of all decedents of that year, we have a number that allows to compute (at least) the top 10%'s share. It is worth noting, however, that the number slowly decreases. This is due to the fact that registry may have some delay and therefore not all of the decedents of the final years are present. This fact will be considered when analyzing results in the following sections.

Adjusting the data: individual real estate and market prices. Once we have a unified decedents-real estate database, three main adjustments need to be performed: (i) converting cadastral values into market prices and (ii) accounting for individual real estate (as opposed to household's).

The first and most important step is the market prices adjustment, which has an effect not only in decedent's real estate wealth, but also on the estimation of the national and household's real estate wealth (W^r_{nt} and W^{hr}_t). For both rural and urban properties, the value of each property was adjusted by multiplying its surface for its market value. In the case of rural properties, official data by the Agriculture Ministry (*Ministerio de Ganadería, Agricultura y Pesca* in Spanish) on price by hectare by department was taken, which is published on yearly

[11] Uruguay is divided in 19 departments, each with several dozen localities.

basis.[12] In the case of urban properties, reports by the National Statistics Institute (*Instituto Nacional de Estadísticas*, INE in Spanish) on the evolution of market prices by city and type of properties were considered.[13] When computing aggregate urban and rural real estate at market prices with the aggregate cadastral values, the resulting adjustment ratios, depicted in Figure A.5, were 14-17% for rural properties and 39-44% for urban properties. These ratios, which are used to adjust each property's price, are exactly within expected adjustment values.[14] Moreover, they are very stable, which is indirect evidence that the yearly update of cadastral values is aligned with market prices' evolution in this period.

The second adjustment refers to distinguishing between household and individual real estate. In the decedents registry data set, all the properties held by each dying individual are accounted for. Nevertheless, we ignore if they are held at the same time by somebody else, which is naturally problematic since a significant proportion of real estate wealth may have been accumulated jointly with a spouse. To adjust for this, two criteria were alternatively taken. In the first one, it is assumed that all real estate is accumulated jointly by two individuals and therefore decedent's registered real estate is in all cases actually household's real estate. Under this assumption, real estate is divided by two to account for the share of that wealth actually belonged to one of the spouses (what is defined as equal-split in the Distributional National Accounts guidelines (WIL, 2021)). Dividing by two will also reduce by half the wealth of last surviving spouses of a given household, but this is a desirable property. As Atkinson pointed out, "The most common "sideways" transfer is from husband to wife or vice versa. Ideally, we should like to exclude such within-generation transfers (including those from brother to sister or cousin), but this is not always possible, and to this extent the degree of inter- generational transfer is over-stated." (Atkinson, 2018, p. 143).

The preceding assumption naturally represents a lower bound estimates, since we are not considering that some individuals may have accumulated their real estate wealth alone. A less restrictive assumption would hence be to account for individual accumulation. Based on the wealth household survey[15], we find that 10% of individuals lives alone, while another 10% declares having wealth separated between spouses (i.e. 20% of individuals). Thus, considering that a combined maximum of approximately 30% of decedents accumulated their wealth individually, a 70-30 split was performed to the data: the real estate of 70% of individuals

[12] See *Anuario Estadístico* by DIEA in https://www.gub.uy/ministerio-ganaderia-agricultura-pesca/comunicacion/publicaciones/.

[13] See http://www.ine.gub.uy/actividad-inmobiliaria.

[14] Unofficial ratios used by DNC in back-of-the-envelope calculations are 15% for rural properties and 40% for urban. Unfortunately, these estimates are not discussed in any official DNC document, but were informed by DNC's high ranking officials.

[15] The household wealth survey (*Encuesta Financiera de los Hogares Uruguayos*, EFHU in Spanish) is available for 2013 and it is representative of the entire population (Ferre et al., 2016). It has a sample of 3490 households, which over-represents households from the fourth and fifth income quantiles and households with business property.

was divided by 2, and for the remaining 30% it was left unchanged. Results reported are the average of 500 random draws from a Bernoulli distribution with these probabilities.

5 Aggregate Wealth

Wealth to income ratios for Uruguay in recent years are presented in this section. Given the complete absence of balance sheets from National Accounts, the focus is put in building solid estimates of national wealth, and a careful decomposition of private wealth. In Section 5.1 the components of National wealth are analyzed based on each on the available datasets, while Section 5.2 presents the aggregate wealth to income ratio estimate by institutional sectors.

5.1 National wealth components

For the estimation of national and private wealth, I proceed in four steps. In dark are the aggregates that are unknown, while the underlined ones represent those that can be observed or easily estimated. Steps 1 and 2 can be calculated directly from equation 1, while steps 3a and 3b are the different components of each sector's wealth. In the following subsections, I will describe the estimation of all the observable elements, i.e. those underlined, that will lead to the estimates presented in section 5.2.
The four steps in the estimation procedure are:

1. **Net National Wealth** = Domestic Capital + Net Foreign Asset Position
2. Net National Wealth = **Private net wealth** + Government net wealth
3. Household and corporate wealth
   (a) Private net wealth = Priv. non fin. assets + **Priv. fin. assets** - Priv. liabilites
   (b) Corp. net wealth = 0 = Corp. non fin. assets + **Corp. fin. assets** - Corp. liabilites

5.1.1 The government sector

The only institutional sector with a relatively complete balance sheet estimates is the Government Sector, which is reported annually by Uruguayan government to the International Monetary Fund (IMF), available for 2001-2016.[16] The IMF provides data on General government Sector's net worth (S13-B90) as a percentage of GDP. Based on this series, in Figure A.9 aggregated public net worth is depicted together with the evolution of net national income

[16] See https://data.imf.org/.

(both in current USD), as well as the ratio between the two. General government's net worth at the beginning of the century was approximately 67% of national income, and by 2016 it was 21.5%. The first years of the 2000s witnessed a sharp drop and partial recovery during the crisis, a relatively stable ratio of 50% of national income up until 2009, and a steady decrease afterwards. Figure A.9 shows that it followed the same general trend than public aggregate net worth, i.e. it is not the artificial result of variations in national income not reflected in public wealth. Despite this downturn, it is worth noting that it is significantly higher than countries such as the US, France, Japan or Britain, which fluctuates around zero, and much closer to the Chinese government's balance sheet (around 30%) (Piketty et al., 2019).

Following SNA's guidelines (United Nations, 2009), the Government Sector's net worth, is the result of non-financial plus financial assets net of liabilities. Figure A.10 (panel a) depicts these main components of government's net worth as a percentage of net adjusted national income. During the early 2000's crisis, there was a large and rapid expansion of government's liabilities, which had the effect of offsetting a milder increase in financial and non-financial assets. From 2003 until 2009 the ratio stabilised around 50%, slowly falling thereafter led by a decreasing share of non-financial assets, fostered by an increase in liabilities in the last few years.

Digging into non-financial assets (AN), IMF data shows that it is exclusively represented by produced non-financial assets and, in particular by fixed assets (AN11). Non-produced non-financial (AN2) are missing, which is noteworthy since land is one of its components. Thus, it is not possible to present any further details about its components, which is an important obstacle since non-financial assets are one of the drivers of government's net worth. Financial assets and liabilities (AF), on the other hand, offer greater opportunities for decomposition. Panel b of Figure A.10 shows that the overall dynamic of government's net financial wealth is led mostly by its liabilities, which are between four and six times higher than the assets. Within liabilities, debt securities (AF3) present the largest variations, being responsible for the impressive spike of 2003-2005.

5.1.2 Net foreign asset position

Figure A.12 depicts the net International Investment Position (IIP)[17] of the country and its two main components, based on the Balance of Payments from Uruguayan Central Bank (BCU, in its Spanish acronym) up to 2007, and the IMF from 2008 onward. In 2011-12 there is a sharp decrease, reaching around -30% of national income. This striking decline seems to be the effect of a change in the way the series is constructed. BCU series used to be presented in two sets: 2002-2011, and 2012 onward. This is what seems to be reported by IMF, since the 2008-2018

[17] Terms International Investment Position and Net foreign asset position will be used indistinctively throughout this study.

IMF series matches the "old" 2002-2011 BCU series fit correctly.[18]

Thus, the IMF series does not seem to provide an adequate picture of the actual evolution of IIP. Unlike older version of the series, new BCU IPP only covers the 2011 onward period. However, it does not present the discontinuity of 2011-12, and provides its complete decomposition, and so it provides a better starting point. Figure A.13 presents the IIP components both by financial instrument and by its public-private split. Financial instruments include direct investment, financial derivatives, other investment and portfolio investment, plus the country's main financial asset which are Central Bank's reserve assets. The main liability component is direct investment, which ranges from 85-110% of national income. When this is observed considering public and private sector, it becomes clear that the negative IPP is entirely driven by private assets and liabilities, since public sector financial position in relation to the rest of the world is balanced or even slightly positive.

5.1.3 Domestic capital

The level and composition of real estate wealth

Real estate wealth as a percentage of national income is depicted in panel a of Figure A.8, which results from adjusting net cadastral value to market prices as discussed on section 4.2, including all real estate assets owned by all institutional sectors. After an initial increase of the gross real estate to income ratio in the early years of the century (which is the result of a massive contraction of national income during the last major economic crisis, of over 7%), the ratio stabilizes around 3.5. A full discussion on the geographical distribution of real estate wealth is presented in Appendix A.6.

Panel b of Figure A.8 shows household's gross housing and land. It is interesting to note that 30-40% of real estate wealth is rural real estate (see Figure A.7), with a urban real estate to income ratio of around 1.25 times national income, somewhat lower than what is found for rich countries, but with rural real estate of approximately an equivalent magnitude to national income, which is significantly higher than estimates for the United States or Europe. Interestingly, this are the general orders of magnitude of land to income ratios in Europe or the United States prior to World War I (Piketty and Zucman, 2014).

I compute household sector's housing wealth based on the household wealth survey for 2012 relative to total gross urban properties, and apply the share of real estate wealth that year to the whole series (therefore assuming the ratio is stable over time). This is further adjusted by the ratio of housing rents (owner occupied + rented dwellings) in tax-survey data to national account's household's operating surplus (which is very close to 1, see De Rosa and Vilá (2020). To estimate land owned by households, I take rural real estate and adjust if by the

[18]Figure A.13, presents the variation of each of the four main components of both assets and liabilities.

share owned by individual (as opposed to firms or the government) based on 2011 agricultural census (52.8%, see (DIEA, 2014). These adjustments result in agricultural land and housing owned by households equivalent to 60-70% and 110-130% of national income respectively.

Corporate wealth

I estimate gross corporate sector net wealth (S11-12 B90) based on firms' tax records described in Section 4. Sole proprietorship's firms are excluded from corporate wealth (and included as household's business wealth), as well as government-owned firms and direct and portfolio foreign investment which are already included in the government's balance sheet and in the International Investment Position respectively. After these adjustments, this micro-dataset allows me to precisely calculate financial, non financial assets and liabilities for 2009-2017 period out of firms' reported balance sheets. Liabilities are the sum of all liabilities recorded by firm's tax records, plus a residual calculated so that it ensures that Net corporate wealth is equal to zero, i.e. it is all owned by households.

The resulting corporate sector balance sheet is depicted in Figure A.11. Non-financial assets account for over 200% of National Income. Financial liabilities, both reported by firms and imputed as the result of ownership by the household sector, account for 300% of national income, while financial assets represent (by construction) the additional 100% necessary to balance the account.

5.1.4 Households' wealth

After computing private net wealth following equation 2, I calculate private's non financial assets and liabilities, calculating as a residual the financial assets. Within this residual, I distinguish pension funds, which are reported by the Central Bank, growing from 16 to 26% of net national income in the period. Private non financial assets are simply the result of adding household sector's real estate wealth described in Section 5.1.3 above, plus the sole-proprietorship business wealth form firm's tax files. Given the extent of informality in small businesses, this value was adjusted upwards based on the Household Survey by computing the ratio of incomes of small businesses who declare not paying taxes and those who do, as a proxy of the share of informal wealth (57% of formal one).

The final piece of the puzzle are household liabilities. Although the Central Bank does not report Household's balance sheet, in its yearly financial system's reports, they do publish the estimated aggregate liabilities of household's as a percentage of household's incomes.[19] According to these reports, liabilities represent 21-27% of household's incomes depending on

[19] All reports available online (in Spanish) in https://www.bcu.gub.uy/Servicios-Financieros-SSF/Paginas/Reporte-Anual-de-Estabilidad-Financiera.aspx.

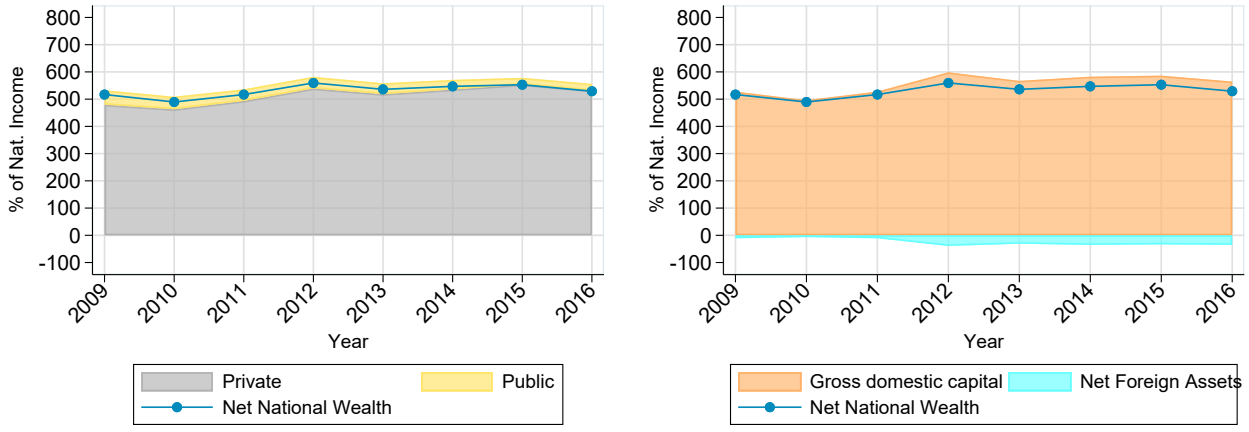
the year. These ratios are directly applied to household's incomes form national accounts described in Section 4.

5.2 National and private Wealth to income ratios

The resulting Net National wealth to income ratios are depicted in Figure 1. In panel a, national wealth is split into its private and public wealth components. While aggregate net wealth is between 450-500% of national income, private wealth is some 25-50% lower, as a result of Government's positive net wealth discussed in Section 5.1.1.The level of net wealth in US dollars is depicted in Figure A.15, showing an increase until 2013, followed by stagnation and even a slight decrease, which mirrored the slowdown of economic growth after 2014.

These estimates place Uruguay well within available estimates, which mostly refer to rich countries (see Figure A.17.) However, it is worth noting that given Uruguay's relatively low national income, average wealth is relatively low. As shown in Figure A.16, it presents an increasing trend up to 2013, when it reaches $US\$80.000$ per adult (PPP), and declines thereafter down to $US\$60.000$.

Figure 1: Net National Wealth to income ratio 2009-2016



(a) Public and Private

(b) Gross domestic capital and net foreign assets

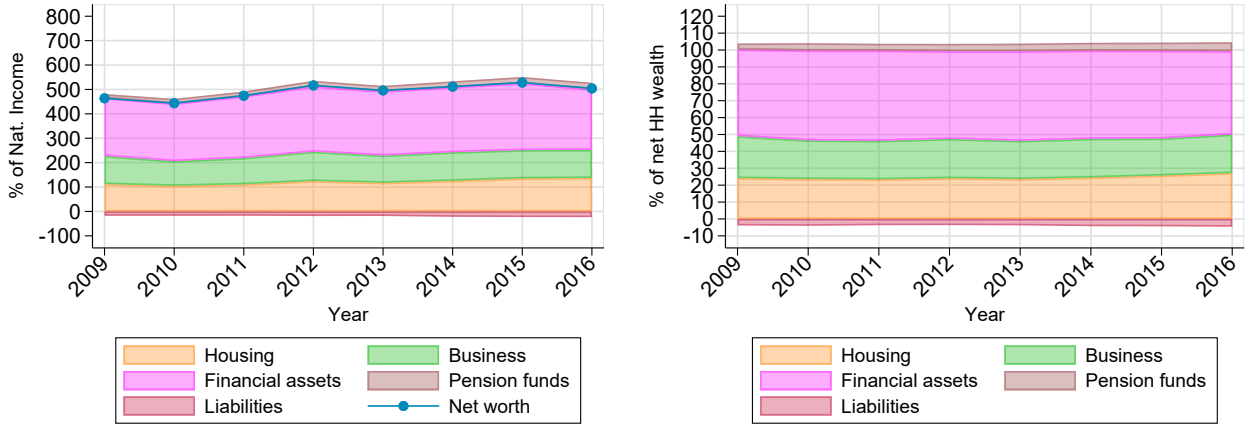
Note. Panels a and b computed based on equation 1. Net national wealth is equivalent by definition in both cases. See net national wealth by sectors and financial/non-financial assets in Figure A.14

Private wealth's decomposition is presented in Figure 2. Panel shows that around 60% of private wealth is financial wealth[20] with roughly 25-30% being housing (which slightly over

[20]Unfortunately, I cannot distinguish between different asset classes within financial assets, which represent the bulk of private wealth. To get an approximate notion, it is worth noting that private sector's net undistributed profits (B5n, S11+S12) represent 45% of total investment income, being the rest household's property rents (D4, S14) (De Rosa and Vilá, 2020). Although this does not translates directly into asset composition due to different rates of return, it does provide a general idea of how the split may look like.

100% of national income, see panel a) and the rest of gross private wealth being business assets. Private aggregate liabilities represent less than 5% of net wealth. Although these estimates present greater aggregation, the levels are very consistent with similar studies (see for instance Saez and Zucman (2016)).

Figure 2: Private net wealth



(a) Level

(b) Composition

Note. Private wealth level and composition depicted in panels a and b. Private net wealth refers to the aggregate depicted in panel a of Figure 1.

6 Wealth distribution

In this section, a set of wealth distribution estimates are discussed and compared. First, the main set of estimates, which are based on the capitalization method described in section 3.2 are presented in Section 6.1, where I also briefly characterize top wealth holders. In 6.1.2, a sensitivity analysis of the homogeneous rates of return is discussed. Section 6.2 presents real estate distribution estimates (both housing and land) based on the simplified estate multiplier method and the real estate wealth tax, as well as estimates based on the wealth household survey and comparison of top wealth holders with *Forbes* billionaires list.

6.1 Capitalization method

6.1.1 The personal distribution of private wealth

In the capitalization method, the underlying wealth of each individual is estimated based on her capital incomes, which are capitalized using factors that are the equivalent to the inverse

of their macro return rate. Thus, one needs a capital incomes distribution and a set of return rates, which are presented in panels a and b of Figure A.20 respectively.

As discussed in Section 4, the capital incomes database is taken from the Distributional National Accounts estimates from De Rosa and Vilá (2020). Overall, capital incomes are highly concentrated (with a Gini index around 0.7), being housing the less unequally distributed, and financial incomes (which includes all incomes derived from corporate sector ownership) the most concentrated one. Regarding return rates, housing shows return rates of 7-8%, while financial assets have implicit return rates between 7-10%, financial liabilities 5-8% and finally business assets have a 4-5% return rate, the lowest of all.[21]

The resulting net private wealth distribution is presented in Figure 3.[22] Top 10% share is 77-79%, while the top 1% is stable around 38-40%. As expected, bottom 50's net wealth is under 5% throughout the period. Both top 0.1% and middle 40% own approximately 20% of private net wealth. In the period, there is a slight downward inequality trend, with a reduction in top 10% and an increase in bottom 90%. In Figure A.21, point estimates are bootstrapped to produce confidence intervals, indicating that the trend is statistically significant. The period is clearly divided in two, with a reducing inequality one up to 2012, and stability thereafter. Top 1 and 0.1%, on the other hand, do not show statistically significant trends. This is interesting because, while top 10% trend is similar to its income distribution counterpart, top fractiles show stability while top fiscal income's present increasing trends (Burdín et al., 2022). Wealth distribution by type of asset is depicted in Figure A.23, where financial wealth is by far the most concentrated one, with virtually all concentrated in the top 10%. On the other extreme, 40% of housing is owned by the top 10%, with over half of owned by the middle 40%.[23]

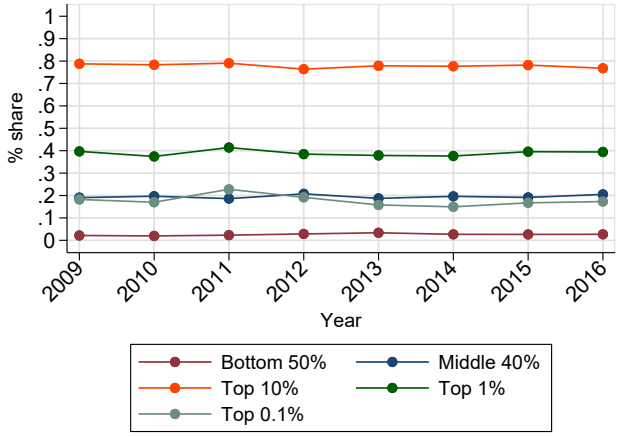
These estimates are similar to what is found, based on the same methodology, for countries such as US or Spain, but much higher than France. In the case of US, Saez and Zucman (2016) estimated that the wealthiest 0.1% owned around 22% of total net wealth in 2012, whilst the top 1% share is close to 42%. In Spain, capitalization method estimations show that the top 1% wealth share is around 40%, whilst the top 10% share is 65-75% (Martínez-Toledano, 2020). Finally in France, the top 1% share is 20-25%, and the top 10 share is 55% (Garbinti

[21] These returns are relatively close to the standard returns, see examples in WIL (2021). Pensions funds wealth is included in financial assets, but was no capitalized but imputed according to wealth survey estimates: which were approximately 31 and 41% for bottom 50 and middle 40%; 28% for top 10% excluding the top 1%; and 8% for the top 1%. Returns are adjusted to ensure income-wealth consistency, e.g. that aggregate financial wealth divided total financial incomes results in financial assets return rates. Given the very low share of pensions, it has no effect whatsoever.

[22] Note that once aggregated, these wealth components are equivalent to total private wealth depicted in panel a of Figure 1. Upper bound estimates, based on the capitalization of upper bound capital incomes from De Rosa and Vilá (2020) depicted in Figure A.22. Top 10% and bottom 50% estimates are remarkably similar, while the main difference is the top 1%, which is stable but 7-8 percentage points higher.

[23] Average wealth by assets is depicted in Table A.3, thresholds in Table A.4 percentage of asset ownership in Table A.5.

Figure 3: Net Personal wealth distribution 2009-2016



Note. Capitalized incomes, based on Distributional National Accounts estimates (De Rosa and Vilá, 2020). Capital incomes distribution and rates of return rates presented in Figures A.18 and A.20. See bootstrapped confidence intervals of wealth shares in Figure A.21.

et al., 2017). Slightly lower wealth inequality is found –somewhat surprisingly– in the Mexican case, although results are not strictly comparable since the methodologies are not the same (Del Castillo, 2017).[24]

It is worth stressing at this point that results are highly dependent on the capital incomes distribution (see Figure A.18 and panel b of Figure A.20). These, in turn, are the result of the process of Distributional National Accounts' construction, which is very sensitive to the way in which capital incomes are scaled to household sector, and –more importantly– to the way in which undistributed profits are imputed (De Rosa and Vilá, 2020; De Rosa et al., 2020). Therefore, results should be taken with caution and compared with other data sources and methods, which is done in Section 6.2.

6.1.2 Wealth correlated returns' sensitivity analysis

One of the most important drawbacks of the capitalization method refers to the assumption that rates of return -for each type of wealth- are identical for every individual. As explained in section 3.2, this may not be the case since identical individuals in terms of observable characteristics may face different rates of return (idiosyncratic returns), or rates of return may be positively correlated with wealth. The first one is probably not very important since the effects of idiosyncratic returns are likely to cancel out, but the second one may be more serious.

In Saez and Zucman (2016), this assumption is tested based on data on *Foundations*, for which both wealth and capital income flows are observable, concluding that the capitalization

[24]For an overview of estimates available at Wid. World, see Table A.2.

method "works well", at least in that context. However, rates of return may be larger for high income or wealth individuals because they are better informed and advised of investment opportunities, and so they are able to own safer and more profitable portfolios. Piketty (2014) argues that in fact return rates are higher for large wealth holders, based on *Forbes* global wealth ranking and publicly available data from US universities. *Forbes* ranking allows him to focus the attention on the very top fractiles of wealth distribution, for which he observes that the growth rate of their wealth was 6.8% per year in real terms between 1987 and 2013, much higher than the average wealth's growth rate (2.1%). Moreover, based on data on tax returns and actual wealth holdings from tax records for the whole Norwegian population, Fagereng et al. (2016, 2020) show that returns are indeed correlated with wealth, as in the case of the US (Smith et al., 2021).

To assess the impact of identical rates of return assumption, a simple sensitivity tests is performed. Instead of constant rates of return, increasing rates are used by p-tile of the capital incomes distribution are used.[25] Returns are assumed to increasing linearly within each type of wealth, excluding liabilities for simplicity. Figure A.28 shows the effect on wealth shares, as the gap between the rates of the bottom and top percentiles increase. In the extreme case, the rates of the top 1% are doubled, and for the bottom 1% are brought to zero. Results show that concentration does fall as expected, but general results do not change substantially. Although this simple exercise relies on several assumptions, such as linearly increasing rates of return, it shows that wealth-correlated returns are not likely to be an important concern in this setting.

A somewhat more demanding exercise is shown in Figure A.29, were return rates of the top 1% and the bottom 99% are increased and decreased respectively. In the extreme case, the top 1%'s rates for each asset is increased by 30%, which is mirrored by a 30% decrease in bottom 99%'s rate, which results in the top group doubling the rates of the rest. This variation is close to what Smith et al. (2021) find for the US, with top 0.01% having rates of return close to 3 times larger than the average, although within the rest of the top 1% rates are closer. This alternative exercise pushes top 1% share upwards and the bottom 99% downwards, resulting in a downturn of top 1% share of close to 10 percentage points, while the change is less dramatic for larger groups such as top 10%. This simple exercise shows the intuitive result that if rates-wealth correlation is particularly extreme at the top of the distribution (e.g. for the top 1% or smaller groups), the effect is likely to be concentrated on those groups but not in overall wealth inequality.

[25] In this exercise, the average rate is always kept constant, and each wealth component is adjusted to match the aggregate wealth level.

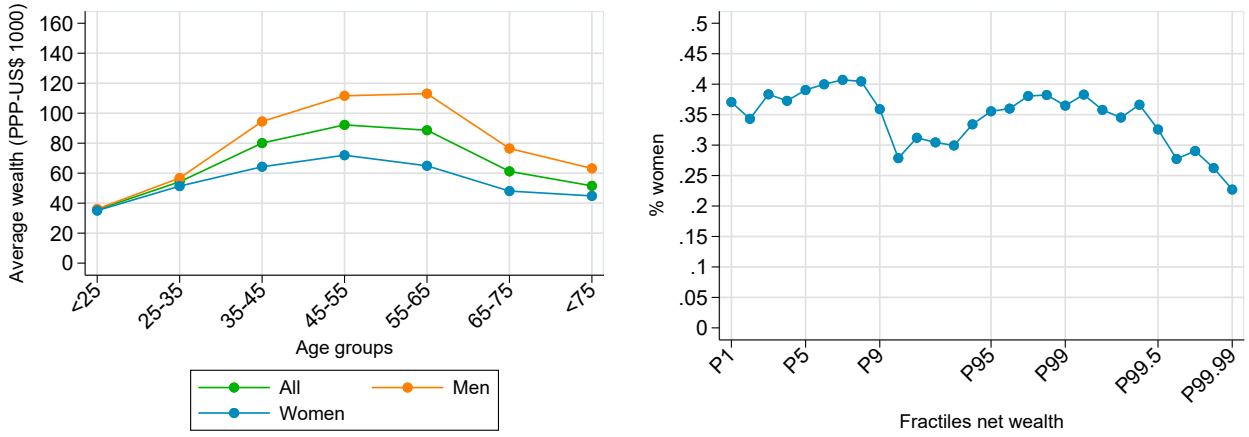
6.1.3 Wealth owners characterisation

Information on individuals in the tax records is used to characterise wealth holders. In panel a of Figure 4, average wealth by sex and age groups is depicted, showing that average wealth tends to increase up to retirement age and slightly decrease afterwards. This suggests that we are not in the presence of a clear life-cycle pattern, although it is not possible to be certain since the estimates are based on cross section data. In any case, it is consistent with the evidence of a relatively high inheritance stock, as discussed in Section 7.2.

Mean wealth is higher for men in all age groups, but particularly in the 40-60 year old interval. It is interesting to observe how the difference increases as individuals grow older until approximately 60 years old, point in which both groups start to converge. This may be explained by the fact that women tend to live longer than men and they also may inherit their partners wealth when they die.[26]

Panel b of Figure 4 depicts the percentage of women by net wealth fractile. While the share of women for the first eight deciles increases from 35% to 40%, it drops within the ninth and tenth deciles. Within the top 10%, the share of women increases steadily from a 25% to a 35-40% in the 99th percentile, only to plunge again within the top 1%, reaching a minimum of 20% for the top 0.1% group.

Figure 4: Wealth by age and gender, 2016.



(a) Average wealth

(b) Share of women

Note. Wealth averages for ten-year age groups and sex depicted in panel a. Individuals over 20 years old. Thousand US dollars, PPP. Similar results for each year depicted in Figure A.30. Average wealth by year in Figure A.16. Panel b depicts the percentage of women by net wealth fractile for 2016 (remaining years in Figure A.31).

Table A.4 depicts net private wealth thresholds in thousand US dollars for the period,

[26] In Table A.6 it may be observed how the proportion of women grows steadily from around 45% in the first age group until over 65% in the older one.

reflecting the highly skewed distribution of wealth. It is interesting to note that all thresholds move upwards up to 2012, and then downwards from then-on. This is likely the result of the movements in the exchange rate, which fell by 10% between 2009 and 2012, and then increased by 49%, which is likely to impact wealth in US dollars of pesos earners.

The capitalization method allows us to analyze jointly the distribution of wealth and income. Although the wealth distribution depends on the capital incomes distribution and is likely to be close (as in fact it is, see Figures 3 and A.20), they do not match for two reasons: (i) capitalized incomes are just a part of the income distribution, which includes in particular labour incomes and pensions, among others; (ii) heterogeneity in rates of return for different types of wealth, entails that individuals with the same total capital income but different composition present different estimated wealth as well. Panel a of Figure 5 depicts the percentage of individuals who belong to the same percentile in both distributions, by wealth percentile. Within the top 1% over 70% of individuals match, i.e. the vast majority of top incomes are also top wealth holders, which is the result of the extreme capital incomes' concentration at the top of the distribution (Burdín et al., 2022). The matching is relatively higher in the top 10% compared to the rest (especially in the 99 p-tile), but is not nearly as high.[27] Panel b presents a heatmap of the top 10%. As expected given panel a, there is greater concentration of observations in the top percentile of both distributions, but there is also relatively more observations above the main diagonal. This means that individuals in the top percentiles of the wealth distribution, tend to be relatively above in the incomes distribution.

6.2 Triangulation of evidence

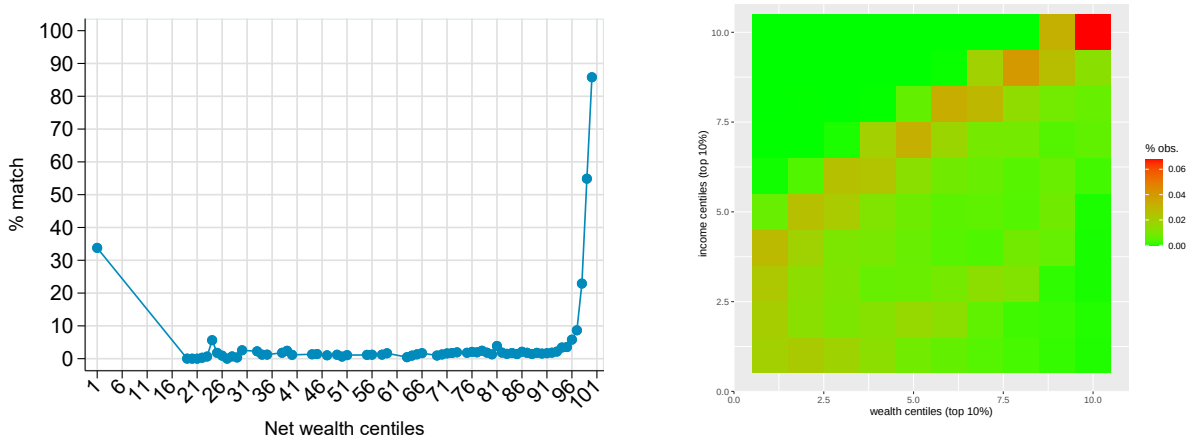
6.2.1 Estate method and wealth tax: the personal distribution of real estate wealth

To estimate the personal distribution of real estate household wealth based on the estate multiplier method, departing from the real estate-decedents database elaborated following the procedure discussed in 4.2.2. That database is weighted by the inverse of the mortality rate in order to match aggregate population of 20 years and older, and adjusted by μ.This ratio of the averages of decedent and living populations real estate wealth, is proxied based on the household wealth survey. To compute it, the average real estate wealth of individuals 78 and older (Uruguay's life expectancy) is divided by the equivalent of younger individuals. This procedures provides a $\mu = 1.32$, close to estimations for countries with available estimates (Piketty and Zucman, 2015; Ohlsson et al., 2020), located between 1.4 and 1.5.

Once individual real wealth is computed, and considering aggregate household's real estate

[27] These results are consistent with findings by Sanroman and Santos (2021) based on the wealth survey.

Figure 5: Income and wealth distribution's matching, 2016



(a) % matching by wealth p-tile

(b) Heatmap (top 10%)

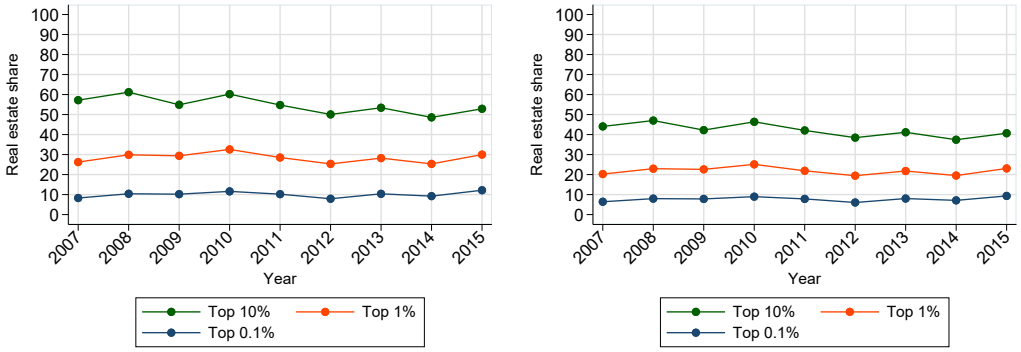
Note. Income refers to total incomes (including capital incomes, labour incomes, pensions and other incomes). Panel a shows the percentage of matching percentiles of income and wealth distributions, by private wealth percentile, while panel b depicts the heatmap of the top 10% of wealth and income distribution, i.e. the percentage of observations in each cell of income/wealth percentiles. By construction, the main diagonal of the heatmap is equivalent to top 10% of panel a. Estimates for remaining years yield same results (see Figures A.32 and A.33).

wealth (Figure A.8), the estimation of top real estate wealth shares is straightforward. Panel (a) of Figure 6 presents the 70-30 criterion of household wealth adjustment, while panel (b) depicts the lower-bound equal-split estimates (see section 4.2.2). Lower-bound estimates show that real estate wealth top 10%'s share is around 40-50% (with the exception of 2011), top 1%'s share is 20-25%, while top 0.1% is under 10%. Estimates under the 70-30 split less restrictive assumption, shows a top 10% share of 50-60%, top 1% of 35-40% and top 0.1% of approximately 10%.

As pointed out by Atkinson (2018), it would be also interesting to analyze the distribution of wealth among the decedent population, i.e. without expanding to the total population. Unfortunately this cannot be done in this setting, because total amount of decedent's real estate is not available. One possibility would be to use total wealth from the registry, since there is no property under the tax threshold (non-filers). However, it is unlikely that this total accounts for total real estate wealth of the decedents, because there is only around 20% of decedents in the owner-decedents registry, as discussed above and depicted in Figure A.36. As a reference, Atkinson (2018) documents that United Kingdom estate's record accounts for 45-50% of the number of deaths, being even larger for the French case, where it reaches 65% (Piketty, 2011).

Estimates for rural and urban real estate top shares are presented in Figure 7 (70-30%

Figure 6: Real estate distribution (upper and lower bounds)



(a) Personal real estate wealth distribution (70-30 criterion)

(b) Personal real estate wealth distribution (equal split)

Note. Based on DGR and DNC merged data. Decedent's wealth "expanded" based on average mortality rate and considering a decedents/adult population wealth ratio of 1.42, computed based on wealth survey.

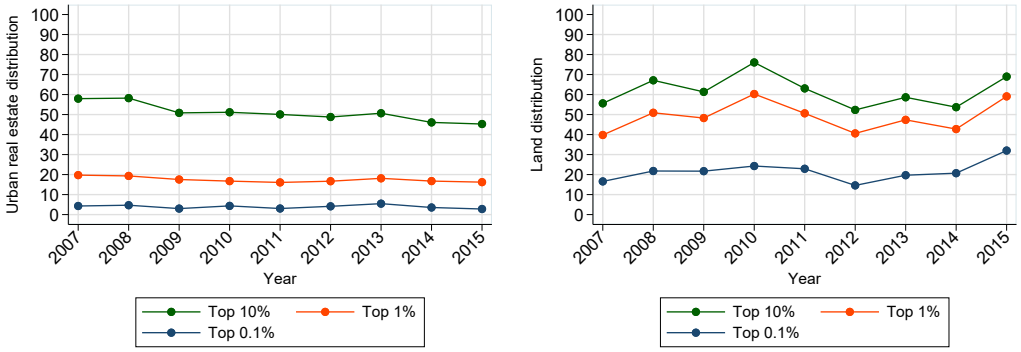
split, see lower bound estimates in Figure A.39).[28] Urban real estate is more evenly distributed than land, very close to the total real estate top shares, given its larger share in aggregate wealth. It is worth mentioning that the urban-rural split found in aggregate data is also present (almost identically) in the real estate-decedents data set, as depicted in Figure A.37. Rural distribution shows significantly higher concentration, especially in top fractiles. Top 1%'s share is as high as 40-50% for most years (although quite unstable), top 0.1% is around 20-30%, while top 10% fluctuates around 60%. The level of land concentration is similar than what was reported for other Latin American countries by Bauluz et al. (2020).

Urban properties distributional estimates, far more stable than rural properties, are compared with capitalization method housing concentration in Table A.9. It is interesting to note that top shares of urban properties are higher than the housing share in the capitalization method for the top 10 and 1%; 5 percentage points in the top 1 and 9 for the top 10%, but 1 point lower for the top 0.1%. Lower bound estimates, on the other hand, show almost identical shares for the top 1%, and 3 points lower than the capitalization method for the top 10%. While these estimates are not strictly comparable, since capitalization method's housing may include some of the rural properties of panel b (houses in rural land in which people actually live), and some urban properties may not be housing (storage e.g. facilities, buildings used for closely held businesses, etc), it may still indicate an underestimation of the main estimates. Indeed, housing top shares in the capitalization method are likely to be underestimated, since it is mainly imputed rents declared by households (more below).

Another possible concentration robustness check is to compare the results with the wealth-

[28] Note that aggregate household's housing and land are the ones depicted in Figure A.8.

Figure 7: Real estate distribution by wealth type



(a) Urban (b) Rural

Note. Based on DGR and DNC merged data. Decedent's wealth "expanded" based on average mortality rate and considering a decedents/adult population wealth ratio of 1.42, computed based on wealth survey. 70-30% split criterion.

tax data (*Impuesto al patrimonio*). As commented in section 4, this tax is payed by approximately 0.3% of adults, hence it is possible to use it compare the top 0.1% of real estates' distribution. To do this, individuals from the tax records are sorted by their underlying real estate according to the wealth tax they pay, and the top 0.1%' share is computed comparing the fratiles' total real estate wealth to total household's real estate. This share is stable around 1-2%, much lower than in the remaining methods (5% in the capitalization method and 3-4% in the estate method). This was expected since there are incentives to miss report the true value of housing, so in any case the difference could be interpreted as the level of tax evasion and avoidance.

6.2.2 The wealth household survey.

The wealth household survey includes similar assets than the ones considered in the capitalization method estimates, hence providing an important insight on wealth distribution and an key data source to contrast capitalization method-based estimates.

In Table 2, gross and net wealth shares are presented, as well as their components, both for household per-adult. The last column takes into account not only financial assets, liabilities, business and housing, but also durable goods and jewellery, which are not accounted for in the capitalization method. The first thing to note is that the last three columns present remarkably similar estimates, which indicates that the choice of gross, net or total wealth does not seem to affect distributional estimates significantly. This reflects that, according to the survey, the assets excluded from the capitalization method estimations do not have a significant impact on wealth distribution. Thus, from now on only the comparable wealth definition of the survey is

considered.

Table 2: Household wealth shares, wealth survey data, 2013

	Housing	Business	Fin. Assets	Liab.	Gross wealth	Net wealth	Incl. dur.
				Household wealth			
Bottom 50%	0%	0%	0%	0%	1%	-1%	1%
Middle 40%	45%	0%	6%	15%	35%	35%	35%
Top 10%	55%	100%	94%	85%	65%	66%	65%
Top 1%	16%	70%	68%	37%	30%	31%	30%
				Per adult household wealth			
Bottom 50%	0%	0%	0%	0%	1%	0%	1%
Middle 40%	44%	0%	6%	15%	34%	33%	34%
Top 10%	56%	100%	94%	85%	65%	68%	65%
Top 1%	17%	72%	68%	37%	30%	32%	30%

Note. Household wealth survey (EFHU) for 2013. Housing includes primary houses and secondary properties, for household's who only own houses as real estate. Business refer to sole-proprietorship firms, while corporations belong to financial assets (together with deposits, bonds, etc), and may include some houses owned by households who own a pool of properties (houses, land, business facilities, among others). Pension funds included in financial assets. Liabilities include mortgages.

Several comments are worth making regarding the comparison with previous estimates. First, the net wealth top 10% share of net wealth is relatively close but larger in the main estimates (77 vs 68%), and most of this difference is given by the top 1% (Table A.9). This is not surprising, given the extensively documented issues of wealth surveys for capturing top wealth holders (Vermeulen, 2018; Kennickell, 2019). The differences in the top tail, are also clearly visible when comparing gross and net wealth thresholds for capitalization method (Table A.4) and in the survey (Table A.7).

Second, while both in the survey and in the capitalization method, financial assets and business are more concentrated than housing, it is surprising to note that each of the assets types is more concentrated in the survey than in the capitalization method. The higher concentration of gross and net wealth in the capitalization method is hence the result of differences in composition, as the source decomposition (Lerman and Yitzhaki, 1985) of Table 3 shows. While housing represents 64% of gross wealth in the survey, it only accounts for 25% in the capitalization method. As for business and financial assets, they represent 14 and 61% in the main estimates respectively, while reaching 18 and 17% in the survey. In both data sources, financial and business wealth are by far the most concentrated, while housing is more equally distributed (see more on housing bellow).[29] As a result primarily of the differences in wealth

[29]It is interesting to note that inequality is higher in the survey for each of the wealth components, which re-

composition, financial wealth contributes to 71% of gross wealth inequality in the capitalization method, but only 19% in the survey, while the opposite happens with housing: a 15% contribution in the capitalization method vs 60% in the survey (the contribution in business wealth is comparatively similar in both sources). Moreover, each of the components' elasticity of gross wealth inequality has the same sign in both sources (only negative in the case of housing), but while the negative contribution to inequality in the capitalization method is twice as high than in the survey, its positive contribution is ten times higher. Thus, lower top shares in the survey are the result of a lack of capacity to adequately capture financial assets, mirroring what happens in the income surveys (De Rosa et al., 2020; Burdín et al., 2022; Atkinson et al., 2011).

Table 3: Inequality decomposition, survey and capitalization method

	Share	Gini	Cont.	Elasticity
		Business		
Capit.	14%	0,95	14%	0,00
Survey	18%	0,99	22%	0,03
		Housing		
Capit.	25%	0,58	15%	-0,10
Survey	64%	0,76	60%	-0,05
		Financial Assets		
Capit.	61%	0,97	71%	0,10
Survey	17%	0,96	19%	0,01

Note. Based on EFHU. Decomposition based on Lerman and Yitzhaki (1985), for 2013.

Third, regarding housing, Table A.9 shows that estimates are higher than capitalization method estimates, but also to the ones based on the estate method and wealth tax. For example, in the case of the top 1% share, survey estimate is 17%, while it is 18% in the case of the estate method (14% in lower bound estimates), and 11% in the capitalization method. The survey and capitalization method's shares are mirrored by the thresholds, which are lower in the survey for the bottom 50% and higher for the top 1%: 1 vs 15 and 189 vs 121 thousand dollars respectively (see Tables A.7 and A.4).[30] Note that for the household's main residence, both the survey and capitalization method rely on self-reporting, since the capitalization method capitalises owner occupied housing rent (from the "regular" household survey, ECH, see section 4), but for the remaining properties, main estimates use taxed capital incomes (rents), so they

inforces the idea that overall inequality is higher in the capitalization method exclusively the result of differences in composition.

[30]In the case of estate method's estimates, top 10% threshold's are much lower for the top 10% (20-25 US$), but higher for the top 1% (215-275 US$), which is consistent with relatively lower top 10% shares than top 1% (see Table A.8).

may be more accurate. However, if self-reporting on the value of a property is more precise than the income flow the house would provide if rented, then the wealth survey should provide a better estimate. It is interesting to note that the percentage of house ownership is 50% in the survey and 74% in the capitalization method (Tables A.7 and A.5), which explains part of the inequality differences but implies that a larger share of people report owner occupied housing rent (in the the regular household survey) than actual house ownership (in the wealth survey). Given the much larger sample size of the household survey (ECH), it is probably more reliable. Further evidence is still needed to fully account for these differences, but in any case it is safe to say that capitalization method housing inequality estimates are likely to represent a lower bound.

6.2.3 Rich lists

The final piece of data used to compare the capitalization method's main estimates is the *Forbes Billionaires List* rich list. In 2022 two Uruguayans entered into the list for the first time ever, with a fortune of around 1.5 billion dollars each.[31] Although 2022 is out of the period under analysis and two individual's wealth alone does not enable to compute top shares, it does allow me to compare their reported wealth with top wealth holders in the capitalized wealth data.

Table 4 presents top 10 net wealth holders of the last available year (2016), the position they held in the previous years, as well as their net wealth. Two things are worth noting. First, such as in the *Forbes* list, only two individuals enter the billionaires club, i.e. hold over one billion US dollars, one over 1.5 billion dollars and one bellow, with 2 and 1.1 respectively, and apart from the rest of the group. Given the anonymous nature of the data and the 2016-2022 time-span, it is impossible to know if these individuals are the same as in the rich list, but in any case this indicates that there were in fact billionaires before 2022 and that top fortunes in the capitalization method's estimates and those of *Forbes* billionaires list are of the same orders of magnitude. In case some of them were actually the same, the reason why they may not have been in the *Forbes* list beforehand could be associated with the fact that the firms they own started to publicly trade in the US stock market only in 2021[32], and therefore were likely to be invisible for *Forbes* before that.

Second, exploiting the panel nature of the data it is possible to see that out of the two one was in the net wealth podium throughout the entire period, while the other entered the top 0.01% in 2013, but remained at an extremely top position (either first or fourth) thereafter. This may be compared with the prob ability of being part of 2016's top 0.01% individuals to be part of that group in the previous year, depicted in Figure A.35. The figure shows that the probability decreases (as expected) as we move further back in time, starting from a nearly

[31] See https://www.forbes.com/billionaires/. Billion dollars refer to 1.000.000.000 dollars.
[32] See shorturl.at/qvT29 (in spanish).

30% persistence to under 10% eight years prior.

Although this simple comparison does not enable me to draw categorical conclusions, it does provide further evidence that the capitalization method's top estimates are close to what is found by completely external data sources and methods.

Table 4: Top 10 wealthiest individuals, 2016

Net wealth ranking								Net wealth	
2016	2015	2014	2013	2012	2011	2010	2009	2016	2022
1	1	4	1	0	0	0	0	2.132	1.998
2	2	3	2	2	2	1	1	1.182	1.108
3	0	0	0	0	0	0	0	545	510
4	3	0	0	0	0	0	0	288	270
5	0	0	0	0	0	0	0	202	189
6	0	0	0	0	0	0	0	198	186
7	0	0	0	0	0	0	0	178	166
8	30	17	6	0	32	0	0	167	156
9	0	141	15	0	0	0	5	164	154
10	29	38	0	0	0	0	0	148	139

Note. The first 8 columns depict the net wealth rank of each individual in each year, only for the top 10 individuals in the 2016 database. Zero indicates that they were not part of the top 0.01%. Net wealth 2016 and 2022 is expressed in million USD. In the case of 2022, values in Uruguayan pesos were first converted to 2022 prices using the consumers price index.

7 Inherited real estate wealth

In this section, the inherited flow of real estate wealth, which includes both housing and land owned by households, as well as an estimate of the aggregate inheritance flow which is consistent with it are presented (section 7.1). The steady state the stock of inherited real estate wealth, are discussed in Section 7.2.

7.1 The flow of inherited real estate wealth

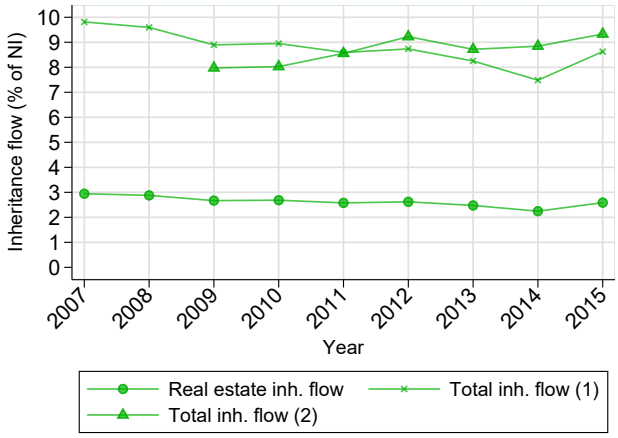
From the decedent-real estate data base discussed in Section 4, it is straightforward to compute the flow of real estate wealth as a share of national income b_y^r, which is depicted in Figure 8, showing that is approximately 3%. The slight downward trend is likely to be artificial, given the decreasing share of owner decedents in the merged data set discussed above and depicted in Figure A.36. Therefore, the first years of the series, probably until 2011, are more reliable. To provide further evidence on this real estate inheritance flow, a series of a transaction tax (*Impuesto a las Transmisiones Patrimoniales*, ITP), which taxes all real estate transfers,

including successions –which are taxed at a rate of 3%, different from the remaining transactions. Figure A.38 depicts the underlying real estate inheritance flow based on ITP which shows a 2-3% flow in the period under analysis (2007-2015), similar to the 3% estimated.[33]

To construct a total inheritance flow series, i.e. considering assets other than real estate, I first assume that the share of inherited real estate in total inheritance is the same as the share of real estate wealth in total private wealth. As a robustness check, I perform a secondary approximate estimate of the inheritance flow, calculated as the decedent's share of private wealth, weighted by the dead-living wealth ratio μ (equation 3).[34]

Both approaches are depicted in Figure 8, yielding very similar estimates. The resulting inheritance flow is 8-10%, still lower than many available estimates (recall section 2), although it is wort stressing that I am not accounting for gifts inter-vivos.[35]

Figure 8: Inherited real estate flow (b_y^r and b_y)



Note. Based on DGR and DNC merged data and National Income series. Inheritance total based on the 70-30 criterion, adjusted upward based on the merging percentages of rural and urban properties (84% and 72%). "Consistent" total inheritance flow based on the share of real estate wealth in total private wealth.

7.2 The stock of inherited real estate wealth

Is it possible to say anything about the stock of inherited wealth φ? Equation 6 provides a way to compute an approximate of this stock based on estimates of b_y. As discussed in section 3, this is a steady state macroeconomic formula, which mechanically tends to underestimate the inheritance stock. I compute φ based on the estimated $b_y = 9\%$, a capital share of $\alpha_h = 39\%$

[33] This value is relatively stable throughout the 1990-2019 period, reaching 4% at its maximum level, with variations clearly associated with national income contractions (as in 1999-2002).

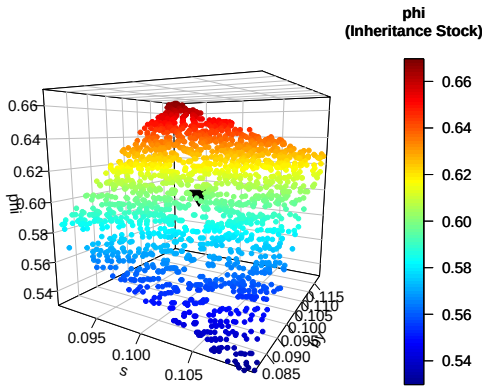
[34] The μ parameter is computed in the same way as in section 6.2, resulting in a ratio of 1.32.

[35] As mentioned in Section 4, as Uruguay does not have an inheritance tax, it is not very likely that this type of gifts are very widespread, yet they should mechanically increase the inheritance flow.

and a household's savings rate of $s_h = 10\%$. The savings rate is computed based on last 30 year average (World Bank data), while the capital share α_h is computed based on National Accounts (De Rosa and Vilá, 2020). By using these parameters to compute equation 6, the key assumption is that these averages were stable during the previous 30-year period. The resulting stock of inherited wealth φ is 59.6%.

The preceding assumptions underline the highly approximate nature of this exercise. It should be stressed that this inheritance stock is by no means an accurate estimation of φ, but it intends to show that, within available parameters, the estimated inheritance flow b_y is consistent with this high inheritance stock. To further show this, in Figure 9 a sensitivity analysis is performed, allowing for variations in the inheritance flow b_y ($\pm$ 2%) and savings rates s ($\pm$ 1%). In all cases, the stock of inherited wealth is above 55%, and may reach over 65%, i.e. closer the Kotikloff and Summers' side in the Kotikloff-Summers-Modigliani controversy discussed in section 2.

Figure 9: φ sensitivity analysis



Note. Own calculations based on 1000 draws taken from b_y and s in depicted ranges ($\alpha = 39\%$ fixed). The sensitivity analysis indicates that the inheritance stock lies within 55-65%. The black dot represents the point-estimate calculated.

An inheritance real estate stock of over 60% is substantially higher than the 33% estimated by Agustoni and Lasarga (2019) and commented in section 2. This is not surprising, since (i) it only referred to real estate wealth; and (ii) that estimation was based on the household wealth survey's question that asks whether the property a household owns was directly inherited. In other words, if a household inherits a property, sells it and then buys a new one, that will not be considered inheritance by the wealth survey, although it actually is from a conceptual point of view. Moreover, this stock of inherited real estate wealth φ is in the higher end of inherited stocks φ calculated for rich countries, which lie between 50-60% (and rising) as discussed in

section 2.

8 Concluding remarks

Capital incomes are the key drivers of both the evolution of top incomes concentration in Latin America and to the increasing problems of official survey-based estimates to properly account for income in quality. Yet, there is almost a complete void in terms of evidence of the distribution of wealth. This article intends to contribute in filling this major knowledge gap.

The bar is set high by the rapidly expanding literature on wealth in the developed world. It is not longer enough to provide estimates of wealth distribution among individuals or households. The challenge is to provide wealth distribution estimates based on a variety of methodological strategies and data sources and to be able to systematically compare them, while at the same time be able to make these estimates fully compatible with both national income distribution and aggregate national wealth. Moreover, key drivers of wealth inequality such as inheritance, need to be estimated macro-consistently with National Income and National Wealth, both in terms of flow and stock.

Scarcity of reliable data is the single most important restriction for the analysis of wealth in almost every country. In the Uruguayan framework, as well as in most of the developing world, the complete absence of wealth aggregates official estimates posed an important information restriction. Wealth aggregates represent the key starting points of the capitalization method from a data viewpoint, as they are necessary for the estimations of rates of return that assure full micro-macro consistency. Therefore, this study had to start from one step behind and estimate wealth to income ratios. Based on those results and a combination of tax micro data, firm's tax records, household surveys and national accounts, wealth distribution was estimated. Results where compared with orthogonal data sources and methods, such as household wealth survey, real estate wealth tax, the estate multiplier method and *Forbes* billionaires list. On top of that, the first estimates of inheritance flows and stock are presented, to better understand it intergenerational dynamics.

To my knowledge, this is the first attempt of this nature for any developing country. Results are still preliminary, and there is still room for significant improvement. They should be considered with caution at this stage. That being said, they do depict an ambitious effort to provide micro-macro consistent estimates of wealth accumulation and distribution. Results show extreme concentration of wealth in the top 1%, which is interesting given Uruguay's position as one of the least unequal countries of Latin America. Given Uruguay's reduced population, this means that less than 25.000 individuals control the vast majority of the country's private productive assets, and hence considerable economic and political power.

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A Appendix: complementary Tables and Figures

A.1 Growth and income inequality

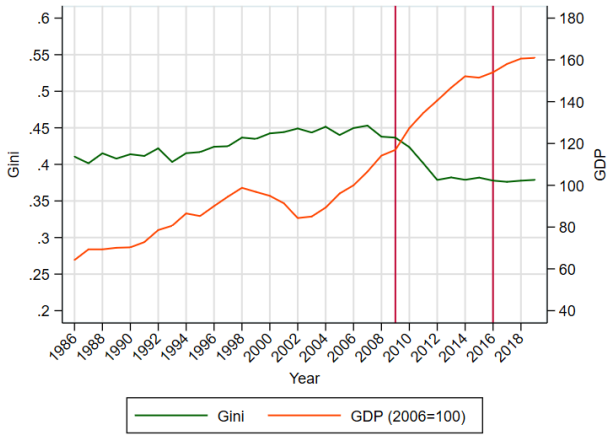
Uruguay is a small high income country, with low income inequality in the Latin American context but still high compared to developed countries[36]. After decades of unstable economic growth and recurrent economic crisis, it has sustained an average annual growth rate of around 4% for the last fifteen years, reaching a per-capita GDP of USD 21,625, around 40% above the Latin American average, but half the average of the OECD countries[37]. This economic growth, coupled with a series of relatively large reforms both in the labour market and in the tax and transfers system put in practice by a centre-left coalition in office since 2005, turned into a significant decline in income inequality. These reforms included a major raise in the minimum wage, the restoration of centralised, collective wage bargaining, an expansion of both coverage and amount of non contributory cash transfers schemes, and the introduction of progressive income taxation. Based on high-quality household surveys, studies have consistently shown[38] that income inequality experienced a rapid decline between 2008 and 2012 followed by a relative stagnation from 2013 onward (Figure A.1). This income inequality decrease has been confirmed by the use of income tax records (Burdín et al., 2022) and Distributional National Accounts estimates De Rosa and Vilá (2020), so the story presented in Figure A.1 is an accurate one, yet incomplete.

[36]The population has around 3.400.000 people and remarkably stable over the last decades, while the survey-based Gini index has now stabilised in 0.38.

[37]Values in PPP. https://data.worldbank.org/

[38]See for instance Cornia (2014).

Figure A.1: Income inequality and growth in Uruguay, 1986-2019.



Notes: Gini index is based on Household Survey (*Encuesta Continua de Hogares*) and refers to per-capita household income. Similar trend is observed when considering inequality estimates such as the top 10% share. The survey is conducted by the National Statistics Institute (INE in its Spanish acronym). GDP data is produced by Uruguay's Central Bank (BCU in its Spanish acronym).

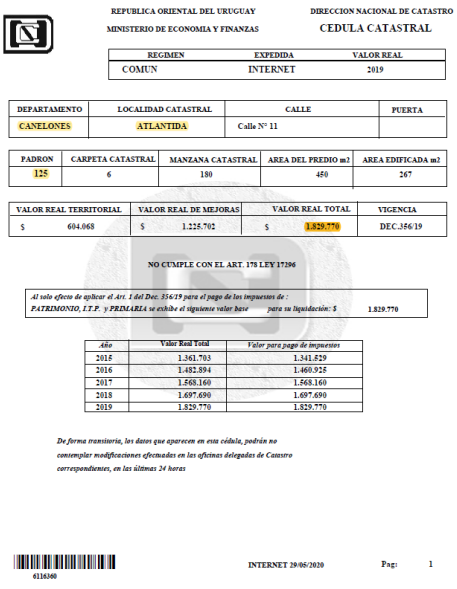
A.2 Wealth to income ratio

Table A.1: Cadastre data set variables

Urban properties	Rural properties
Department (out of 19)	Department (out of 19)
Locality	Locality
Number	Number
Cadastral value (UY$)	Cadastral value (UY$)
Size (sq. mts. - building and terrain)	Size (sq.mts.)
Unit	
Block	

Note. Based on DNC data. Variables for 1999-2018 period for 242.431 rural properties and 1.383.868 urban properties.

Figure A.1: Raw cadastre individual data



REPUBLICA ORIENTAL DEL URUGUAY
MINISTERIO DE ECONOMIA Y FINANZAS

DIRECCION NACIONAL DE CATASTRO
CEDULA CATASTRAL

REGIMEN	EXPEDIDA	VALOR REAL
COMUN	INTERNET	2019

DEPARTAMENTO	LOCALIDAD CATASTRAL	CALLE	PUERTA
CANELONES	ATLANTIDA	Calle N° 11	

PADRON	CARPETA CATASTRAL	MANZANA CATASTRAL	AREA DEL PREDIO m2	AREA EDIFICADA m2
125	6	180	450	267

VALOR REAL TERRITORIAL	VALOR REAL DE MEJORAS	VALOR REAL TOTAL	VIGENCIA
$ 604.068	$ 1.225.702	$ 1.829.770	DEC.356/19

NO CUMPLE CON EL ART. 178 LEY 17296

Al solo efecto de aplicar el Art. 1 del Dec. 356/19 para el pago de los impuestos de :
PATRIMONIO, I.T.F. y PRIMARIA se exhibe el siguiente valor base para su liquidación: $ 1.829.770

Año	Valor Real Total	Valor para pago de impuestos
2015	1.361.703	1.341.529
2016	1.482.894	1.460.925
2017	1.568.160	1.568.160
2018	1.697.690	1.697.690
2019	1.829.770	1.829.770

De forma transitoria, los datos que aparecen en esta cédula, podrán no contemplar modificaciones efectuadas en las oficinas delegadas de Catastro correspondientes, en las últimas 24 horas

6116360 INTERNET 29/05/2020 Pag: 1

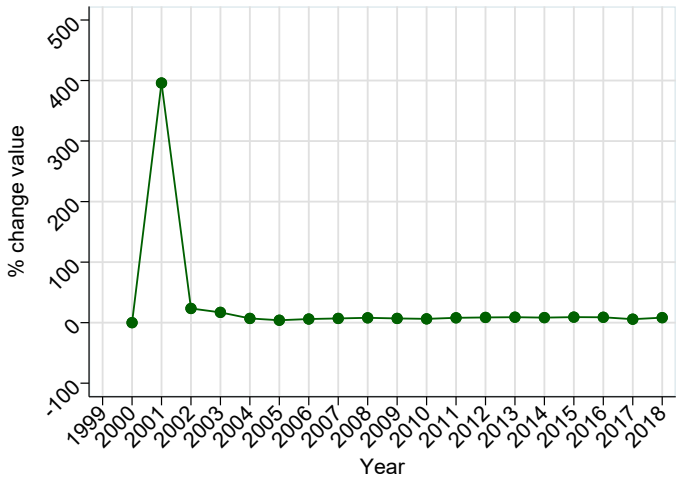
Note. Screenshot from *geoCatastro*, MEF. Raw data of *Cédula Catastral*. http://visor.catastro.gub.uy/visordnc/. Data used for estimates (see Table A.1) highlighted.

Figure A.2: Cadastre property identification: example by type

(a) Urban (b) Rural

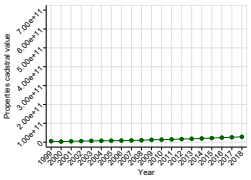
Note. Screenshots from *geoCatastro*, MEF. Urban identifier: *Departamento, Localidad, Padrón, Unidad*. *Unidad* is not an identifier of the whole property, but distinguishes individual units of real estate within Horizontal Property Regime (including apartment buildings). Problems still remain, e.g. "block" is lost as it is not present in DGR data. Rural identifier: *Departamento, Padrón*. Close to perfect identification.

Figure A.3: Revaluation example

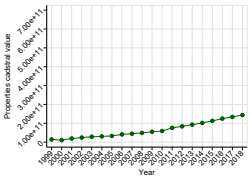


Note. Based on DNC. The figure shows an example of a property that was re-valuated in 2001, resulting in an increase of 400% of its cadaster value that year.

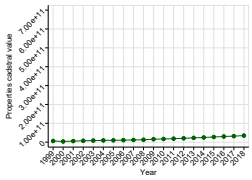
Figure A.4: Cadastral aggregate value by department



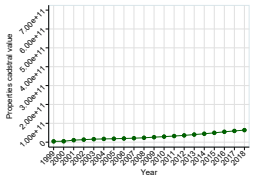
(a) Artigas



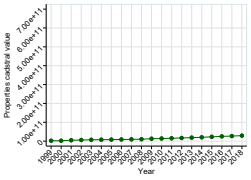
(b) Canelones



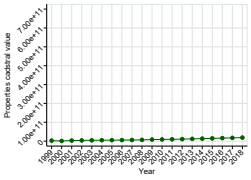
(c) Cerro Largo



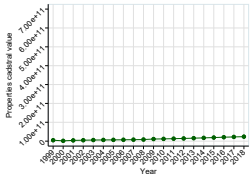
(d) Colonia



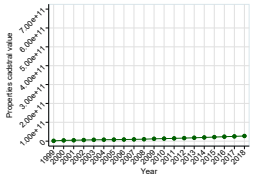
(e) Durazno



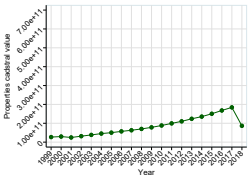
(f) Flores



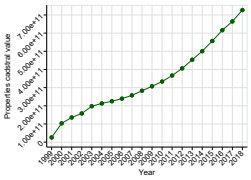
(g) Florida



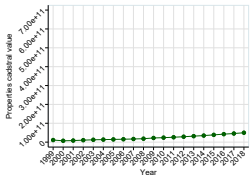
(h) Lavalleja



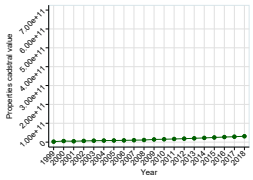
(i) Maldonado



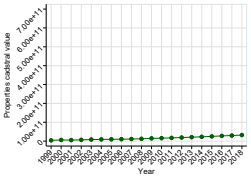
(j) Montevideo



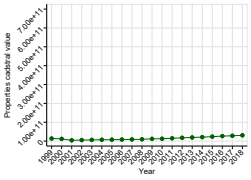
(k) Paysandú



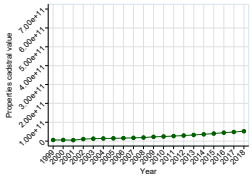
(l) Río Negro



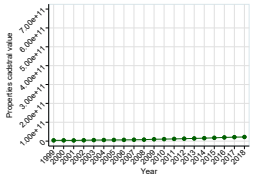
(m) Rivera



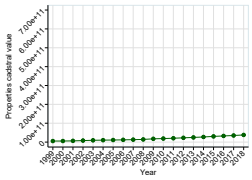
(n) Rocha



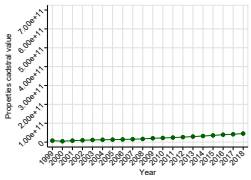
(o) Salto



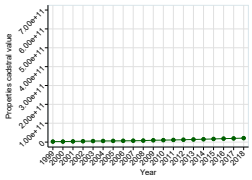
(p) San José



(q) Tacuarembó

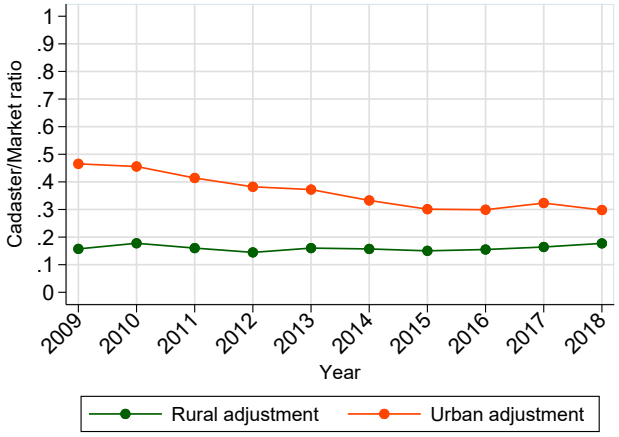


(r) Soriano



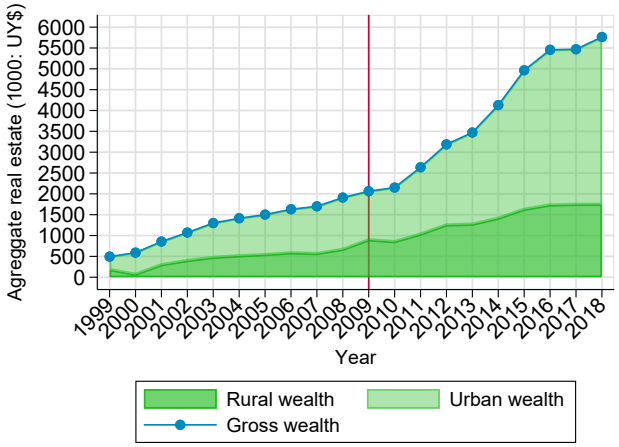
(s) Treinta y Tres

Figure A.5: Market price adjustments, 2009-2018.



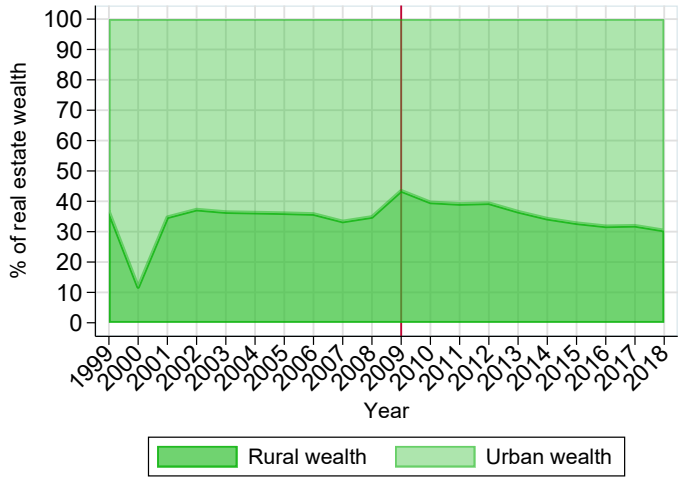
Note. Price adjustment based DNC, DGR and DIEA data. The series depict the ratio of urban and rural aggregate cadaster value and market prices. Rural properties adjusted by department.

Figure A.6: Aggregate gross real estate wealth.



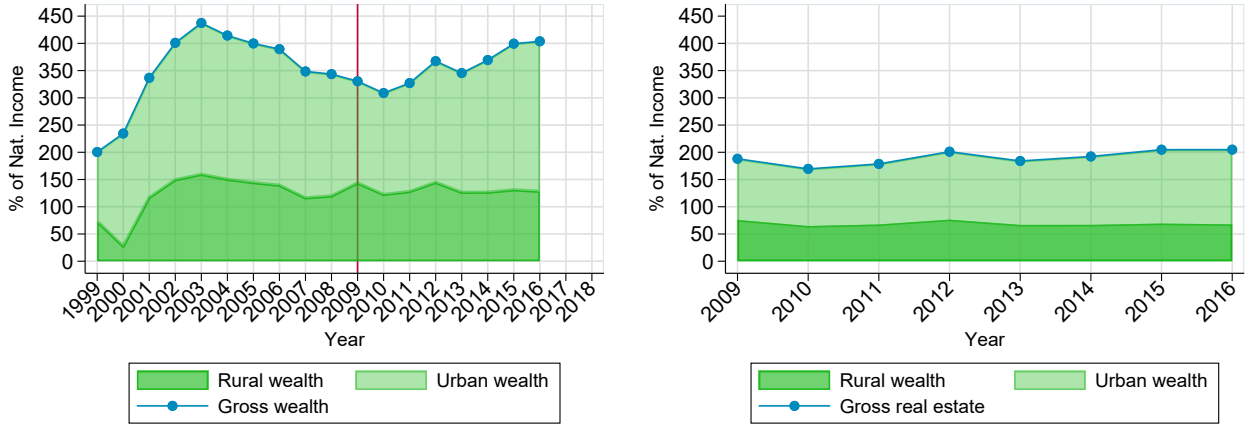
Note. Based on Cadastre data from DNC, corrected by market prices adjustment depicted in Figure A.5. Household's gross real estate share in national gross real estate is approximately 55%, based on household wealth survey (EFHU).

Figure A.7: Urban-rural real estate shares



Note. Based on DNC, DIEA and DGR. The figure depicts the dsitribution of real estate properties owned by all institutional sectors.

Figure A.8: Aggregate real estate wealth

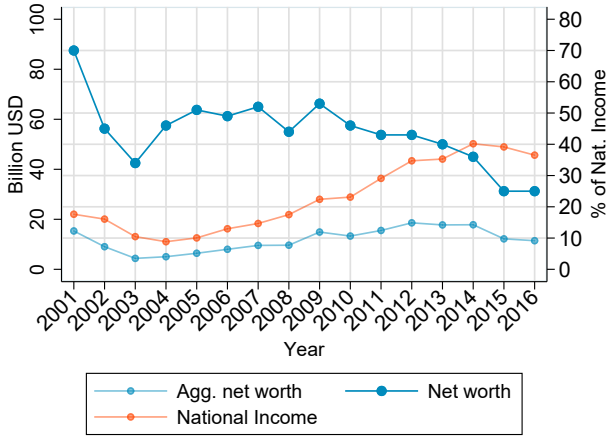


(a) Real estate wealth as a % of NI.

(b) National and Household's real estate wealth.

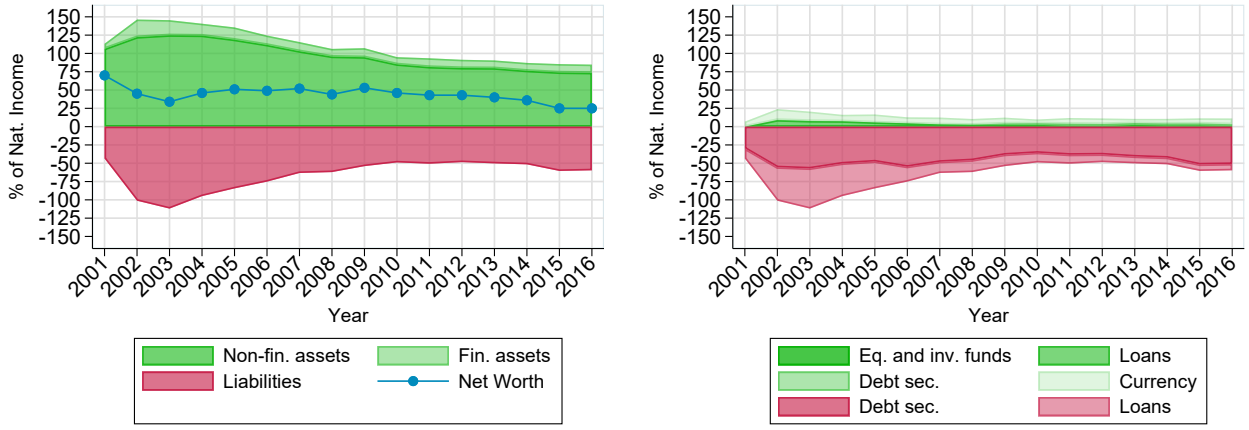
Note. Based on Cadastre data from DNC, DGR and DIEA. Market price adjustment depicted in Figure A.5 from 2009 onward (vertical red line), and 15%-40% for rural and urban properties were used for years with no available estimates. Total, urban and rural gross real estate aggregate value at market prices depicted. Urban and rural aggregate value and shares depicted in Figures A.6 and A.7.

Figure A.9: Government sector aggregate net worth, 2001-2016



Note. Based on IMF Data Warehouse (government balance sheet as share of current GDP) and World Bank's GDP and net adjusted National Income series. Primary axis depicts national income and public net worth in US billion dollars (for aggregate government's net worth and national income), while secondary axis depicts government wealth to income ratio.

Figure A.10: Government sector Balance Sheet, 2001-2016.

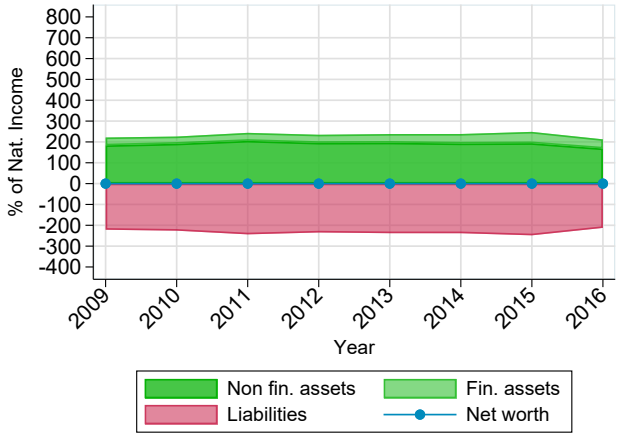


(a) Balance sheet

(b) Financial balance sheet

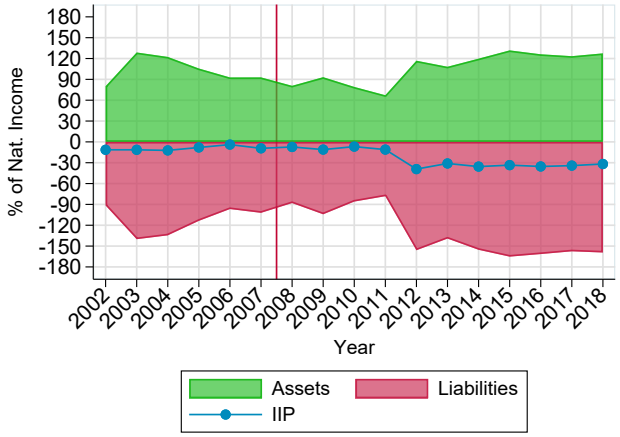
Note. Based on IMF Data Warehouse (government balance sheet as share of GDP) and World Bank's GDP and net adjusted National Income series. Net worth is the result of Financial and Non-financial assets net of liabilities.

Figure A.11: Corporate sector net wealth, 2009-2017



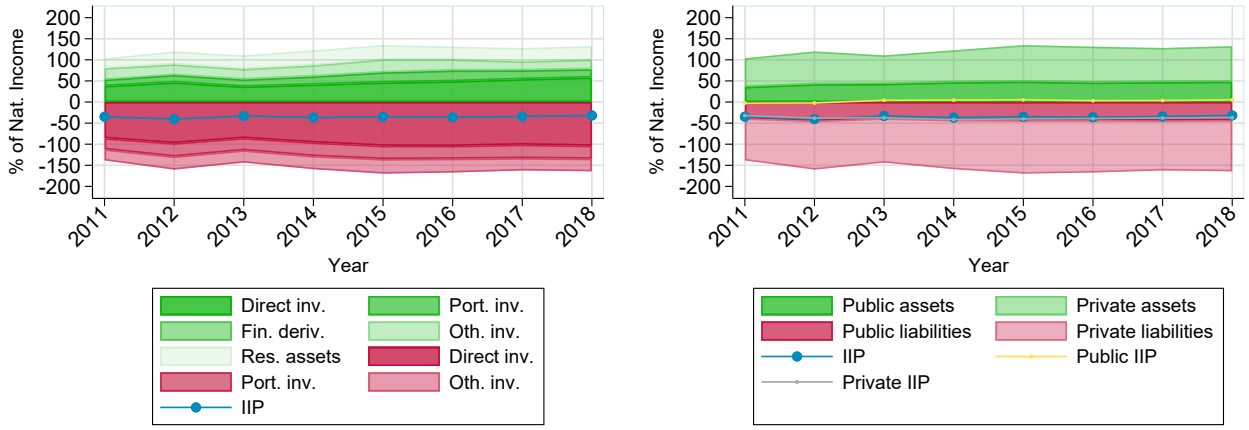
Note. Based on firm's balance sheet administrative data (DGI). The data set accounts for the universe of firms which pay corporate income tax. Publicly owned firms and sole-proprietorship were excluded (as they are included in public and business wealth). Foreign direct and portfolio investment aggregates from Figure A.13 also excluded.

Figure A.12: International investment position (IIP), 2002-2018



Note. Based on IMF Data Warehouse (government balance sheet as share of current GDP), Uruguayan Central Bank and World Bank's GDP and net adjusted National Income series. The vertical line depicts the limit between Central Bank and IMF data (left and right respectively).

Figure A.13: International investment position (IIP) composition, 2011-2018.

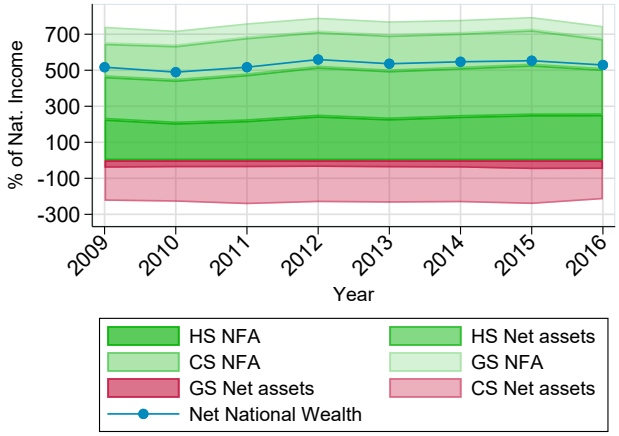


(a) By financial instrument

(b) Public/Private

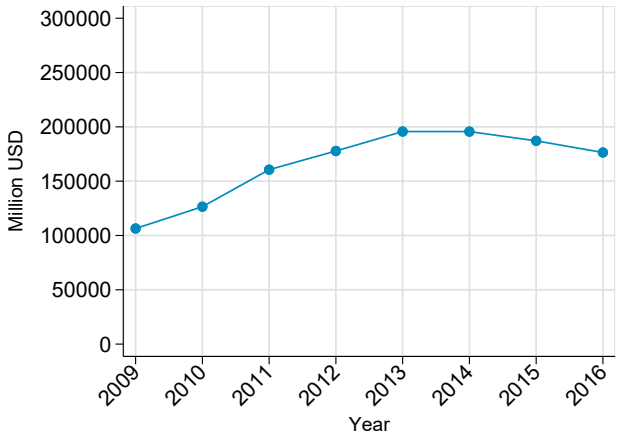
Note. Based on Central Bank's (BCU) International Investment Position and World Bank's net adjusted National Income series.

Figure A.14: National wealth by sectors and financial/non-financial ssets



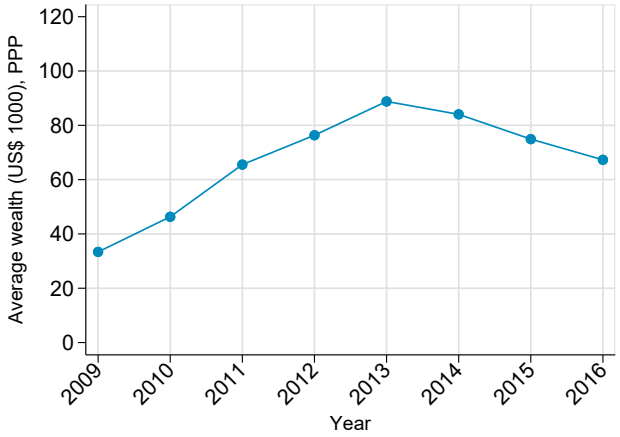
Note. Own elaboration. The figure is equivalent to Figure 1 but with greater detail.

Figure A.15: Net wealth in million USD, 2009-2016



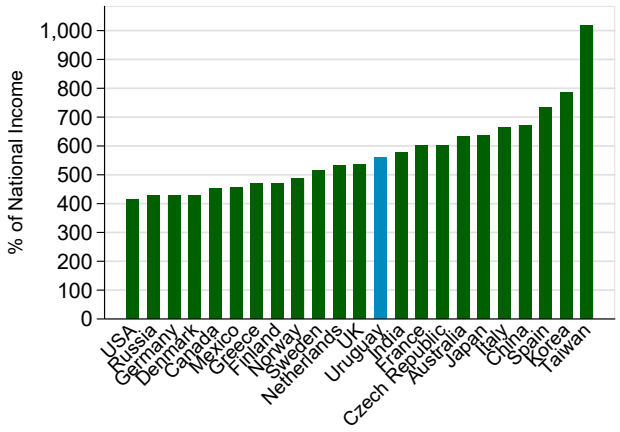
Note. Net National Wealth in USD million dollars (PPP).

Figure A.16: Per-adult average net wealth, 2009-2016



Note. Thousand US dollars, PPP.

Figure A.17: Wealth to income ratios, international comparison.



Note. Source: Own estimates for Uruguay and https://wid.world/ for remaining countries (2012's wealth to income ratios).

A.3 Wealth distribution

Table A.2: International wealth distribution comparison, 2016

	Top 1	Top 10	Middle 40	Bottom 50
South Africa	54%	87%	16%	-3%
Uruguay	39%	77%	20%	3%
USA	36%	73%	26%	1%
Russia	46%	73%	23%	3%
India	32%	64%	30%	6%
Korea	25%	58%	36%	6%
France	25%	59%	36%	5%
United Kingdom	21%	57%	39%	4%
China	30%	67%	26%	6%

Note. Source Wid.World.

Table A.3: Average wealth by fractile and asset

		Housing	Business	Fin. Assets	Liab.	Gross wealth	Net wealth
2009	Bottom 50%	2	0	1	1	2	1
	Middle 40%	10	3	4	1	18	17
	Top 10%	43	82	174	2	265	263
	Top 1%	141	416	1071	6	1332	1327
	Total	8	8	18	1	35	33
2010	Bottom 50%	2	0	1	2	3	2
	Middle 40%	13	8	5	2	25	23
	Top 10%	53	104	264	3	366	363
	Top 1%	175	489	1509	8	1742	1734
	Total	11	11	27	2	48	46
2011	Bottom 50%	3	0	2	2	5	3
	Middle 40%	19	4	7	3	34	32
	Top 10%	69	149	411	4	522	518
	Top 1%	213	740	2531	11	2724	2714
	Total	15	15	38	2	68	66
2012	Bottom 50%	4	0	2	2	7	4
	Middle 40%	24	9	12	3	43	40
	Top 10%	80	176	398	5	588	583
	Top 1%	247	834	2452	12	2949	2938
	Total	18	18	43	3	79	76
2013	Bottom 50%	6	0	1	3	8	6
	Middle 40%	27	0	7	4	49	45
	Top 10%	88	200	477	5	697	692
	Top 1%	304	1034	2848	15	3378	3365
	Total	21	20	51	3	92	89
2014	Bottom 50%	5	0	2	3	8	5
	Middle 40%	25	2	9	4	45	41
	Top 10%	84	192	446	6	659	653
	Top 1%	278	991	2602	16	3180	3165
	Total	21	19	48	4	88	84
2015	Bottom 50%	5	0	2	3	7	4
	Middle 40%	23	0	7	3	39	36
	Top 10%	79	171	417	5	591	586
	Top 1%	295	933	2448	15	2977	2964
	Total	19	16	43	3	78	75
2016	Bottom 50%	5	0	2	3	6	4
	Middle 40%	24	1	7	3	38	34
	Top 10%	86	153	364	5	522	517
	Top 1%	305	867	2189	14	2666	2653
	Total	18	15	37	3	70	67

Note. Own elaboration.

Table A.4: Wealth thresholds by fractiles and asset

		Housing	Business	Fin. As-sets	Liab.	Gross wealth	Net wealth
2009	Top 1%	62	153	317	6	435	429
	Top 10%	19	7	5	2	59	57
	Top 50%	5	0	1	1	7	6
2010	Top 1%	74	193	516	8	610	602
	Top 10%	25	16	7	2	80	77
	Top 50%	7	0	3	2	11	9
2011	Top 1%	96	267	630	11	773	762
	Top 10%	34	9	9	3	110	106
	Top 50%	10	0	3	3	15	12
2012	Top 1%	113	314	673	12	894	882
	Top 10%	43	19	19	4	133	129
	Top 50%	12	0	4	3	19	17
2013	Top 1%	121	379	971	15	1291	1276
	Top 10%	45	1	16	4	159	154
	Top 50%	15	0	5	4	23	20
2014	Top 1%	117	360	896	16	1221	1205
	Top 10%	42	5	14	5	151	146
	Top 50%	14	0	5	4	22	18
2015	Top 1%	107	304	778	15	1056	1042
	Top 10%	38	0	12	4	131	127
	Top 50%	13	0	4	3	20	17
2016	Top 1%	119	254	687	14	938	924
	Top 10%	40	2	12	4	117	113
	Top 50%	13	0	4	3	20	17

Note. Own elaboration.

Table A.5: % ownership & distribution by asset

		Housing	Business	Fin. Assets	Liab.	Gross wealth	Net wealth
2009	% asset > 0	75%	12%	100%	100%	100%	79%
	Gini index	0,50	0,65	0,94	0,10	0,83	0,81
2010	% asset > 0	74%	13%	100%	100%	100%	79%
	Gini index	0,49	0,63	0,93	0,09	0,82	0,80
2011	% asset > 0	74%	11%	100%	100%	100%	79%
	Gini index	0,47	0,63	0,94	0,10	0,83	0,81
2012	% asset > 0	74%	12%	100%	100%	100%	80%
	Gini index	0,45	0,62	0,93	0,09	0,81	0,79
2013	% asset > 0	77%	10%	100%	100%	100%	82%
	Gini index	0,45	0,63	0,93	0,11	0,82	0,80
2014	% asset > 0	77%	10%	100%	100%	100%	82%
	Gini index	0,45	0,64	0,92	0,09	0,81	0,80
2015	% asset > 0	76%	10%	100%	100%	100%	79%
	Gini index	0,44	0,66	0,93	0,09	0,81	0,79
2016	% asset > 0	74%	10%	100%	100%	100%	77%
	Gini index	0,43	0,68	0,92	0,09	0,81	0,78

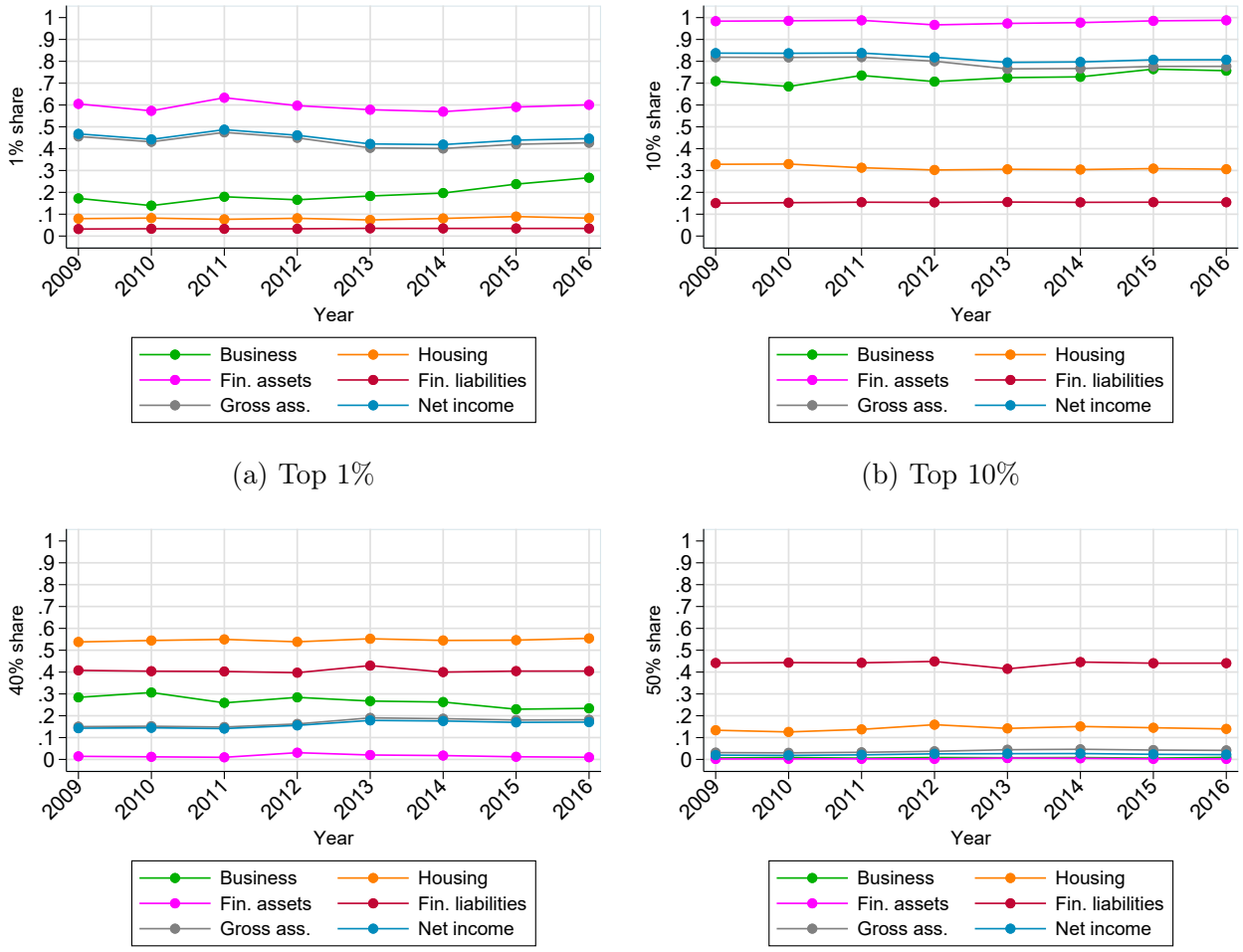
Note. Own elaboration.

Table A.6: Proportion of women (in %) by age group.

Age group	2009	2010	2011	2012	2013	2014
20-24	54.42	56.13	55.01	44.82	41.53	44.98
25-29	41.96	44.07	43.93	46.08	44.54	44.70
30-34	43.55	45.42	45.01	47.32	45.61	46.35
35-39	44.50	46.33	45.81	48.17	46.00	47.33
40-44	45.11	46.89	46.41	48.96	46.72	48.51
45-49	46.41	47.45	46.97	49.83	47.48	49.23
50-54	47.10	48.12	47.74	50.11	48.15	49.78
55-59	48.18	48.79	48.43	50.90	48.89	50.17
60-64	49.80	49.95	49.80	52.31	50.30	51.05
65-69	51.67	51.91	51.74	53.04	52.13	52.28
70-79	53.28	53.29	53.03	56.94	53.03	53.12
80+	57.63	57.39	57.14	66.77	56.75	56.56

Note. Own elaboration based on tax incomes records (DGI), 2012.

Figure A.18: Personal capital income shares 2009-2016



(a) Top 1%

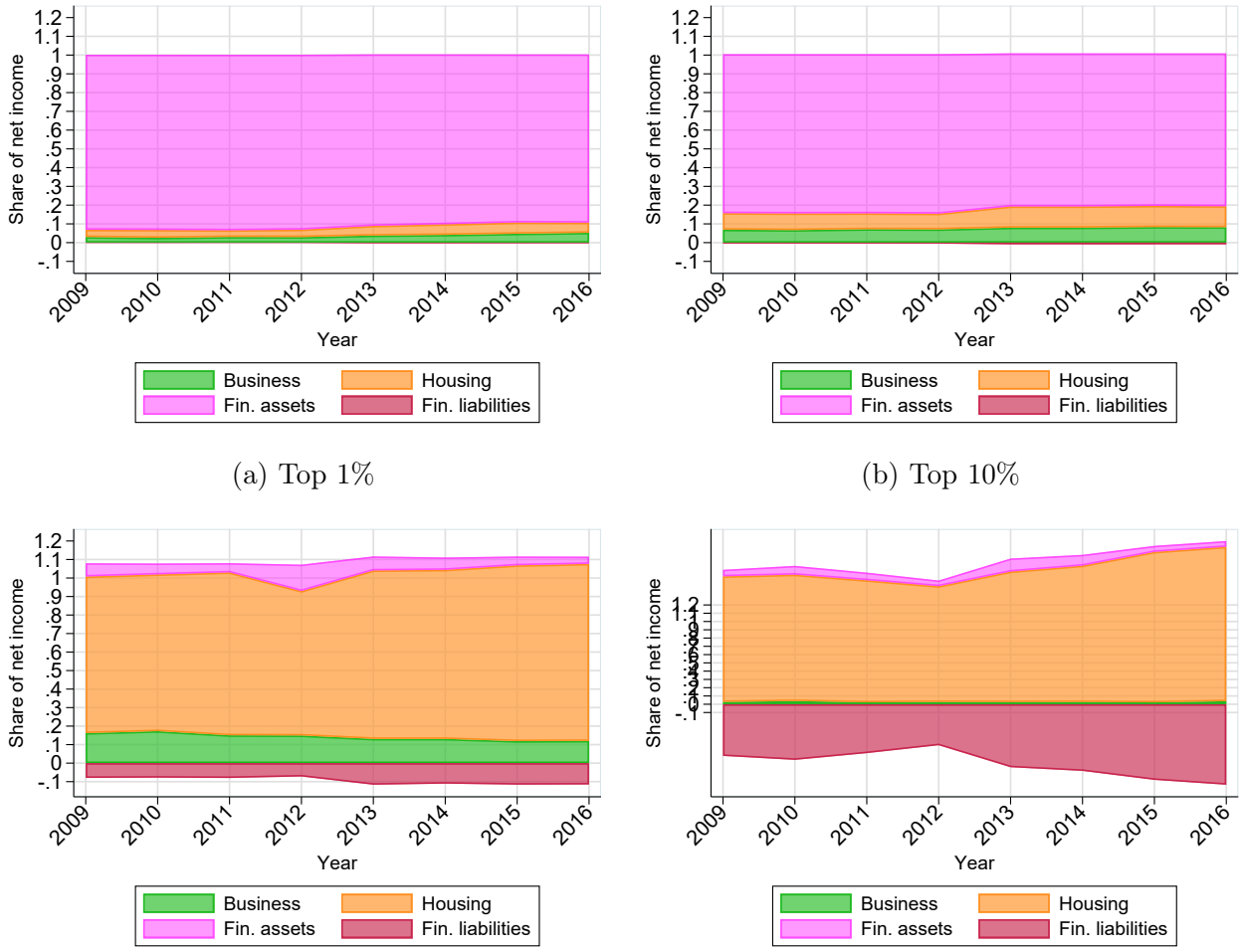
(b) Top 10%

(c) Middle 40%

(d) Bottom 50%

Note. Capital income distribution based on De Rosa and Vilá (2020). Includes dividends, interests, rents, owner occupied housing rents and undistributed profits.

Figure A.19: Personal capital incomes composition 2009-2016



(a) Top 1%

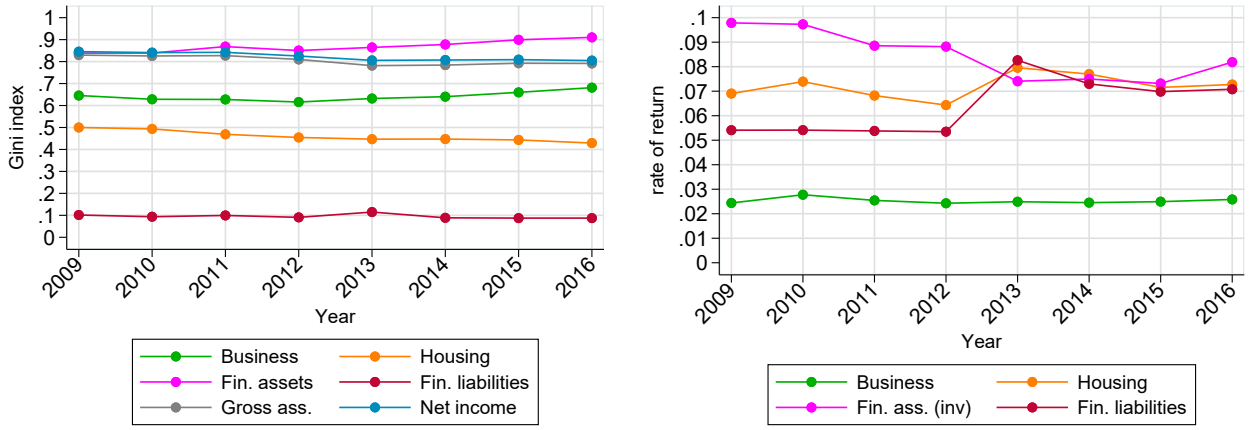
(b) Top 10%

(c) Middle 40%

(d) Bottom 50%

Note. Capital income distribution based on De Rosa and Vilá (2020). Includes dividends, interests, rents, owner occupied housing rents and undistributed profits. Capital incomes composition by income group depicted in Figure A.27.

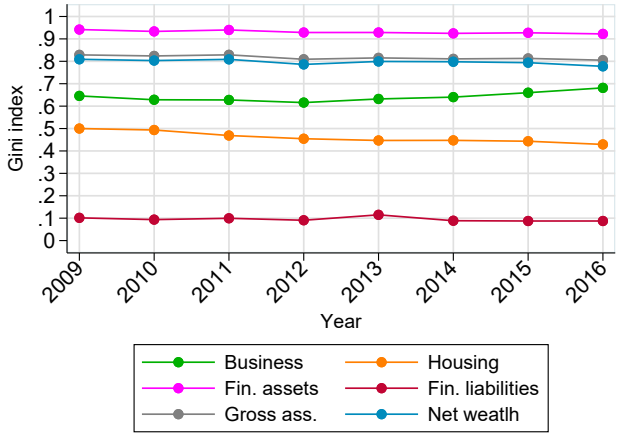
Figure A.20: Net Personal capital incomes distribution and return rates 2009-2016



(a) Gini index (b) Rates of return

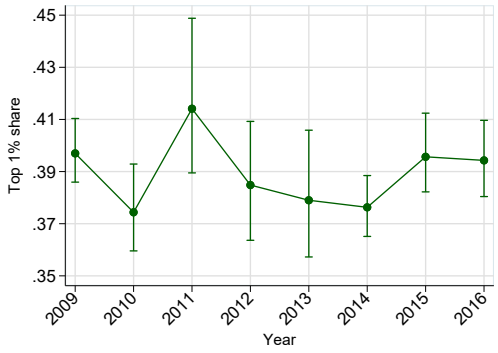
Note. Capital income distribution based on De Rosa and Vilá (2020). Includes dividends, interests, rents, owner occupied housing rents and undistributed profits. Personal capital incomes shares depicted in Figure A.18.

Figure A.24: Net Personal wealth distribution - Gini index 2009-2016

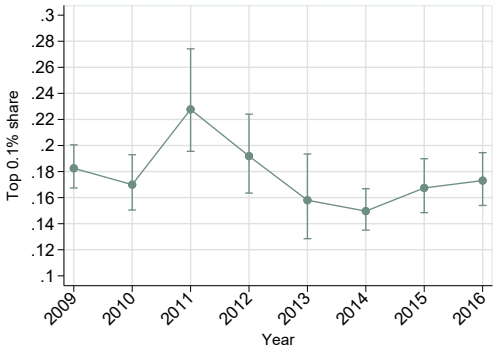


Note. Gini index of the four main wealth components. Wealth shares depicted in Figure A.25.

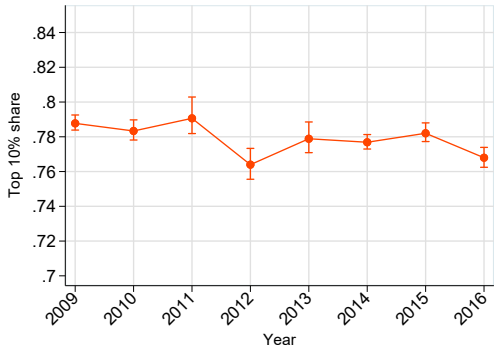
Figure A.21: Net wealth distribution's confidence intervals 2009-2016



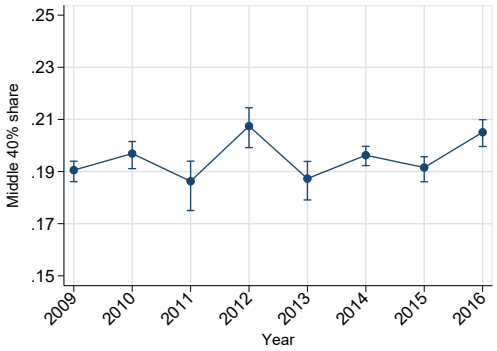
(a) Top 1%



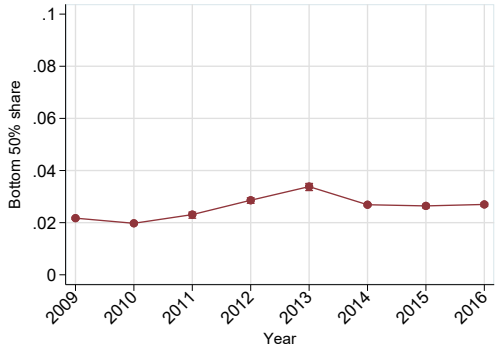
(b) Top 0.1%



(c) Top 10%



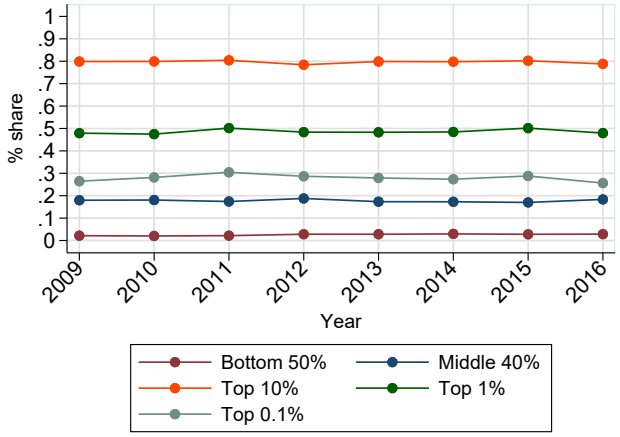
(d) Middle 40%



(e) Bottom 50%

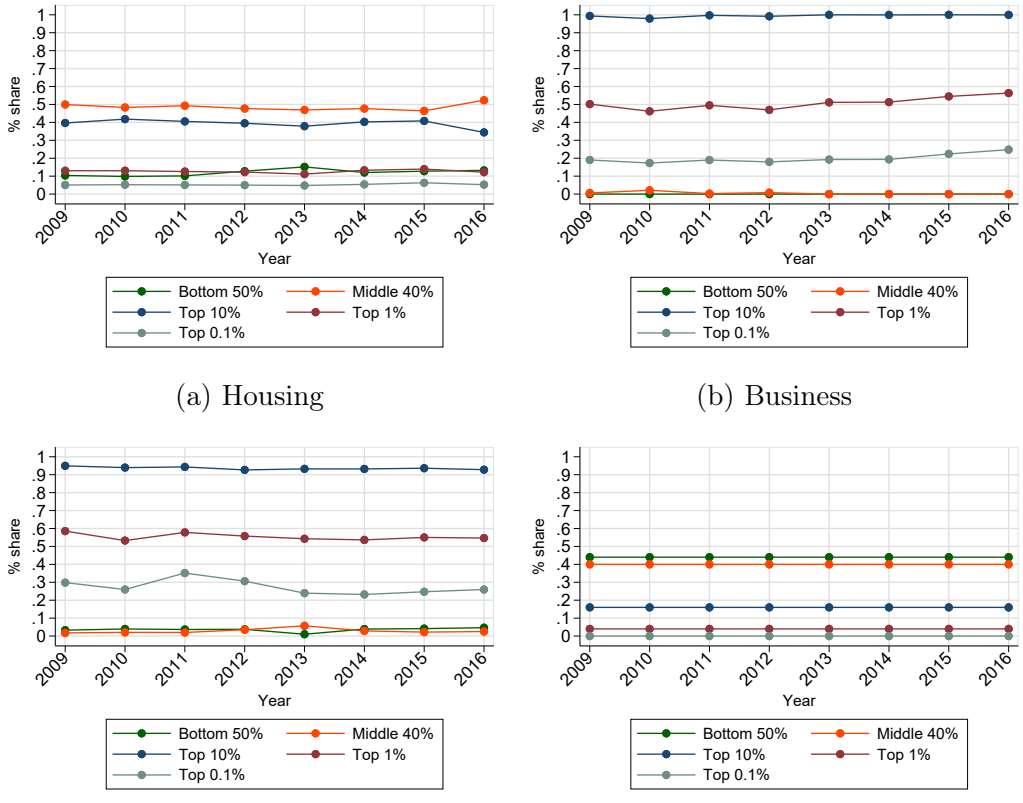
Note. 5% confidence intervals estimated based on bootstrap (500 draws).

Figure A.22: Net Personal wealth distribution (upper bound) 2009-2016



Note. Capitalized incomes, based on Distributional National Accounts estimates (De Rosa and Vilá, 2020), *alternative 2*. In this variant, undistributed profits are imputed based on matched firm-owners data, resulting in upper bound estimates.

Figure A.23: Wealth distribution by asset type, 2009-2016



(a) Housing

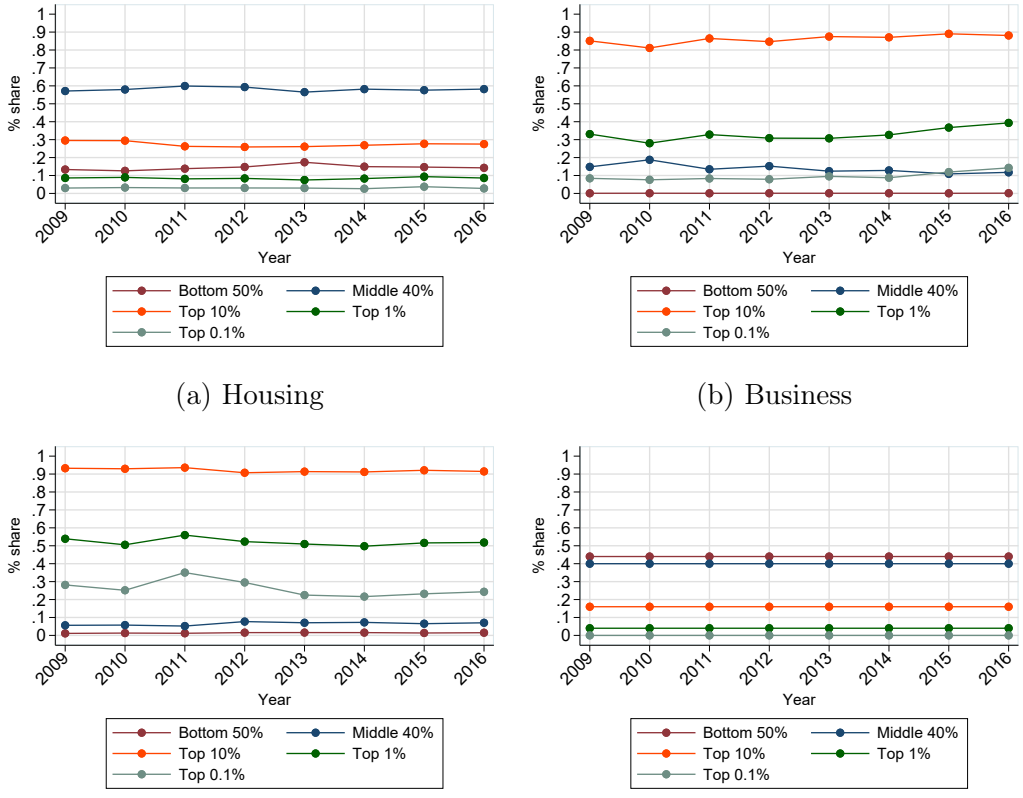
(b) Business

(c) Financial assets

(d) Liabilities

Note. Wealth shares constructed based on each asset/liability. The distribution of each asset according to total private net wealth fractiles is depicted in Figure A.25, while Gini indices by asset type presented in Figure A.26. Figure A.27 depicts wealth portfolio by wealth group.

Figure A.25: Wealth distribution by asset type in shares of total wealth, 2009-2016



(a) Housing

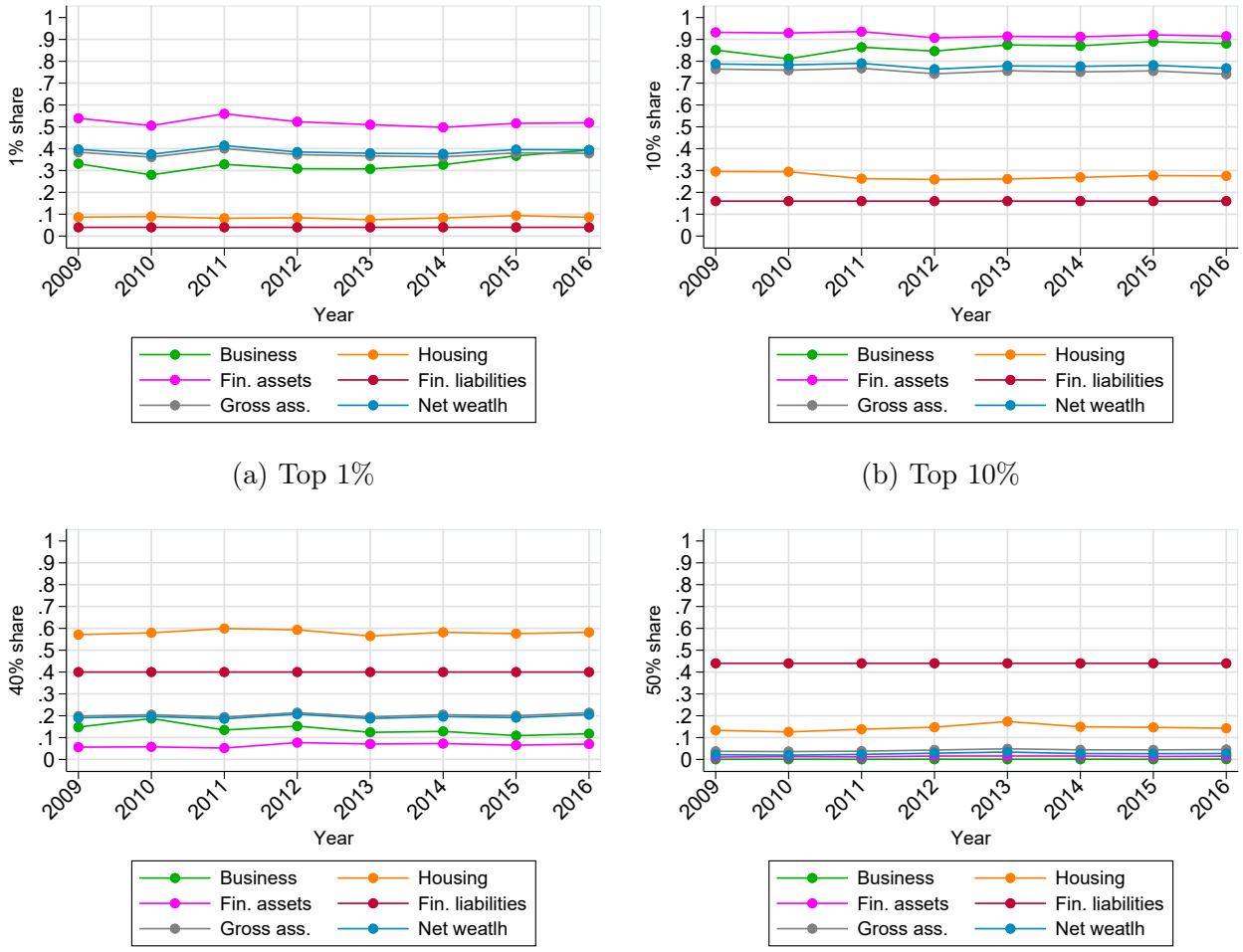
(b) Business

(c) Financial assets

(d) Liabilities

Note. Figure A.27 depicts wealth portfolio by wealth group. Fractiles of total private net wealth.

Figure A.26: Personal wealth distribution by wealth groups 2009-2016



(a) Top 1%

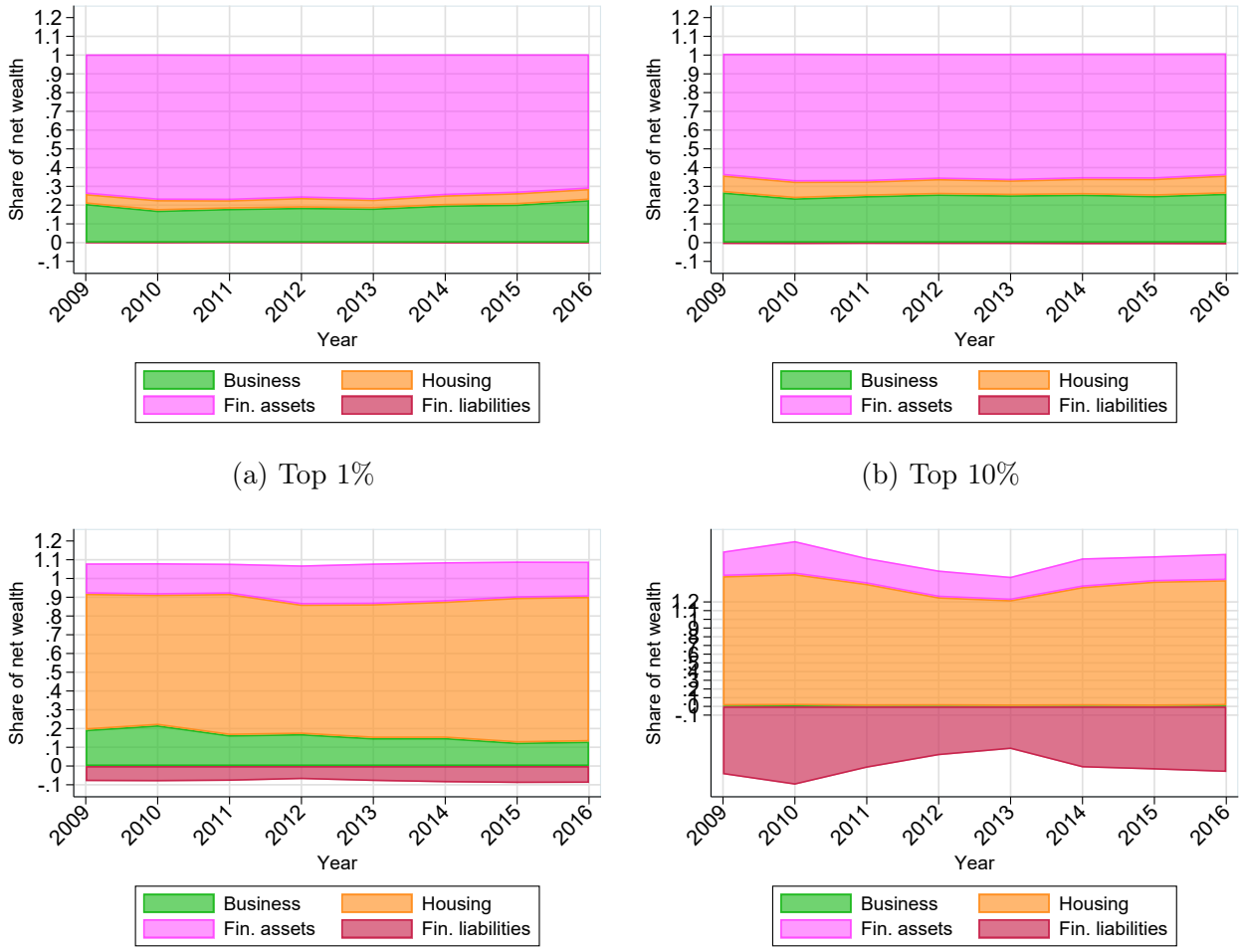
(b) Top 10%

(c) Middle 40%

(d) Bottom 50%

Note. Gini index by capital income types depicted in Figure A.18.

Figure A.27: Personal wealth composition 2009-2016



(a) Top 1%

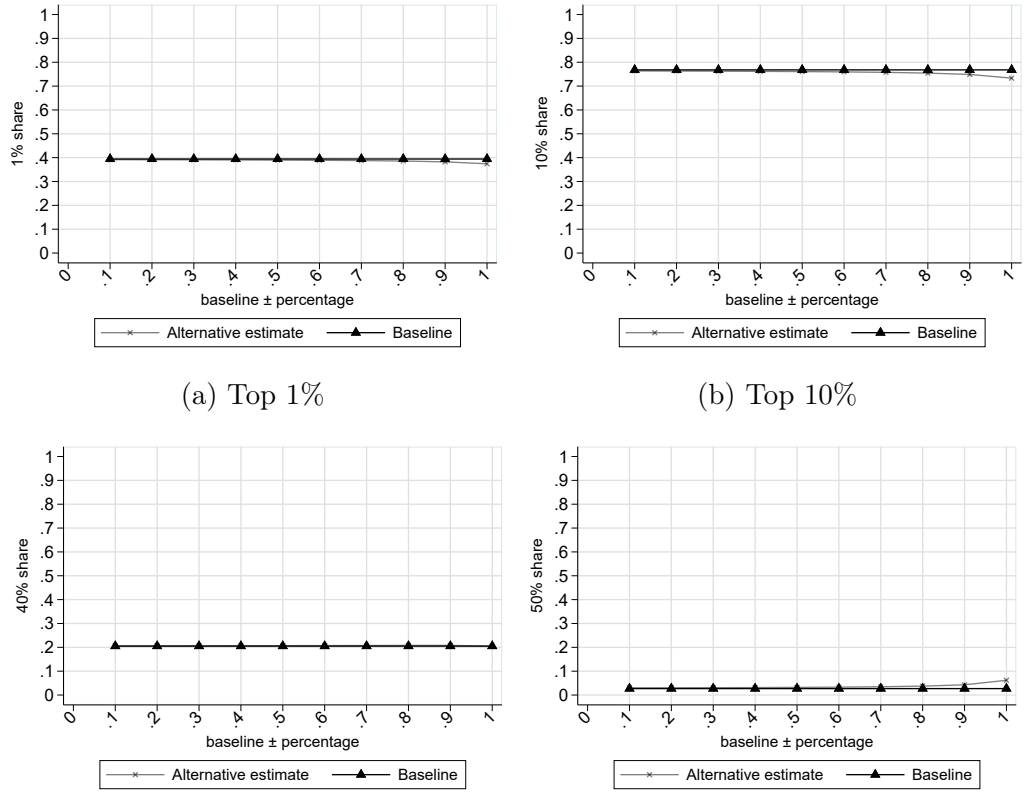
(b) Top 10%

(c) Middle 40%

(d) Bottom 50%

Note. Capital incomes composition depicted in Figure A.19.

Figure A.28: Wealth correlated returns' sensitivity analysis (exercise 1), 2016.



(a) Top 1%

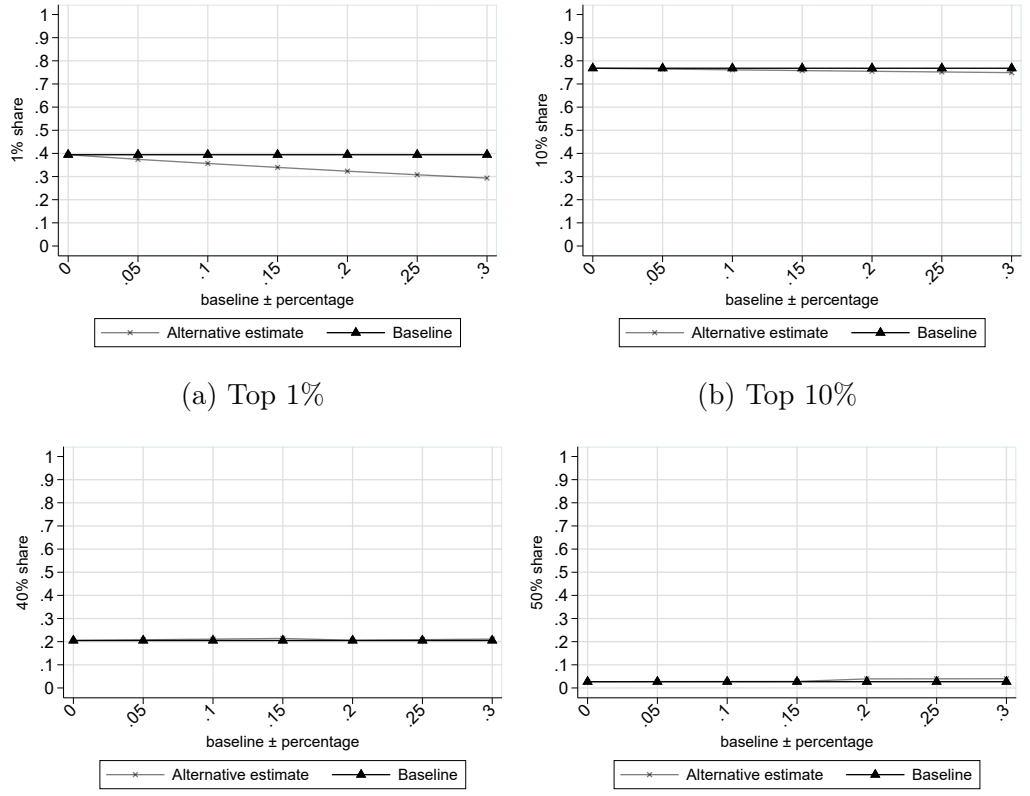
(b) Top 10%

(c) Middle 40%

(d) Bottom 50%

Note. The x-axis column depicts rates of return' variation ranges in relation to average return rates for extreme groups top and bottom 1%. As an example, a value of 0.25 in the x-axis hence indicates that the top 1%'s rate has been increased by 25%, and reduced by 25% for the bottom 1%. Returns in the remaining percentiles vary linearly between these two points. Results depicted for 2016, identical conclusions are drown from analyzing remaining years (available upon request).

Figure A.29: Wealth correlated returns' sensitivity analysis (exercise 2), 2016.



(a) Top 1%

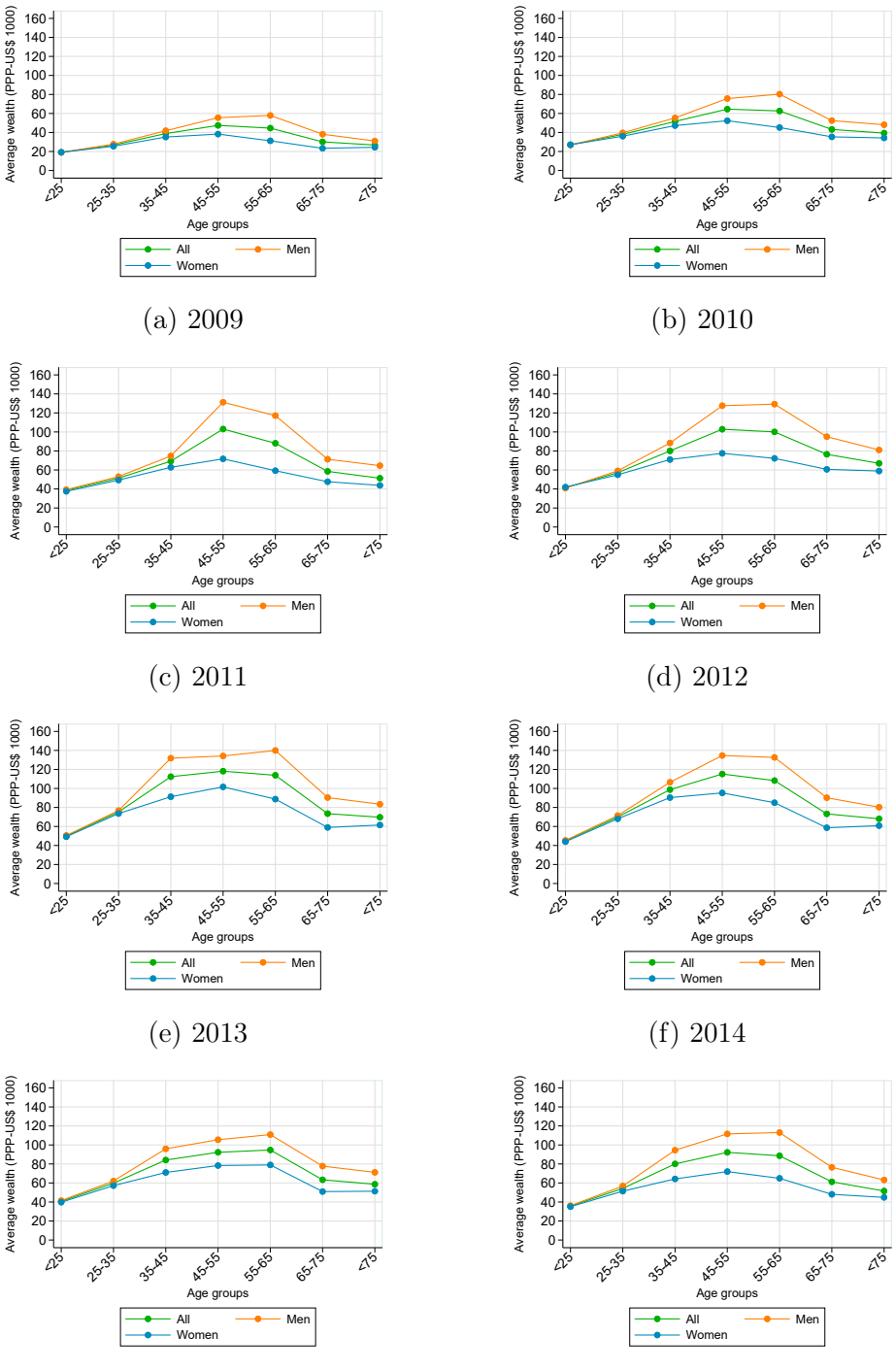
(b) Top 10%

(c) Middle 40%

(d) Bottom 50%

Note. The x-axis column depicts rates of return' variation ranges in relation to average return rates for the bottom 99% (negative) and the top 1% (positive). As an example, a value of 0.25 in the x-axis indicates that the top 1%'s rate has been increased by 25%, and reduced by 25% for the bottom 1%. Results depicted for 2016, identical conclusions are drown from analyzing remaining years (available upon request).

Figure A.30: Average wealth by sex and age, 2009-2016.



(a) 2009 (b) 2010

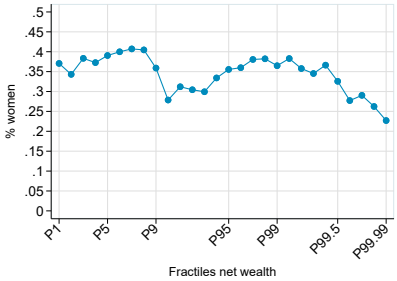
(c) 2011 (d) 2012

(e) 2013 (f) 2014

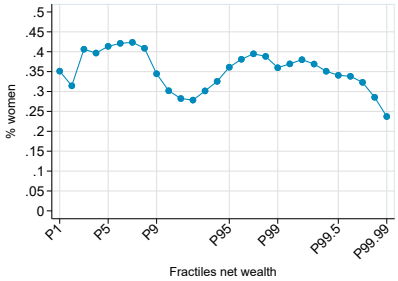
(g) 2015 (h) 2016

Note. Wealth averages for ten-year age groups and sex. Individuals over 20 years old.

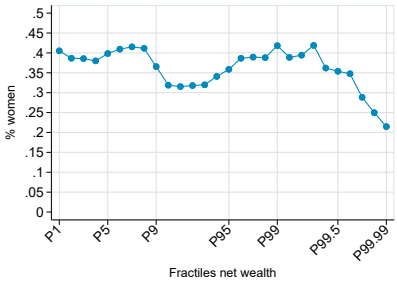
Figure A.31: Share of women by wealth fractile, 2009-2016.



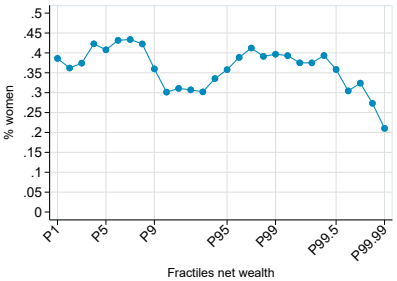
(a) 2009



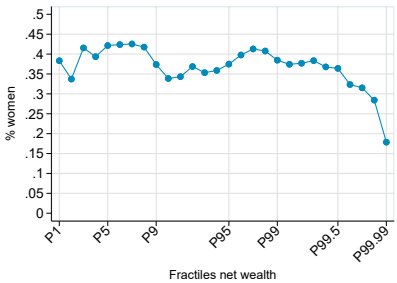
(b) 2010



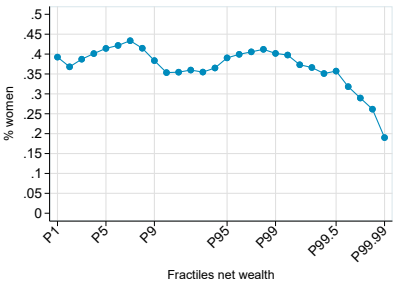
(c) 2011



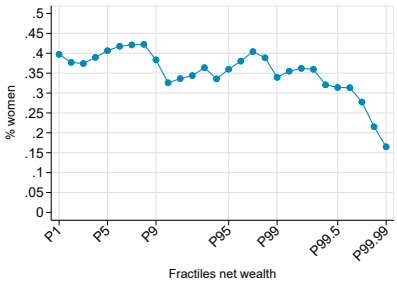
(d) 2012



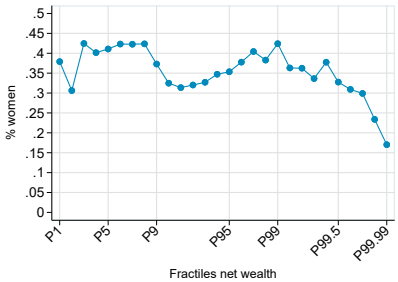
(e) 2013



(f) 2014



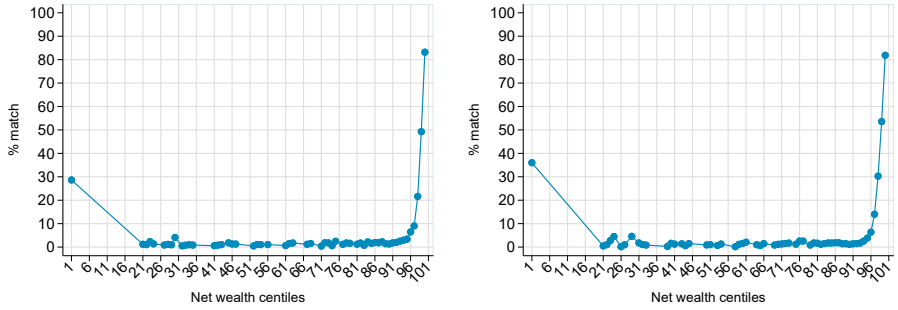
(g) 2015



(h) 2016

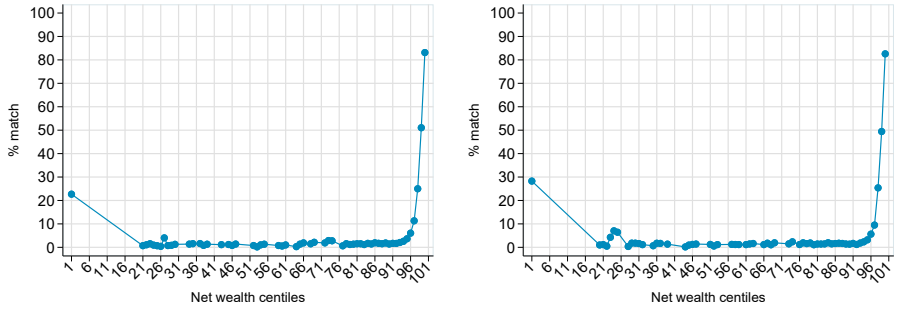
Note. Percentage of women (20+ years) by net wealth fractile.

Figure A.32: Percentage of income-wealth matching by wealth p-tile, 2009-2016



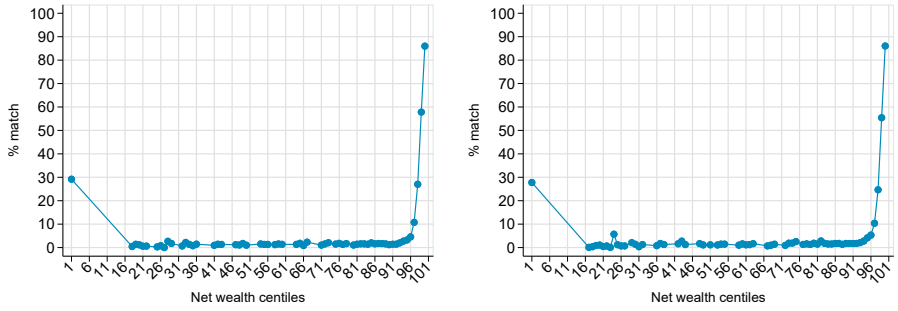
(a) 2009

(b) 2010



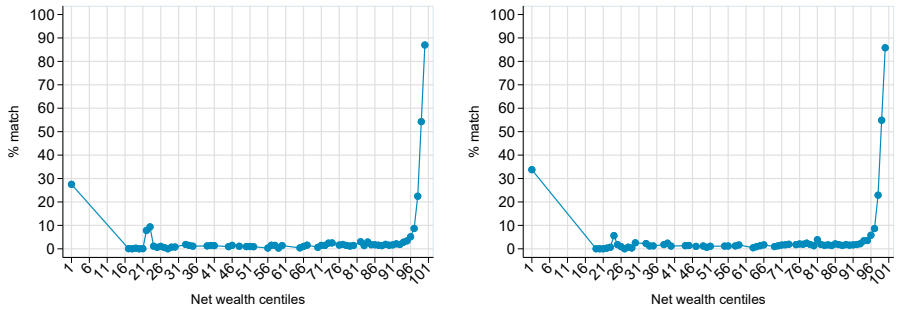
(c) 2011

(d) 2012



(e) 2013

(f) 2014

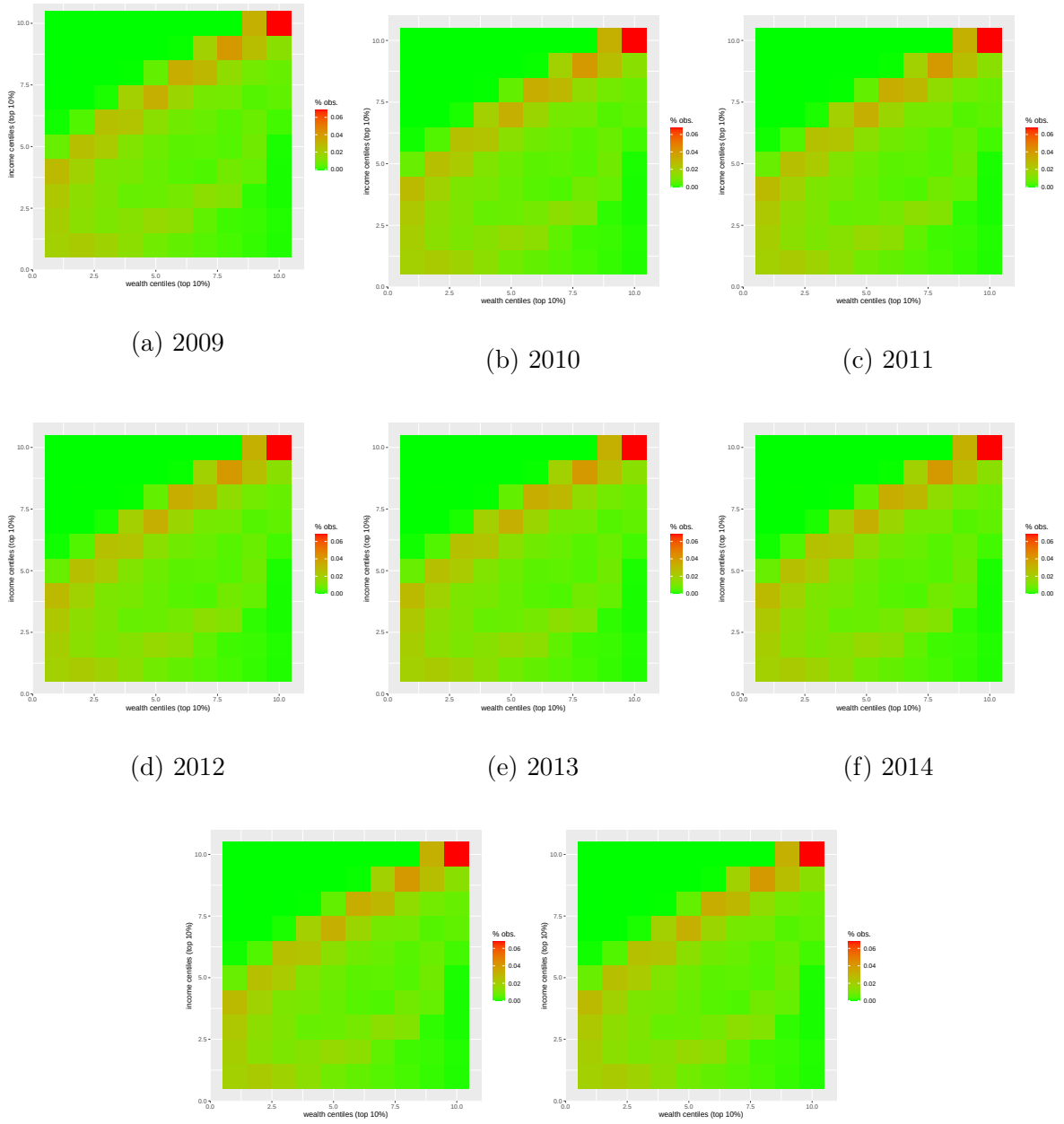


(g) 2015

(h) 2016

Note. Income refers to total incomes (including capital incomes, labour incomes, pensions and other incomes).

Figure A.33: Income and wealth heatmap (top),%009-2016



(a) 2009 (b) 2010 (c) 2011

(d) 2012 (e) 2013 (f) 2014

(g) 2015 (h) 2016

Note. Income refers to total incomes (including capital incomes, labour incomes, pensions and other incomes).

A.4 Triangulation with other evidence

Table A.7: Descriptive statistics, wealth survey

	Housing	Business	Fin. Assets	Liab.	Gross wealth	Net wealth
	Mean values (thousand US dollars, PPP)					
Bottom 50%	0	-	-	-	1	- 0
Middle 40%	22	-	2	1	26	24
Top 10%	113	86	50	11	208	200
Top 1%	354	661	364	51	978	947
Total	20	6	5	1	31	29
	Thresholds (thousand US dollars, PPP)					
Top 1%	189	170	59	28	349	337
Top 10%	54	0	5	2	66	63
Top 50%	1	0	0	0	6	5
	% ownership & distribution					
% asset > 0	50%	7%	29%	35%	63%	61%
Gini index	0,52	0,82	0,86	0,75	0,68	0,69

Note. Based on EFHU. Per adult wealth.

Table A.8: Wealth thresholds, estate method

	Urban						Rural					
	Lower bound			Main estimates			Lower bound			Main estimates		
	Top 10%	Top 1%	Top 0,1%	Top 10%	Top 1%	Top 0,1%	Top 10%	Top 1%	Top 0,1%	Top 10%	Top 1%	Top 0,1%
2007	8	72	320	10	90	413	8	73	321	10	93	414
2008	12	113	680	14	139	870	12	114	573	15	145	705
2009	10	104	628	13	130	804	10	103	628	13	136	772
2010	14	150	990	17	185	1297	14	152	887	18	187	1163
2011	18	191	1247	22	233	1653	18	190	1194	23	245	1551
2012	20	215	1104	25	274	1347	21	215	1180	25	277	1428
2013	23	246	1508	27	309	1976	23	247	1501	28	313	1843
2014	18	221	1268	22	275	1572	18	222	1197	22	279	1509
2015	14	213	1385	17	256	1759	14	213	1342	19	271	1846

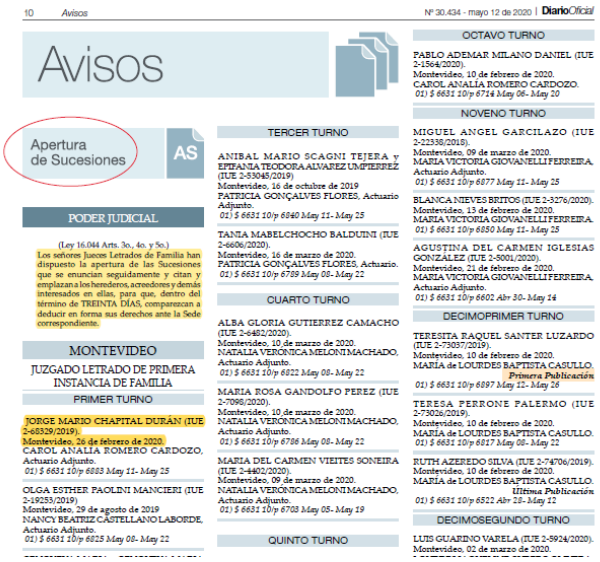
Note. Real estate wealth thresholds, based on estate multiplier method (section 6.2).

Table A.9: Method's comparison

	Capitalization method						Survey						Estate method				Tax
	Bus.	Hous.	F. Ass.	Liab.	Gross W.	Net W.	Bus.	Hous.	F. Ass.	Liab.	Gross W.	Net W.	Urban	Urban LB	Rural	Rural LB	Urban
									Top 0,1%								
2007													4%	3%	17%	13%	
2008													5%	4%	22%	17%	
2009	19%	5%	30%	0%	30%	18%							3%	2%	22%	17%	1%
2010	17%	5%	26%	0%	26%	17%							4%	3%	24%	19%	1%
2011	19%	5%	35%	0%	35%	23%							3%	2%	23%	18%	1%
2012	18%	5%	31%	0%	31%	19%							4%	3%	15%	11%	2%
2013	19%	5%	24%	0%	24%	16%	33%	2%	40%	9%	12%	13%	5%	4%	20%	15%	
2014	19%	5%	23%	0%	23%	15%							4%	3%	21%	16%	2%
2015	22%	6%	25%	0%	25%	17%							3%	2%	32%	25%	
2016	25%	5%	26%	0%	26%	17%											
									Top 1%								
2007													20%	15%	40%	31%	
2008													19%	15%	51%	39%	
2009	50%	13%	59%	59%	38%	40%							18%	14%	48%	37%	
2010	46%	13%	53%	53%	36%	37%							17%	13%	60%	46%	
2011	50%	13%	58%	58%	40%	41%							16%	12%	51%	39%	
2012	47%	12%	56%	56%	37%	38%							17%	13%	41%	31%	
2013	51%	11%	54%	54%	37%	38%	72%	17%	68%	37%	30%	32%	18%	14%	47%	37%	
2014	51%	13%	54%	54%	36%	38%							17%	13%	43%	33%	
2015	54%	14%	55%	55%	38%	40%							16%	12%	59%	46%	
2016	56%	12%	55%	55%	38%	39%											
									Top 10%								
2007													58%	45%	56%	43%	
2008													58%	45%	67%	51%	
2009	99%	40%	95%	16%	76%	79%							51%	39%	61%	47%	
2010	98%	42%	94%	16%	76%	78%							51%	39%	76%	59%	
2011	100%	41%	94%	16%	77%	79%							50%	38%	63%	48%	
2012	99%	40%	93%	16%	74%	76%							49%	37%	52%	40%	
2013	100%	38%	93%	16%	76%	78%	100%	56%	94%	85%	65%	68%	51%	39%	59%	45%	
2014	100%	40%	93%	16%	75%	78%							46%	35%	54%	42%	
2015	100%	41%	94%	16%	76%	78%							45%	35%	69%	53%	
2016	100%	34%	93%	16%	74%	77%											

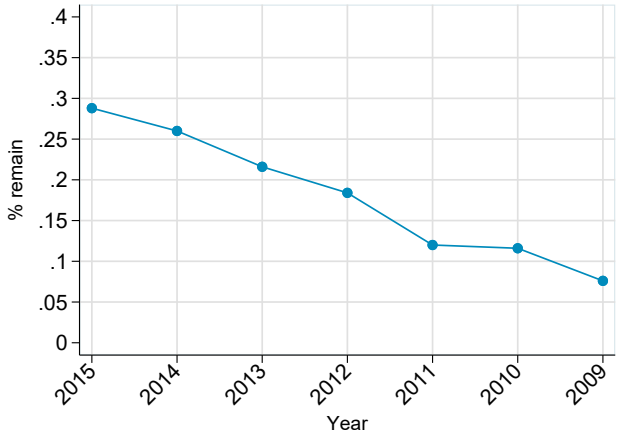
Note. Each column depicts the top shares of different assets/methods, based on own assets fractiles.

Figure A.34: Opening of inheritance process



Note. Screenshot from *Diario Oficial*, IMPO. https://www.impo.com.uy/

Figure A.35: Top 0.01%'s attrition



Note. Share of the 250 individuals (approximately top 0.01%) who belong to the same group in the previous years.

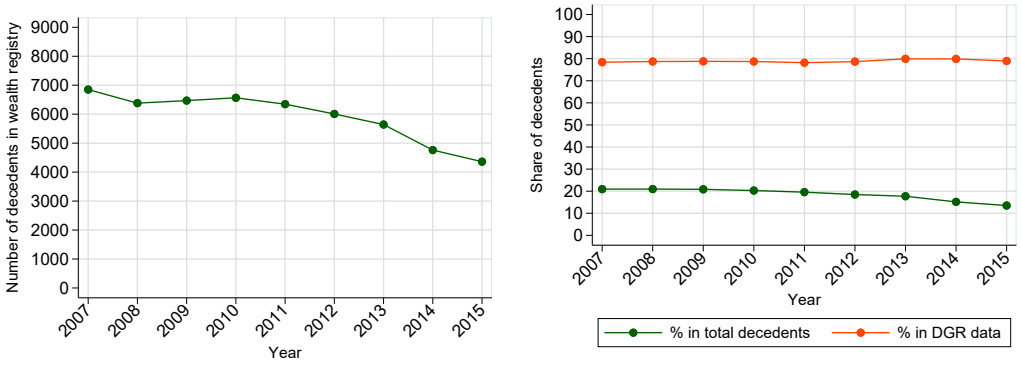
A.5 Inherited real estate wealth

Table A.10: DGR decedents data base

Year	Total decedents	Av. Num. Properties	Med. Num. Properties	Max. Num. Properties
2007	8.736	9,7	1	471
2008	8.107	4,0	1	154
2009	8.210	3,2	1	92
2010	8.342	3,8	1	94
2011	8.116	3,8	1	94
2012	7.638	4,8	1	221
2013	7.059	3,1	1	92
2014	5.959	3,6	1	99
2015	5.522	3,2	1	92

Note. Based on DGR decedents data.

Figure A.36: Decedent population in merged data (2007-2015).

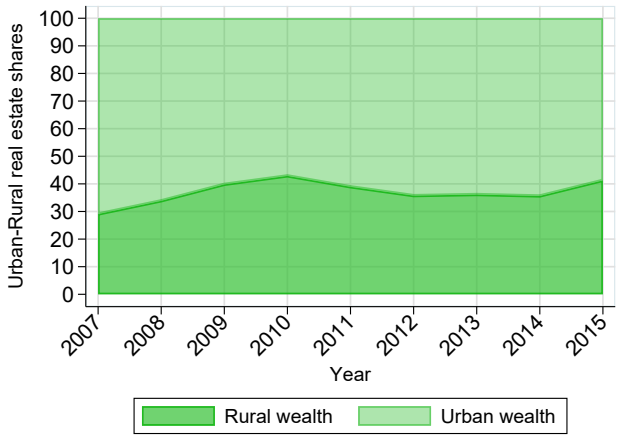


(a) Number of owner decedents.

(b) % of owner decedents in total decedent population.

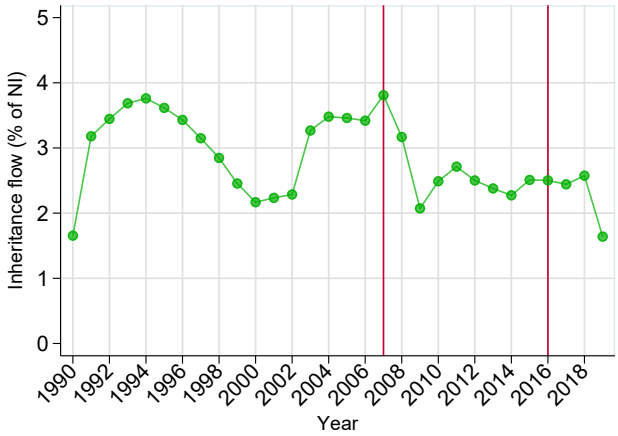
Note. Based on DGR, DNC and INE's total decedents number. Panel (a) presents the absolute number of individuals in the decedents-real estate merged data set. Panel (b) depicts the share of individuals in the merged decedents-real estate in total decedents and in the total number of decedents in DGR raw data.

Figure A.37: Cadaster-decedent's urban & rural wealth



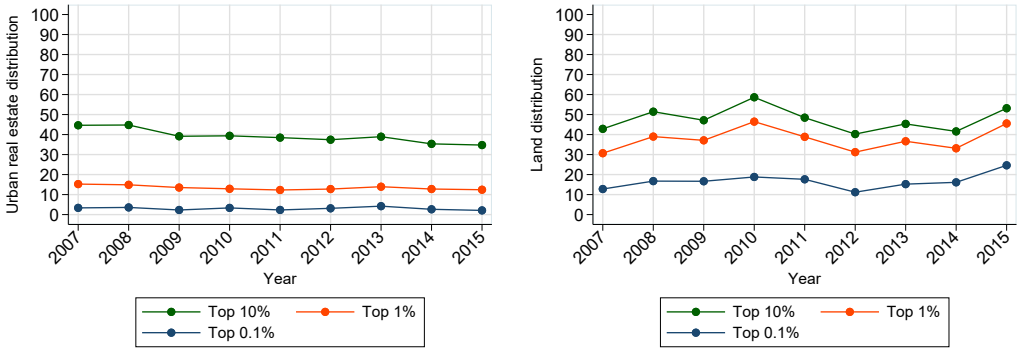
Note. Based on Cadastre data from DNC and merged data set. All values adjusted to market prcies.

Figure A.38: Inherited real estate flow (tax-based)



Note. Based on ITP records (DGI). Vertical red lines indicate period under analysis in the decedent-real estate data base. Out of total ITP paid, it is calculated that 17.6% is paid as a result of inheritances, based on housing market reports by INE (2015, first available for the whole country). The report establishes that there were 125.727 registry inscriptions, so the 5.522 properties held by the decedents (Table A.10) represent 17.6%. Report available at https://www.ine.gub.uy/sector-inmobiliario.

Figure A.39: Real estate distribution by wealth type (70-30 split)



(a) Urban (b) Rural

Note. Based on DGR and DNC merged data. Decedent's wealth "expanded" based on average mortality rate and considering a decedents/adult population wealth ratio of 1.42, computed based on wealth survey. Equal-split lower bound estimates.

A.6 The geographical distribution of real estate wealth

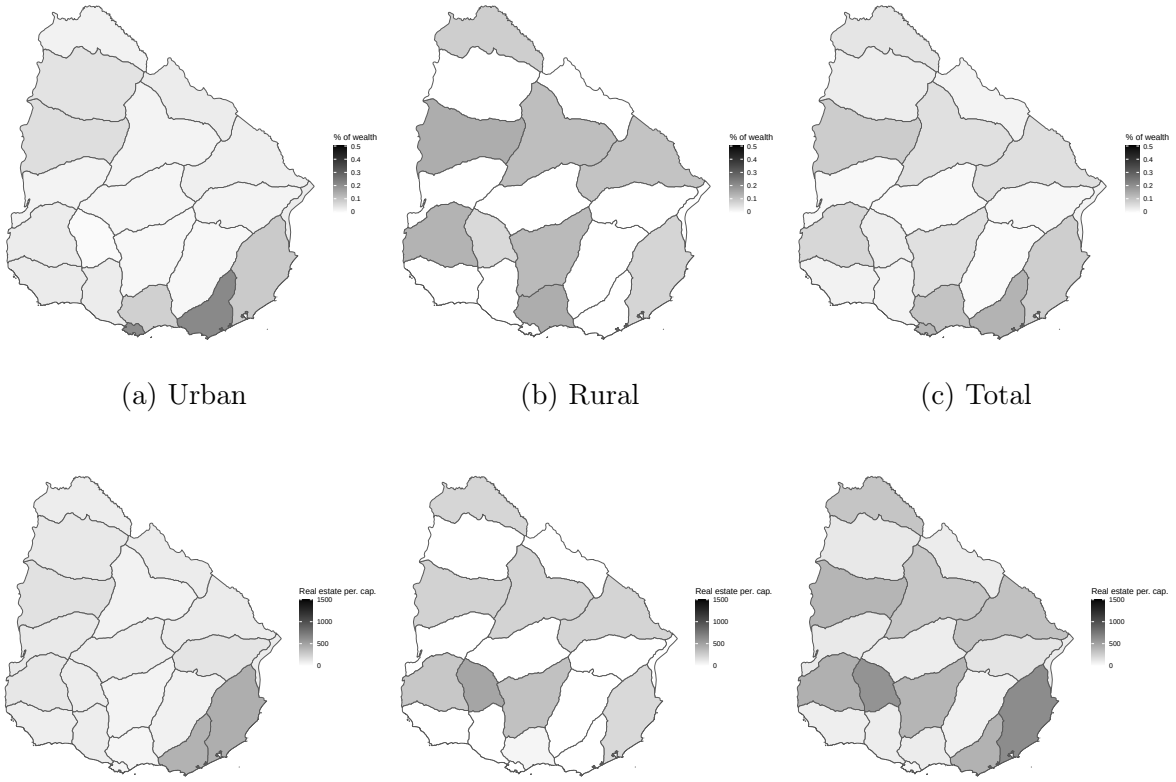
To estimate the geographical distribution of wealth, we depart from market-prices adjusted cadastral data discussed in section 4. This data reflects market-price gross real estate wealth for the universe of rural and urban properties, regardless of the institutional sector who owns them.

Wealth distribution by department is depicted in Figure A.40 (panels a-c). Real estate wealth shares of total, rural and urban real estate are shown, reflecting the different wealth levels (presented as a percentage of national income) depicted in Figure A.41. In the case of urban real estate wealth, it is very concentrated in the south, especially in the capital city Montevideo, the Canelones department (which hosts very large bedroom towns associated with economic activity in the capital), and Maldondado, where the high-class touristic city of Punta del Este is located. In the case of rural real estate, the distribution is more even across the territory, with radically less importance of the capital given its very small relative territory. The overall picture, suggests a higher share of real estate wealth in the south of the country, and to a lesser degree in some departments from to the west by the riverside.

The preceding results are heavily influenced by the size of each department (especially in the case of land) and by its population (when considering housing). For this reason, Figure A.40 (panels d-f) shows per capita real estate wealth. When doing so, the relative importance of Maldonado stands out in the case of urban real estate (given its low population relative to the value of the installed touristic capacity), and the axis Montevideo-Canelones looses relative importance given that half of the country's population lives there. Some departments by the Uruguay river (to the west), such as Colonia (with two large cities, Colonia del Sacramento and

Carmelo) also present slightly higher values. In the case of rural real estate the relatively less populated departments of the center emerge as the ones with higher rural wealth per capita. Overall, per capita real estate wealth seems to be higher in some departments of the south (especially Maldonado), and in the center-west, somewhat differently to the clearer L-shape pattern found in regional GDP (Rodríguez Miranda and Menendez, 2020).

Figure A.40: Gross real estate wealth by department

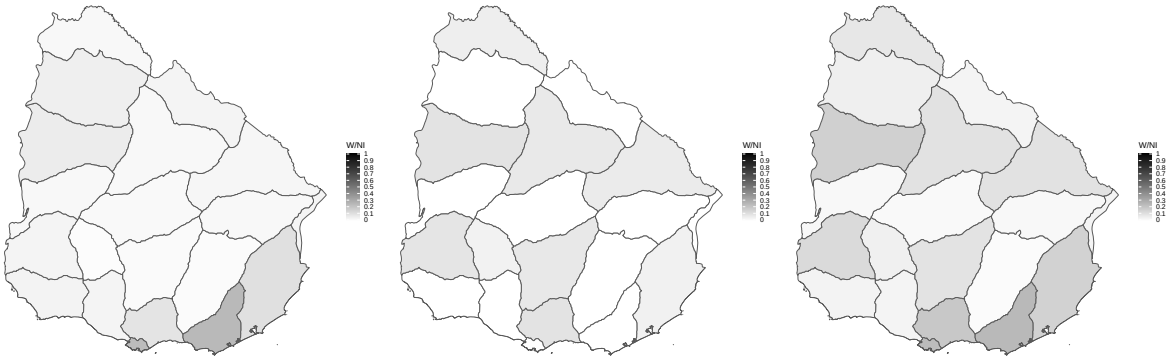


(a) Urban (b) Rural (c) Total

(d) Urban - per cap. (e) Rural - per cap. (f) Total - per cap.

Note. Based on Cadastre data from DNC, DGR and DIEA. Market price adjustment depicted in Figure A.5, 2018 values and official population projections (INE). Remaining years present very similar distribution.

Figure A.41: Wealth to income ratio by department



(a) Urban (b) Rural (c) Total

Note. Based on Cadastre data from DNC, 2018 values and population from 2011 census. Remaining years present very similar distribution.