Inheritance and real estate wealth distribution in Uruguay.

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Abstract

After decades of controversy, the role of inheritance in wealth distribution, and the importance of the latter in overall economic inequality have become increasingly undisputed. However, there is essentially no evidence whatsoever regarding these important dimensions for developing countries. In this paper two sets of contributions are made to fill this gap. First, Uruguay's aggregate level of national and household's net real estate wealth is estimated for 1999-2018, based on cadastral administrative data adjusted to market prices, showing levels of 250-300% and 150% of national income respectively. Moreover, based on a novel microdata base of real estate wealth of the decedent population for 2007-2015, a flow of inherited real estate wealth of 20% of national income is estimated, which is consistent with a steady-state high stock of inheritance in total wealth of around 70%. Second, estimates of geographical and personal distribution of net real estate wealth are presented. Lower bound estimations show that top 10%'s share of real estate within the living population is 40-50%, whilst top 1%'s share is 20-30%. Land is more heavily concentrated than housing, especially in top fractiles, reaching a top 1% of 30-40%.

Key words: wealth distribution, estate method, inheritance, Uruguay.

JEL classification: D31, E01, E21

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1 Introduction

While it is now clear that economic inequality, as Atkinson pointed out, has finally been brought back *from the cold* (Atkinson, 2015) and substantial progress has been made in the last decade, in a number of central dimensions work is still in progress. This is particularly true in the case of wealth inequality and the role of inheritance, which keep on being debated in the handful of rich countries for which estimations are available. Evidence for the vast and heterogeneous part of the globe usually referred to as "developing world" is virtually non-existing.

After the famous 1980s' Kotikloff-Summers-Modigliani controversy, which debated over the role of inheritance in aggregate private wealth and hence in the shaping of wealth distribution, new evidence has been accumulated (Piketty and Zucman, 2015). The seminal study of the long-run evolution of inheritance in France (Piketty, 2011), was followed by others, but in all cases exclusively focusing on a limited number of European countries and the United States (Ohlsson et al., 2020; Atkinson, 2018; Alvaredo et al., 2017). There is very little evidence on this issue for the rest of the world, and essentially the same could be said about wealth inequality. Estimations for a number of mostly rich countries are now available, but there is still much controversy about recent decades' trends, especially in the case of the United States (Saez and Zucman, 2016; Kopczuk, 2015; Sutch, 2017). In the case of European countries, general conclusions are less contested, but nevertheless alternative methods and data sources entail different levels and trends (Zucman, 2019). Again, estimations for the non-rich world are extremely scarce with few exception (Torche and Spilerman, 2006).

In this paper, I contribute to overcome this caveat in two ways: first, by providing estimations of real estate inheritance flow and computing the implicit stock in aggregate real estate wealth; second, by estimating personal real estate wealth distribution for the Uruguayan case in the 2007-2015 period. As a secondary contribution, I present novel estimations of the aggregate and household's real estate wealth as well, decomposing it in its housing and land components. Real estate wealth, including both housing and land, is by far the most important type of wealth, representing over 80% of household wealth in the Uruguayan case according to the household wealth survey of 2013, and the majority of wealth in all available estimations for other countries (Piketty and Zucman, 2014).[1] I estimate not only personal but also geographical distribution of real estate wealth, while providing estimates of personal housing and land distributions for the first time. It is worth stressing at the onset that the estimates presented here should be viewed as tentative and exploratory at this stage. That being said, they represent some of the first peeks on these key dimensions for a poor country.

Data availability is by far the most important obstacle in inheritance and wealth distri-

[1] Moreover, housing has been shown to be a key driver of the increase in the inheritance flow in countries such as United Kingdom (Karagiannaki, 2015).

bution research. In the standard approach, which to be sure is not ideal either, one would use long run series of estate tax data (or capital incomes tax data), combined with National Accounts' balance sheets reporting aggregate private and public wealth to compute inheritance flows and/or wealth inequality estimates (Piketty and Zucman, 2015). Long run series of this sort are unavailable for the vast majority of the poor world, while in the Uruguayan case, even data for recent years is scarce. In particular, the absence of official balance sheets with aggregate national and private wealth estimations imposes important challenges that need to be carefully addressed. In this paper, I construct national and household's real estate aggregates based on Cadastre's administrative data (which accounts for the universe of rural and urban properties), official reports on land and housing prices and a household wealth survey. Moreover, I am able to merge Cadastre's property data with a data set of decedent individuals who owned real estate at the time of death, which is the basic input for the inheritance and real estate distribution analysis.

Based on this novel data sets, I compute the inheritance flow, i.e. the total value of inherited real estate wealth as a share of national income, which reaches around 20%. 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 over 70% is estimated and compared with previous results (Agustoni and Lasarga, 2019), under the assumption that the inheritance flow is stable over a generation and taking official estimates of savings rates, hence locating Uruguay closer to Kotikloff-Summers' corner in the inheritance controversy. This relatively high stock of inherited real estate wealth is consistent with high inheritance flows, low savings rates and the complete absence of wealth-destroying shocks with a similar magnitude that those suffered by European countries during the first half of the XX^{th} century.

Moreover, I estimate real estate wealth distribution within the living population of 20 or more years, based on an adaptation of the estate multiplier method methodology (Alvaredo et al., 2018), which essentially entails weighting the decedent population by the average mortality rate while adjusting for the ratio of their wealth in relation to that of the living population. Results show that real estate wealth top 10%'s share is around 40% in the lower bound estimations, and can reach over 50% of total household real estate wealth under less restrictive assumptions. Top 1%'s share is stable around 20%, whilst top 0.1% reaches 10%. These estimates are consistent with what is found in previous studies based on completely orthogonal sources and methodologies to the ones used here, such as household wealth surveys and the capitalization method (De Rosa, 2019; Agustoni and Lasarga, 2019; Sanroman and Santos, 2017).

A somewhat secondary result, but of capital importance nonetheless, refers to the estimations of aggregate real estate wealth which, unlike the remaining distributional estimations, could be build for the 1999-2018 period. This series shows a net national real estate wealth to income ratio of 250-300%, in line with recent literature (Alvaredo et al., 2018; Saez and Zucman, 2014). More interestingly, the share of land wealth in total real estate wealth reaches 30-40%, much larger than what is observed in rich countries today (Piketty, 2014), and closer to early XXth century estimations for those regions. Moreover, it was estimated based on a wealth household survey that approximately 55% of that aggregate real estate wealth belongs to households, entailing a household real estate to income ratio of 150%.

I also provide novel estimations regarding geographical distribution of wealth and desegregating land and housing distributions. The geographical distribution of wealth is important since it provides a sense of wealth accumulation vis-à-vis economic activity. Uruguay is a small country population-wise (with around 3.5 million inhabitants), but with a surface that is larger than England's, so it does make sense to provide a some estimates of wealth distribution in its geographical dimension. As expected, urban wealth's share is higher in regions with relatively large cities, but massively concentrated in the capital city Montevideo, its bedroom towns in Canelones, and in Maldonado department, which hosts the high-class touristic city of Punta del Este. Rural real estate wealth's share, on the other hand, is more evenly distributed across the territory, with a slightly higher share towards the relatively more fertile regions of the west. Clearer heterogeneity does appear when per capita real estate is considered given the uneven distribution of the population in the territory. As for personal distribution, land concentration is much higher than housing's, with a top 1%'s share of over 40%. Urban wealth distribution resembles overall wealth distribution, which is consistent with the fact that accounts for 60-70% of total real estate wealth.

I contribute to two broad strands of literature, which are discussed further in section 2. First, this article is directly related to studies that estimate the inheritance flow and stock, which have shown that the relative importance of inheritance varies considerably across regions and time. Therefore, it is not obvious what the result may be in a part of the globe that, on top of a number of structural and historical differences, was less affected by the massive wealth-destroying shocks of the first half of the XXth century. Second, this paper is a contribution to the understanding of personal wealth distribution, through the estimation of personal distribution of real estate, which has played a major role in the evolution of wealth inequality throughout the last and present centuries in the rich world. To a lesser degree, it also dialogues with the expanding literature on land distribution (Bauluz et al., 2020), and to the macroeconomic estimation of wealth to income ratios that was kick-started by Piketty and Zucman (2014).

The rest of the paper is organized as follows. In section 2 related literature is summarized, while definitions and methodology are discussed in section 3. Section 4 presents the main data

sources and the procedure for constructing the working data. Sections 5 and 6 present the main results: the former from a purely macroeconomic perspective, i.e. presenting results on aggregate real estate wealth, its composition and inheritance's flow and stock, and the latter depicting geographical and personal real estate distribution. Section 7 concludes.

2 Related literature

In this section, the two main strands of literature to which this study dialogues with are discussed. First, the literature on inheritance, focusing on the estimation and evolution of flow and stock of inheritance in countries with available estimates, and second, the relatively more abundant literature on personal wealth distribution. Results presented in sections 5 and 6 are directly related with the literature discussed in 2.1 and 2.2 respectively.

2.1 The flow and stock of 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 (Piketty and Zucman, 2015).

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. 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. As discussed in section 3, 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

[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.

with this inheritance definition, Sanroman and Santos (2017) find that inheritance is the most important determinant of wealth inequality in the Uruguayan case.

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 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 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 (Alvaredo et al., 2018; 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. Kopckzuk 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, 2017; Bricker et al., 2016; Fagereng et al., 2016; Roine and Waldenström, 2009).

Other thread of studies aim to analyze wealth inequality worldwide relaying on 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. Several sophistication to this procedure were performed by other scholars, see for example Davies et al. (2016) for an adjustment of the top tail using rich lists such as the ones compiled by Forbes or Fortune magazines. 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 scarce or null, 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 (Alvaredo et al., 2016). In De Rosa (2019) wealth distribution in 2009-2014 is estimated based on the capitalization method, finding top 10% share of around 60-65%, with a top 1% reaching 35-40%. Real estate wealth is less concentrated, with a top 10% of 40%, and a top 1% of 20%. Survey estimates are –somewhat surprisingly– higher, with a top 10% share of real estate wealth of over 50%. Very similar results, also based on wealth survey data, where presented by Agustoni and Lasarga (2019). These results are discussed in more detail in section 6.

3 Methodology

This section presents the main definition of real estate wealth and inheritance following the System of National Accounts, which are going to be used throughout the reminder of this study. It also presents the main features of the estate multiplier method, 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

In this paper, we are concerned with net real estate wealth, but it is important begin by framing it in a more general setting. Following the concepts discussed in Piketty and Zucman (2015), which are based on the System of National Accounts balance sheet's definitions, private wealth W_t is defined as the net wealth (assets minus liabilities) of households. 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. The market value national wealth W_{nt} results from the addition of private and public wealth, and it is also equivalent to the sum of domestic capital and net foreign assets.

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

In equation 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. In general terms and 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). With Y_t being the national income, the private wealth to income ratio β_t is hence defined as:

$$\beta_t = \frac{W_t}{Y_t} \tag{2}$$

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. Intu-

itively, 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).

3.1.3 Net real estate wealth

The present study lies in broad terms within the boundaries of private wealth W_t, but in the component referred exclusively to net real estate, i.e. housing and land. We hence define the net national and private's net real estate wealth as W^r_{nt} and W^r_t respectively. When considering only real estate wealth and excluding financial wealth, it is no longer true that the household sector owns the corporate sector, and so it is necessary to distinguish between them and bare in mind that household's net real estate wealth W^r_{ht}, is a fraction of W^r_t.

By the same token, we define β^r_{nt}, β^r_t and β^r_{ht}, as national, private and household's net real estate wealth to income ratios. As for inheritance, the net real estate inheritance flow is b^r_y, while the stock φ^r is the real estate inheritance stock in aggregate household's real estate wealth. Note that, in this case, equation 6 needs to consider the capital share α and savings s from households and not from the whole economy. Moreover, ideally we should only account for the share of household's savings rate destined to real estate. Taking this into account, we define household's capital share as α_h and household's real estate's savings rate as s^r_h. The equivalent of equation 6 for real estate's of the household sector is thus depicted in equation 7.

$$\varphi^r = \frac{b^r_y}{b^r_y + (1 - \alpha^h) \cdot s^r_h} \tag{7}$$

3.2 The estate multiplier method

3.2.1 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.

3.2.2 The adapted 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. 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 net 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 net 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 net 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}.

Essentially, by weighting all individuals by the same mortality rate and the same parameter μ we are leaving wealth distribution unchanged, while at the same time adjusting individual wealth so that it corresponds to adult population and aggregate household real estate wealth, hence allowing to compute top wealth shares. To be sure, this procedure is far from ideal, but it allows us to compute top real estate shares while correcting for the main concern of the estate multiplier method, i.e. that the decedent population is likely to be wealthier than the average living population as a result of life-time accumulation.

4 Data

As discussed in section 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 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.

4.1 Cadastre 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 4.3), 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).

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.2, 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.3. 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.[3]

[3]The country is divided in 19 departments. Evolution of cadastral aggregate value for all of them is depicted

4.2 Owner's decedents data

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.4. 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 cadastral data.

Between 5.500 and 8.800 individuals are present in the owner decedents data base, as depicted in Table A.2. 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.

4.3 The unified real estate-decedents database

Recalling the discussion of section 3, it follows that the basic input required is a data set with deceased individuals and the net 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 hereafter.

4.3.1 Merging the data

In order to construct a data set with individual net 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.5: the department, the locality within the department and the number of the property.[4] 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 (see example in Figure A.5). When the

in Figure A.8, showing no discontinuities.

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

two data sets are merged based on these variables, 78-80% of dead individuals in DGR's raw data are merged (see Figure A.6), corresponding to 72% of rural owner-property observations and 84% of urban owner-property observations.

As depicted in Figure A.6, 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.

4.3.2 Adjusting the data

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

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, more on this in section 5). 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 basis.[5] 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.[6] When computing aggregate urban and rural real estate at market prices with the aggregate cadastral values, the resulting adjustment ratios, depicted in Figure A.7, 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.[7] 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

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

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

[7] 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.

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 (Alvaredo et al., 2016)). 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 estimation, 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[8], 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 approximaetelly 30% of decedents accumulated their wealth individually, a 70-30 split was performed to the data: the real estate of 70% of individuals was divided by 2, and for the remaining 30% it was left unchanged. Results reported are the average of 100 random draws from a Bernoulli distribution with these probabilities.

One last adjustment to the value of the properties was performed in order to account for net real estate wealth. Based on the household wealth survey it can be estimated that total mortgages represent 4% of household's real estate value, so a 96% adjustment to individual's wealth was done in order to account for debts.

5 Total and inherited real estate wealth

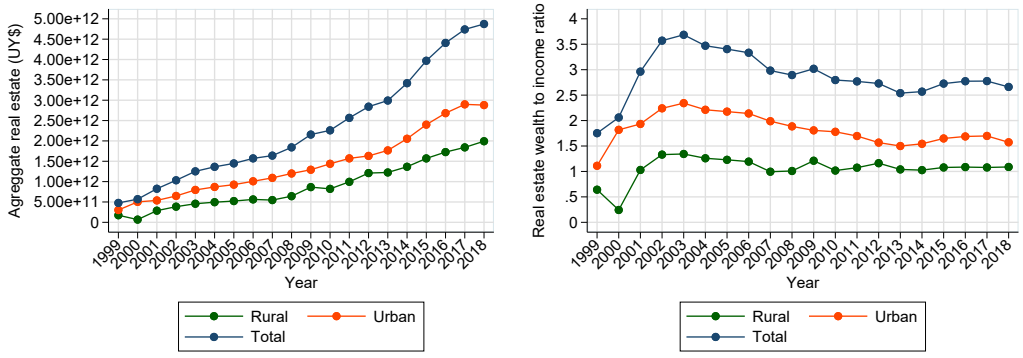
In this section the level and composition of net real estate wealth are presented, as well as estimates of the inheritance flow and the likely inherited stock of real estate wealth. The first part is important in its own right, as well as novel, but is in this context instrumental since it provides the wealth control total necessary for real estate distribution estimates discussed in section 6. On the other hand, estimations of inheritance flows and stock are one of the main objectives of this study and allow to dialogue with the literature discussed in 2.1.

[8]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.

5.1 The level and composition of net real estate wealth

Aggregate net real estate wealth in absolute terms W^r_{nt} and as percentage of national income β^r_{nt} are depicted Figure 1. This is the result of adjusting net cadastral value to market prices as discussed on section 4.3.2, and as it does not depend on the decedent data set, a 1999-2018 can be constructed. After an initial increase of β^r_{nt} 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 2.5-3. This means that net aggregate real estate represents between 250 and 300% of national income, which fit within the range of available estimates (Piketty and Zucman, 2014; Atkinson, 2018).

Figure 1: Aggregate net real estate wealth



(a) Aggregate net real estate wealth W^r_{nt}. (b) Real estate wealth as a % of NI β^r_{nt}.

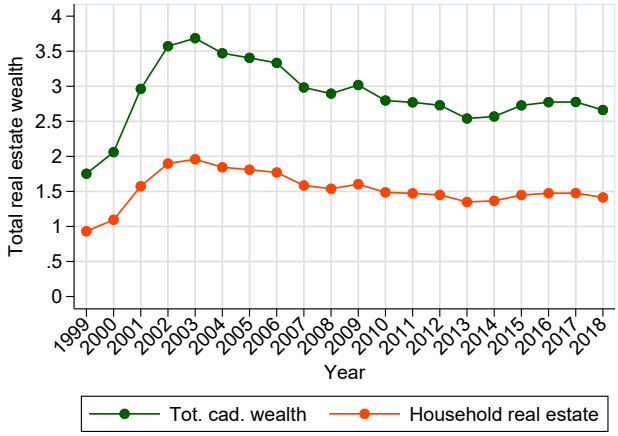
Note. Based on Cadastre data from DNC, corrected by market prices adjustment presented in Figure A.7. Market price adjustment ratios of 15% for rural properties and 40% for urban prices were used for years with no available estimates. Total, urban and rural net real estate aggregate value at market prices depicted.

What is perhaps more interesting is the fact that 30-40% of real estate wealth is rural real estate. Housing is around 1.5 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).

This net national real estate wealth, however, is not the control total we need for distributional purposes. It is necessary to establish which share of that is household's net real estate, that is, we need to distinguish between β^r_{nt} and β^r_{ht}. This is done by computing aggregate net real estate wealth based on the household wealth survey for 2013 relative to private wealth (that is, the ratio of β^r_{ht} and β^r_{nt}), and applying the share of real estate wealth that year to the whole series, and therefore assuming the ratio is stable over time. In 2013, the ratio was approximately 55%, entailing a household's net real estate to income ratio of 1.5. The remaining

real estate wealth, equivalent to 100% of national income, is distributed between government, corporate sector and the rest of the world. The resulting estimated evolution of β^r_{nt} and β^r_{ht} are depicted in Figure 2.

Figure 2: National and Household's real estate wealth.



Note. Based on Cadastre data from DNC, corrected by market prices adjustment depicted in Figure A.7. Household's net real estate share in national net real estate is approximately 55%, based on household wealth survey.

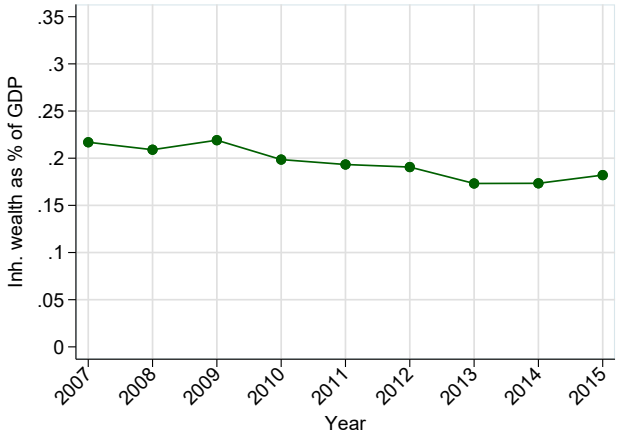
5.2 Inherited net real estate wealth

5.2.1 The flow of inherited real estate wealth

From the decedent-real estate data base, it is straightforward to compute the flow of net real estate wealth as a share of national income b^r_y, which is depicted in Figure 3, showing that is on average 20% and slightly decreasing. Two comments are worth making. First, the 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.6. Therefore, the first years of the series, probably until 2011, are more reliable. Second, a 20% inheritance flow is a relatively high one. Most of the estimations for the rich world are around 10-15%, although rising in all cases, as discussed in section 2. Moreover, we are only considering real estate inheritance, so if we were to consider other types of inheritance this flow is likely to be higher.

How to make sense of this high inheritance flow? The inheritance flow in the present similar to what rich countries had prior to the wealth destroying shocks of the first half of the XXth century. Uruguay did not withstood any shock of a magnitude similar to those massive wealth destruction, and that may be one of the explanations why the flow is high. Moreover, the low growth world envisioned by Piketty for the XXIst century has been the reality of the south for most of the second half of the last century, particularly in Uruguay, a country which

Figure 3: Inherited real estate flow (b_y^r)



Note. Based on DGR and DNC merged data, adjusted to market prices.

presents an average GDP growth under 2% from 1960-2007.[9] Thus, the combination of low growth and absence of wealth destroying shocks is perfectly consistent with the high inheritance flows found.

5.2.2 The stock of inherited real estate wealth

Is it possible to say anything about the stock of inherited real estate wealth φ^r? Equation 7 provides a way to compute an approximate of this stock based on estimations 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^r based on the estimated $b_y = 20\%$ and the following parameters: (i) the household's capital share of $\alpha_h = 8.5\%$ and (ii) household's real estate's savings rate of $s_h^r = 7.5\%$, based on the following. First, α_h is taken from estimations based on a combination of tax records and household surveys (Burdín et al., 2020) and refer to an an average of the 2009-2016 period. By using it to compute equation 7, the key assumption is that this average was stable during the previous 30-year period. Second, s_h^r is an average of household's savings rate of the last two spending's household surveys of 2006 and 2016-17.[10] In this case, on top of assuming relative stability of this saving rate, we are also assuming that all savings are destined to real estate. This is likely to overestimate the relevant savings rate, but may not be as problematic in the Uruguayan setting, since financial assets' are extremely low, reaching only 5-6% of total assets even in fifth's income quintile households, according to 2013's wealth household's survey (Ferre et al., 2016).

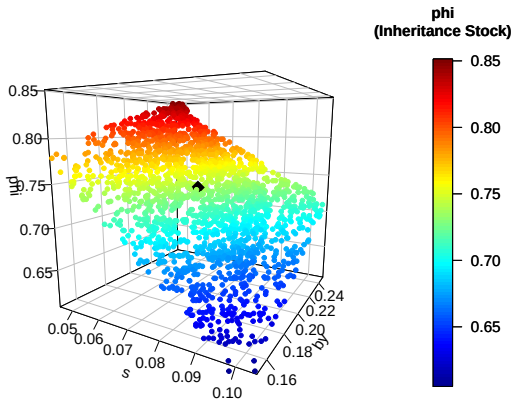
The preceding assumptions underline the highly approximate nature of this exercise. It

[9] See https://data.worldbank.org/

[10] See http://www.ine.gub.uy/engih2016.

should be stressed that this inheritance stock is by no means an accurate estimation of φ^r, but it intends to show that, within available and reasonable parameters, the estimated inheritance flow b_y^r is consistent with this high inheritance stock. To further show this, in Figure 4 a sensitivity analysis is performed, allowing for variations in the inheritance flow b_y^r ($\pm$ 4%) and savings rates s ($\pm$ 3%). In all cases, the stock of inherited wealth is well above 60%, and may reach over 80%, i.e. closer the Kotikloff and Summers' side in the Kotikloff-Summers-Modigliani controversy discussed in section 2.

Figure 4: φ^r sensitivity analysis



Note. Own calculations based on 1000 draws taken from b_y and s in depicted ranges ($\alpha = 40\%$ fixed). The sensitivity analysis indicates that the inheritance stock lies within 65-85%. The black dot represents the point estimation found in this article.

An inheritance real estate stock of over 70% is substantially higher than the 33% estimated by Agustoni and Lasarga (2019) and commented in section 2. This is not surprising, since that estimation is 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. Therefore, taking both estimates as true, it is possible to say that over two thirds of real estate wealth was inherited, while almost a quarter of it was directly inherited. Moreover, this stock of inherited real estate wealth φ^r is higher than inherited stocks φ calculated for rich countries, which lie between 50-60% (and rising) as discussed in section 2. An evident source of differences refers to the fact that we are considering only real estate wealth's inheritance in this study, as opposed to total wealth. It

is likely to be the case that, in the case of real estate wealth, inheritance stock is higher since accumulation may be lower than, for instance, financial accumulation. MORE

6 The distribution of net real estate wealth

This section presents estimations for net real estate wealth from two different perspectives. First, it discusses the geographical distribution of wealth, as a continuation of the macro-economic approach of the preceding section, i.e. accounting for the totality of national net real estate wealth. In the second part, the main estimates for personal net real estate distribution are presented, from a purely micro-economic viewpoint. In all cases, rural and urban real estate are distinguished and discussed.

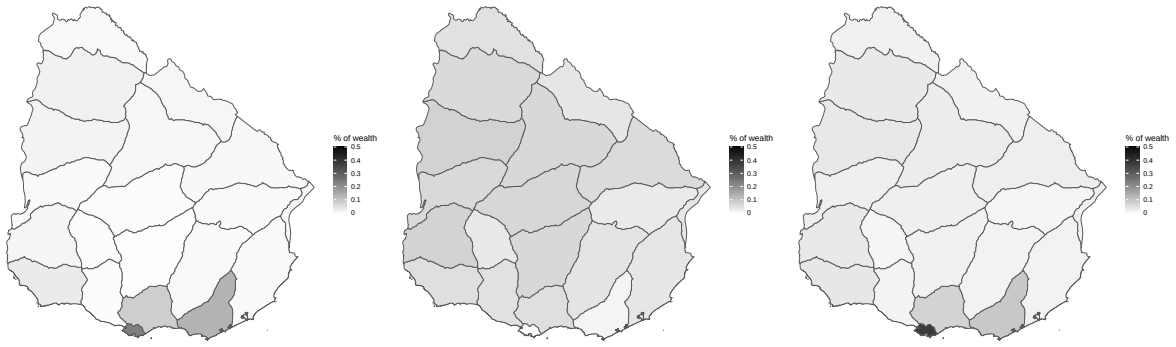
6.1 The geographical distribution of wealth

To estimate the geographical distribution of wealth, we depart from market-prices adjusted cadastral data discussed in section 4. This data reflects market-price net real estate wealth for the universe of rural and urban properties, regardless of the institutional sector who owns them, and so the distribution will refer in all cases to aggregate W^r_{nt} (see section 3).

Wealth distribution by department is depicted in Figure 5. 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.9. 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 6 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,

Figure 5: Net real estate wealth by department

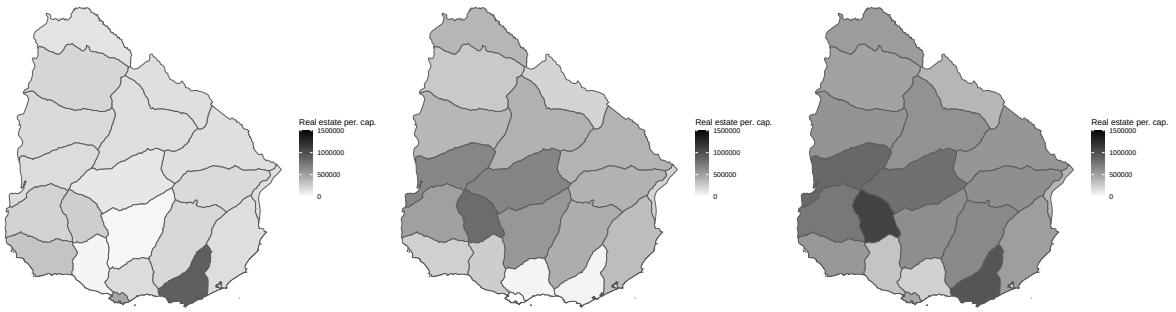


(a) Urban (b) Rural (c) Total

Note. Source: Table A.3. Based on Cadastre data from DNC adjusted to market prices. 2015 values. Remaining years present very similar distribution.

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 6: Per capita real estate wealth by department



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

Note. Source: Table A.4. Based on Cadastre data from DNC, 2015 values and population from 2011 census. Remaining years present very similar distribution.

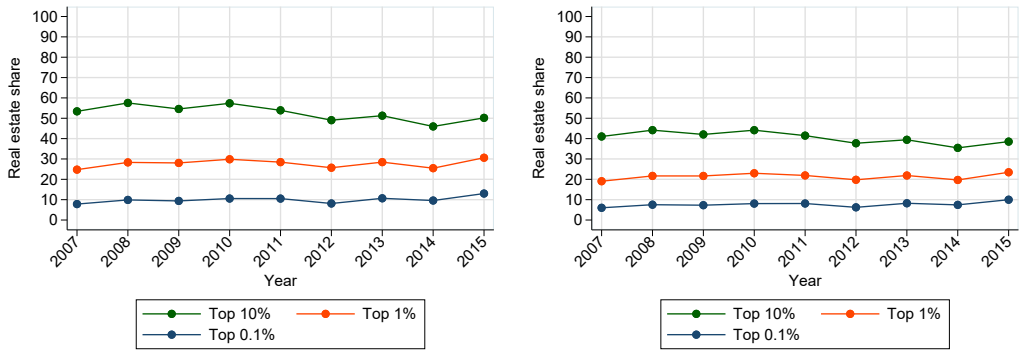
6.2 The personal distribution of wealth

To estimate the personal distribution of net real estate household wealth as discussed in section 3.2, we depart from the real estate-decedents database elaborated following the procedure discussed in 4.3. 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 net real estate wealth of individuals 78 and older (Uruguay's life expectancy) is divided by the equivalent of younger individuals. This procedures provides a $\mu = 1.46$, remarkably 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 wealth discussed in section 5.1, the estimation of top net real estate wealth shares is straightforward. Panel (a) of Figure 7 presents the 70-30 criterion of household wealth adjustment, while panel (b) depicts the lower-bound equal-split estimations (see section 4.3.2). Lower-bound estimations show that real estate wealth top 10%'s share is around 40%, top 1%'s share is 20%, while top 0.1% is almost 10%. Estimations under the 70-30 split less restrictive assumption, shows a top 10% of 50-60%, top 1% of 30% and top 0.1% of approximately 10%. It is interesting to note that lower-bound estimations are remarkably close to capitalization method based estimates of real estate wealth (De Rosa, 2019), while the less restrictive ones are very close to wealth survey based estimates found by previous studies (Agustoni and Lasarga, 2019; De Rosa, 2019). Thus, it is highly likely that the true distribution lies somewhere within this range.

Figure 7: Net real estate distribution (upper and lower bounds)



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

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

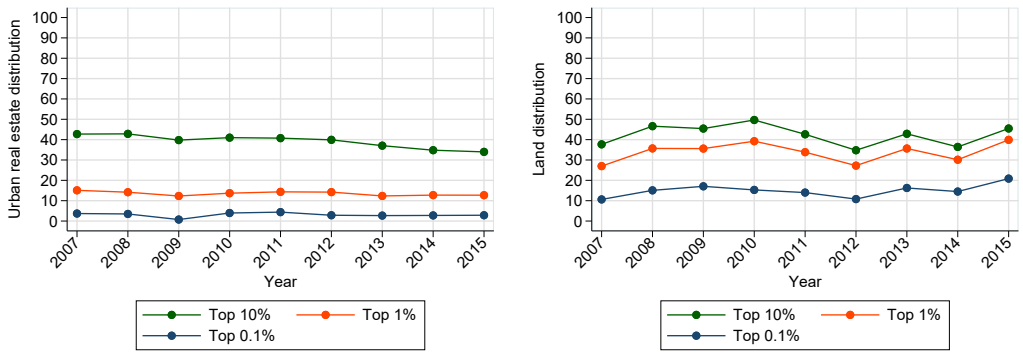
Note. Based on DGR and DNC merged data. Decedent's wealth "expanded" based on *average* mortality rate and considering a decedents/adult population wealth ratio of 1.46, computed based on wealth survey.

Another remark involves the downward trend visible in top 10%'s share and the relative stability of the remaining fractiles. Given the documented attrition of the decedents data set already commented and depicted in Figure A.6, it does not seem safe to risk any clear-cut conclusions regarding inequality trends, especially in such a short period of time. Extending these estimates over a longer time-span under study is highly relevant to get a clearer picture.

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 we only have around 20% of decedents in our owner-decedents registry, as discussed above and depicted in Figure A.6. 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).

Lower bound estimations for rural and urban real estate top shares are presented in Figure 8. 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.10. Rural distribution shows significantly higher concentration, especially in top fractiles. Top 1%'s share is as high as 30-40%, while top 0.1% is around 10-20%. This estimates, although very high, indicate that the level of land concentration is far lower than what was reported for other Latin American countries by Bauluz et al. (2020), with top 10% shares exceeding 60%. It is worth noting that these estimates are closer upper bound 70-30 criterion depicted in Figure A.11.

Figure 8: 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 1.46, computed based on wealth survey. Equal-split lower bound estimates.

7 Concluding remarks

It has been clear for a long time now that in order to understand overall economic inequality, it is not enough to analyze income distribution, but that one needs to also understand wealth accumulation and its distribution. Moreover, given the dynamic nature of wealth inequality and, in particular, the inter-generational transmission of wealth, inheritance needs to be part of the equation as well. However, accounting for these key dimensions of inequality is as important as it is tricky.

To be sure, results presented here are to be considered exploratory. They show, at best, the potential the data gathered has to inform us about central dimensions of wealth accumulations, transmission and distribution that we completely ignored so far. Further work is still required to make the preliminary conclusions drawn here more robust. That being said, they do represent one of the first systematic efforts to estimate inheritance and wealth distribution for a poor country, at least in its real estate form.

The estimations presented fit well within orders of magnitude of available estimates of rich countries. However, they tend to be closer to what is expected to find in those countries prior to World War I. This is the case, at least, for the real estate to income ratio, for the share of land in aggregate real estate and for the inheritance stock. Some hypothesis to explore include whether this can be seen simply as the results of a developing path that is arriving one hundred years later; or if it actually reflects something similar to a steady state long run equilibrium to which the rich world is heading to after the slow recovery of the early XX^{th} century shocks; or a taste of how the low growth and high relative importance of past accumulation forecasted for the XXI^{th} century could look like, which are some of the characteristics of Uruguay and most of the poor world have experienced for most of the last sixty years.

Whatever the explanation, it is clear that further work is still required to extend this in at least three directions: including more types of wealth, expanding the time span under analysis and improving the quality of the estimates. For the last point, at least two important tasks are still unfinished. First, it is necessary to acquire data on the characteristics of the decedent population to be able to properly perform the estate multiplier method. This may be done in the future by merging decedents' registry data with death certificates. Second, it is necessary to improve the estimates of aggregate real estate wealth, and make them consistent with a more general estimation of the full balance sheet of the country. Advancing in these directions would improve the quality of the estimates presented here and hence provide the first comparable estimates of inheritance and its role in shaping wealth distribution for a developing country.

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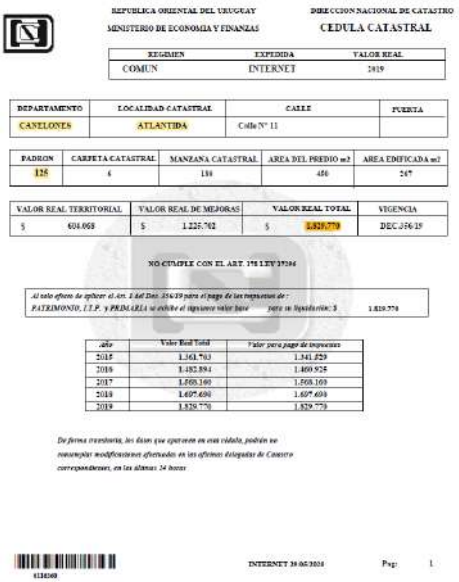
A Appendix

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	188	456	247

VALOR REAL TERRITORIAL	VALOR REAL DE MEJORAS	VALOR REAL TOTAL	VIGENCIA
$ 604.068	$ 1.225.702	$ 1.829.770	DIC 2019

NO CUMPLE CON EL ART. 198 LEY 19.996

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

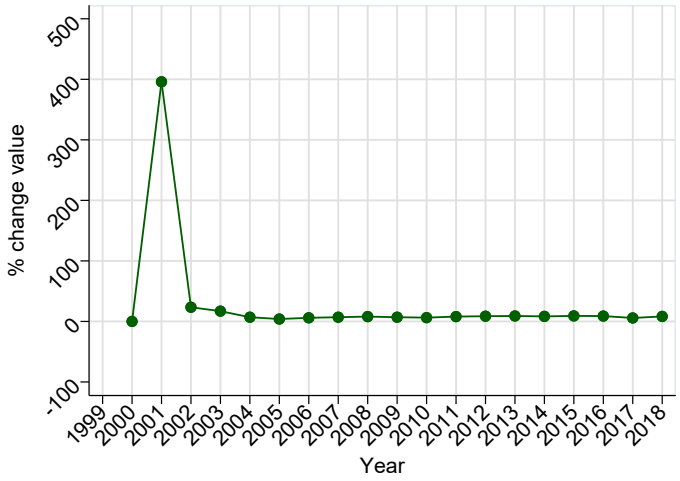
Año	Valor Real Total	Valor para pago de impuestos
2015	1.361.703	1.341.529
2016	1.382.884	1.469.926
2017	1.568.160	1.568.160
2018	1.607.690	1.607.690
2019	1.829.770	1.829.770

De forma transitoria, los datos que aparecen en esta cédula, podrán ser consumplar modificaciones efectuadas en las oficinas delegadas de Catastro correspondientes, en las últimas 24 horas

INTERNET 30/05/2024 Pag: 1

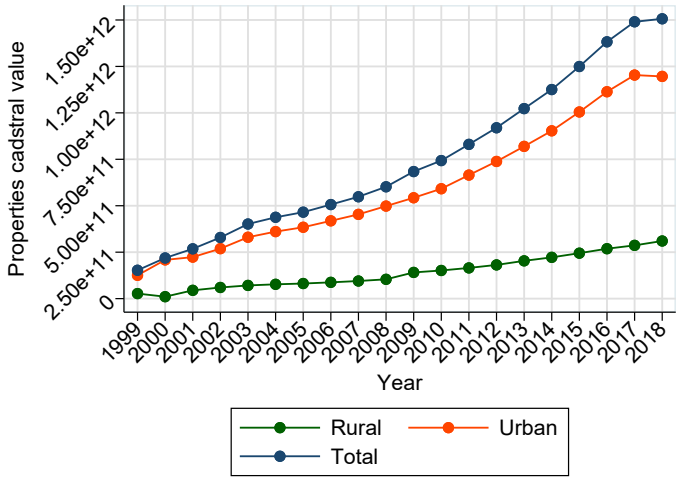
Note. Screenshot from *geoCatastro*, MEF. Raw data of *Cédula Catastral*. http://visor.catastro.gub.uy/visordnc/.

Figure A.2: Revaluation example



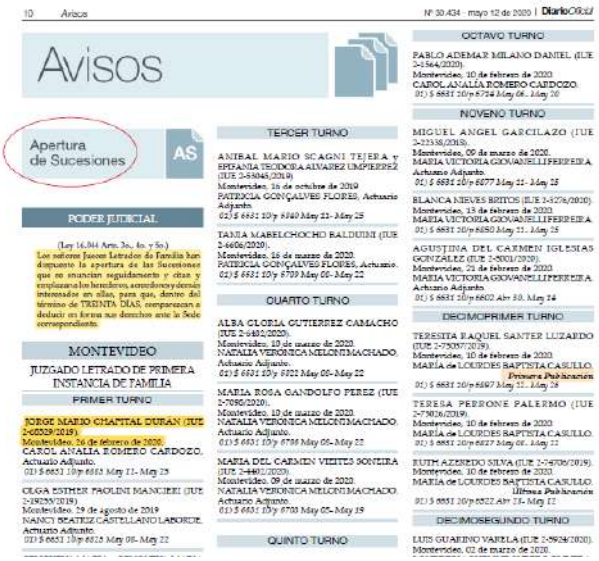
Note. Based on DNC.

Figure A.3: Aggregate Cadastre's value



Note. Based on DNC.

Figure A.4: Opening of inheritance process



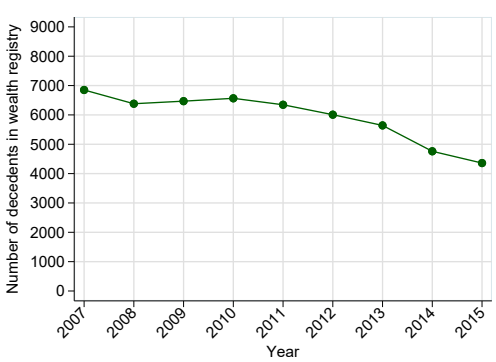
Note. Screenshot from *Diario Oficial*, IMPO. https://www.impo.com.uy/

Figure A.5: Cadastre property identification: example by type

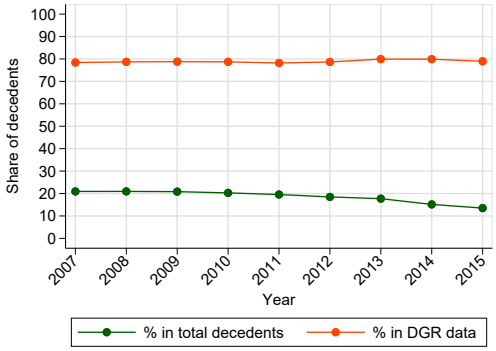
(a) Urban (b) Rural

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.6: Decedent population in merged data (2007-2015).



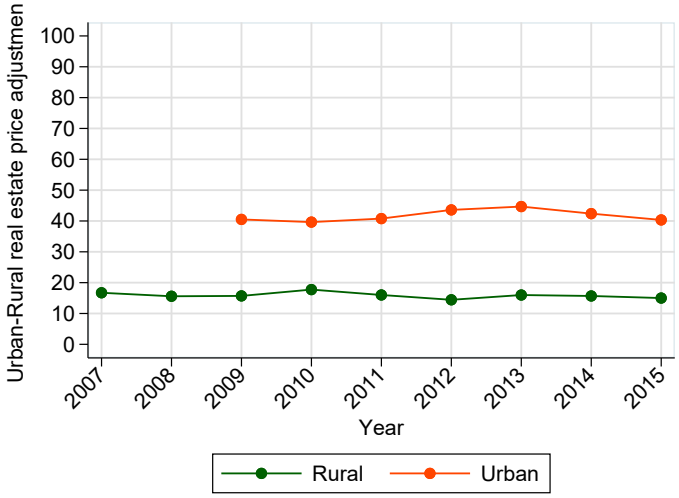
(a) Numner of owner decedents.



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

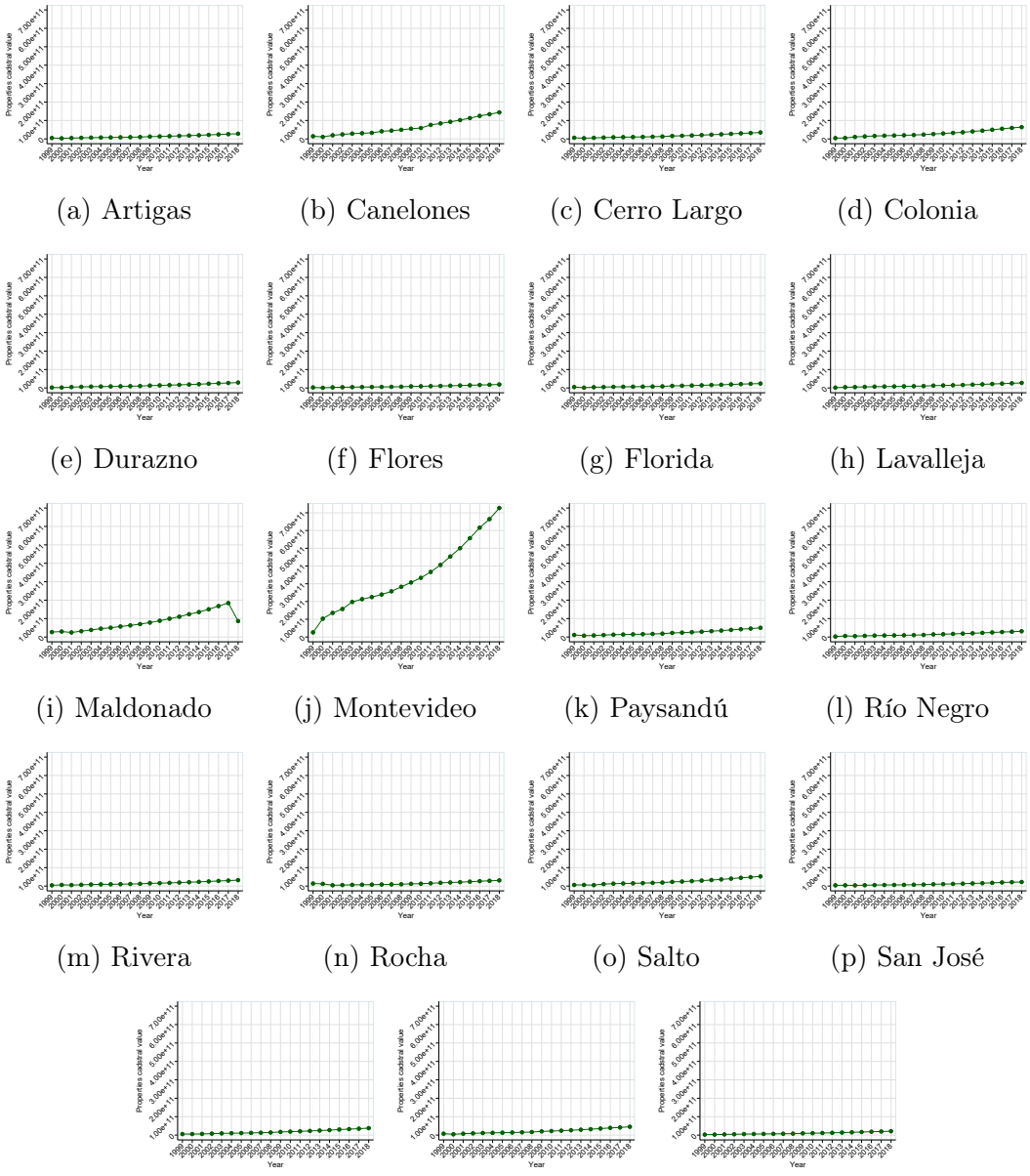
Note. Based on DGR, DNC and INE's total decedents number. Panel (a) presents the absolute number of individuals in the decedents-real estate merged data set. Panel (b) depicts the share of individuals in the merged decedents-real estate in total decedents and in the total number of decedents in DGR raw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

Figure A.7: Cadastre's market price adjustment



Note. Based on Cadastre data from DNC, urban market prices from INE and rural market prices from MGAP.

Figure A.8: Cadastral aggregate value by department



(a) Artigas (b) Canelones (c) Cerro Largo (d) Colonia

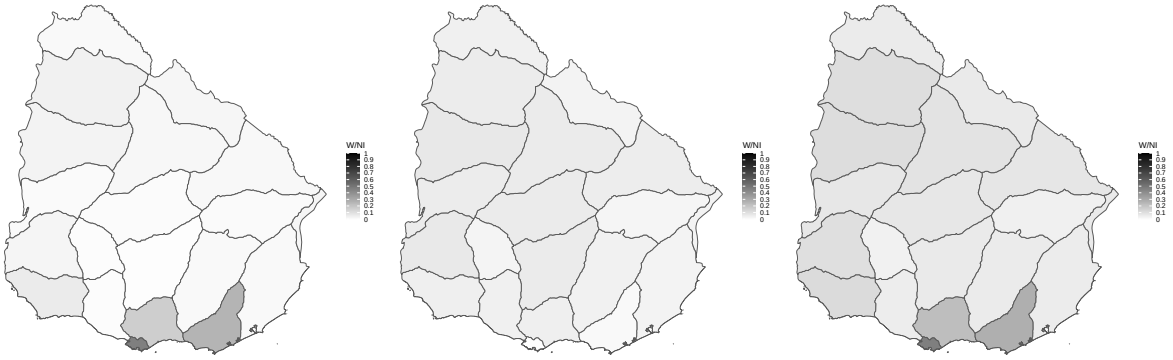
(e) Durazno (f) Flores (g) Florida (h) Lavalleja

(i) Maldonado (j) Montevideo (k) Paysandú (l) Río Negro

(m) Rivera (n) Rocha (o) Salto (p) San José

(q) Tacuarembó (r) Soriano (s) 2010 - top 1%.

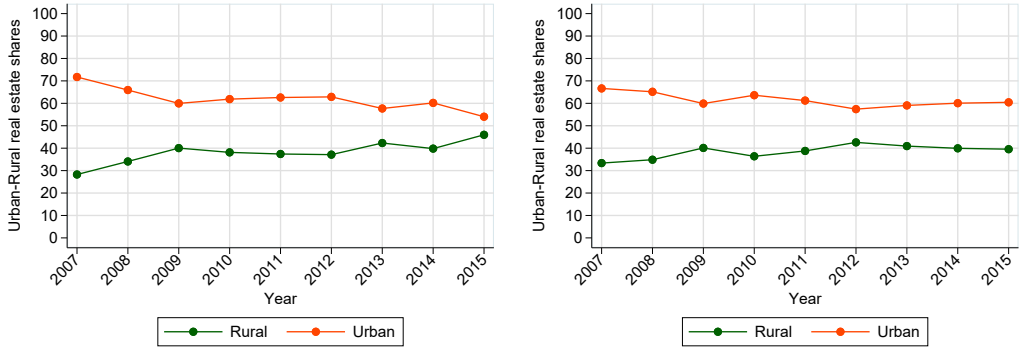
Figure A.9: Wealth to income ratio by department



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

Note. Source: Table A.5. Based on Cadastre data from DNC, 2015 values and population from 2011 census. Remaining years present very similar distribution.

Figure A.10: Cadastre's urban & rural wealth



(a) Cadastre-Decedents merged data set (b) Cadastre's data set

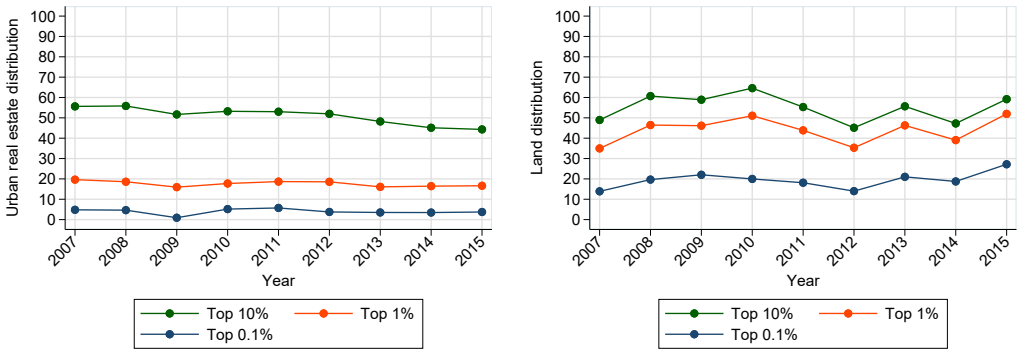
Note. Based on Cadastre data from DNC and merged data set. All values adjusted to market prcies.

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.11: 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 1.46, computed based on wealth survey. Upper bound 70-30 criterion estimates.

Table A.2: 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 data.

Table A.3: Net real estate shares by department and year

		1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total	Canelones	11%	5%	7%	7%	7%	7%	7%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%
	Maldonado	14%	13%	8%	8%	8%	8%	9%	9%	10%	10%	9%	10%	10%	9%	9%	9%	10%	10%	10%	5%
	Rocha	9%	5%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	3%	3%	2%	2%	2%	2%	3%
	Treinta y Tres	1%	1%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
	Cerro Largo	6%	2%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
	Rivera	2%	4%	3%	3%	3%	3%	3%	3%	2%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
	Artigas	5%	1%	3%	3%	2%	2%	2%	2%	2%	2%	3%	2%	3%	3%	3%	3%	3%	3%	3%	3%
	Salto	3%	3%	2%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
	Paysandú	9%	3%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
	Río Negro	1%	5%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
	Soriano	7%	2%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
	Colonia	2%	2%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	5%
	San José	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
	Flores	3%	0%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
	Florida	5%	1%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
	Lavalleja	1%	3%	3%	3%	2%	2%	2%	2%	2%	2%	3%	2%	2%	3%	3%	2%	2%	2%	2%	3%
	Durazno	1%	1%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
	Tacuarembó	5%	5%	4%	3%	3%	3%	3%	3%	3%	3%	4%	3%	4%	4%	4%	4%	4%	3%	3%	4%
	Montevideo	13%	44%	40%	37%	38%	38%	37%	37%	38%	37%	34%	36%	34%	32%	33%	34%	34%	34%	34%	37%
Rural	Canelones	15%	0%	6%	5%	5%	5%	5%	6%	6%	6%	6%	6%	6%	6%	5%	5%	5%	5%	5%	5%
	Maldonado	0%	0%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
	Rocha	7%	0%	5%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
	Treinta y Tres	0%	0%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
	Cerro Largo	11%	0%	7%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
	Rivera	0%	19%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
	Artigas	9%	0%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
	Salto	0%	0%	0%	7%	6%	6%	6%	6%	6%	6%	7%	7%	6%	7%	6%	6%	6%	7%	7%	7%
	Paysandú	15%	0%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%
	Río Negro	0%	30%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	6%	6%	6%
	Soriano	13%	0%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	7%	7%
	Colonia	0%	0%	6%	6%	6%	6%	6%	6%	6%	6%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
	San José	0%	0%	6%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
	Flores	7%	0%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
	Florida	12%	0%	8%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%
	Lavalleja	0%	21%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
	Durazno	0%	0%	8%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%
	Tacuarembó	12%	30%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%
	Montevideo	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	2%	2%	2%	2%	3%	3%
Urban	Canelones	8%	5%	8%	8%	8%	7%	7%	9%	9%	9%	9%	8%	10%	10%	10%	10%	10%	10%	10%	11%
	Maldonado	21%	14%	11%	11%	11%	12%	13%	13%	13%	14%	14%	14%	14%	14%	15%	14%	14%	15%	15%	7%
	Rocha	9%	6%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
	Treinta y Tres	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
	Cerro Largo	3%	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
	Rivera	3%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	1%	1%	1%	1%	2%
	Artigas	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
	Salto	5%	3%	2%	3%	3%	2%	3%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	3%
	Paysandú	6%	3%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
	Río Negro	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
	Soriano	3%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
	Colonia	3%	2%	4%	4%	4%	4%	4%	4%	4%	4%	3%	4%	4%	4%	4%	4%	4%	4%	4%	4%
	San José	3%	2%	0%	1%	0%	1%	0%	0%	0%	1%	0%	1%	0%	0%	1%	1%	1%	1%	1%	1%
	Flores	1%	0%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
	Florida	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	Lavalleja	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
	Durazno	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
	Tacuarembó	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
	Montevideo	21%	50%	61%	59%	60%	59%	59%	57%	57%	57%	57%	56%	55%	55%	55%	55%	55%	55%	55%	60%

Note. Based on DNC data adjusted to market prices.

Table A.4: Real estate net per capita wealth by department and year (thousand UY$)

		1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total	Canelones	97	50	109	138	163	175	186	229	241	273	313	329	413	449	465	534	619	688	737	784
	Maldonado	394	434	383	490	594	700	775	876	960	1.072	1.197	1.358	1.502	1.582	1.717	1.973	2.302	2.588	2.838	1.415
	Rocha	606	421	278	348	412	455	480	522	524	597	755	740	909	1.088	1.104	1.242	1.445	1.603	1.716	1.858
	Treinta y Tres	135	141	333	418	495	537	566	607	609	697	885	876	1.020	1.195	1.216	1.365	1.573	1.731	1.839	1.991
	Cerro Largo	317	106	305	382	454	496	526	564	571	655	834	824	964	1.136	1.148	1.291	1.484	1.633	1.743	1.891
	Rivera	94	220	204	255	313	339	356	383	391	448	558	559	644	745	758	854	984	1.084	1.160	1.260
	Artigas	298	98	284	358	426	461	492	530	532	612	786	770	906	1.078	1.082	1.213	1.402	1.549	1.675	1.825
	Salto	118	120	101	336	397	430	457	492	501	568	707	712	822	945	968	1.104	1.280	1.425	1.534	1.666
	Paysandú	379	153	312	392	465	505	538	574	579	662	834	828	964	1.122	1.142	1.283	1.481	1.632	1.745	1.900
	Río Negro	113	482	438	574	680	742	779	839	842	975	1.265	1.231	1.468	1.730	1.741	1.958	2.254	2.466	2.622	2.842
	Soriano	406	132	404	508	601	650	687	740	743	850	1.077	1.068	1.246	1.460	1.481	1.673	1.925	2.123	2.253	2.451
	Colonia	85	97	301	376	445	482	506	542	557	631	748	782	894	1.005	1.048	1.196	1.387	1.540	1.659	1.788
	San José	90	92	179	223	263	284	298	315	312	360	470	456	541	645	648	725	836	928	995	1.060
	Flores	562	84	599	744	880	960	1.008	1.086	1.076	1.236	1.595	1.567	1.839	2.174	2.198	2.487	2.855	3.159	3.366	3.655
	Florida	379	61	349	435	515	556	588	629	612	710	943	902	1.080	1.297	1.298	1.446	1.662	1.827	1.949	2.093
	Lavalleja	69	317	351	440	524	567	595	638	643	740	934	926	1.082	1.267	1.286	1.446	1.663	1.824	1.948	2.114
	Durazno	93	94	444	558	660	709	747	808	793	914	1.153	1.122	1.344	1.595	1.602	1.794	2.112	2.343	2.486	2.693
	Tacuarembó	290	296	323	401	476	516	548	589	592	677	864	855	1.003	1.180	1.181	1.330	1.543	1.685	1.810	1.962
	Montevideo	47	189	248	288	361	389	411	437	470	516	554	614	656	680	756	878	1.026	1.145	1.235	1.351
Rural	Canelones	49	0	31	40	48	52	54	61	59	74	100	95	114	138	126	141	161	176	187	190
	Maldonado	-	0	34	43	51	56	60	65	64	76	103	98	120	148	146	162	187	205	220	239
	Rocha	190	0	195	244	288	319	336	360	348	406	548	522	633	770	762	847	969	1.060	1.134	1.229
	Treinta y Tres	-	-	228	289	343	373	394	425	413	483	656	625	754	922	922	1.025	1.180	1.296	1.375	1.492
	Cerro Largo	217	-	223	278	331	361	384	411	405	473	640	610	735	893	886	987	1.133	1.244	1.327	1.441
	Rivera	-	121	124	156	185	202	213	230	226	266	363	344	415	507	502	558	642	705	754	818
	Artigas	206	1	210	266	316	342	368	397	388	454	617	585	709	872	861	957	1.104	1.216	1.317	1.436
	Salto	-	-	-	201	237	256	271	292	283	331	451	429	518	631	628	710	817	900	965	1.046
	Paysandú	227	-	213	268	319	348	368	393	382	447	604	575	694	840	836	928	1.064	1.165	1.236	1.344
	Río Negro	-	362	366	461	548	600	631	682	661	778	1.055	999	1.218	1.472	1.464	1.629	1.874	2.045	2.170	2.349
	Soriano	284	-	288	361	427	461	485	524	510	594	802	763	922	1.125	1.117	1.248	1.431	1.572	1.664	1.809
	Colonia	-	-	144	180	212	228	239	255	247	288	384	365	443	538	533	593	679	745	793	860
	San José	-	-	155	193	227	244	255	272	262	305	410	389	470	570	566	628	719	788	841	914
	Flores	468	-	473	588	696	752	789	847	817	952	1.290	1.231	1.483	1.809	1.801	2.029	2.323	2.548	2.711	2.945
	Florida	318	-	325	404	478	516	547	585	564	657	886	840	1.015	1.230	1.224	1.361	1.562	1.715	1.828	1.981
	Lavalleja	-	242	247	310	371	400	420	449	438	517	697	664	802	980	977	1.090	1.250	1.367	1.459	1.584
	Durazno	-	-	379	477	565	606	639	693	668	778	1.002	953	1.162	1.408	1.400	1.556	1.835	2.035	2.156	2.334
	Tacuarembó	223	225	236	293	348	377	400	431	419	489	663	632	765	934	915	1.021	1.180	1.298	1.398	1.517
	Montevideo	-	-	-	-	-	-	-	-	-	-	-	-	-	-	22	25	28	32	35	39
Urban	Canelones	48	50	79	98	115	123	132	168	182	199	213	234	299	312	339	394	458	512	550	595
	Maldonado	394	434	350	447	542	644	715	811	896	996	1.094	1.260	1.381	1.434	1.571	1.811	2.115	2.382	2.618	1.177
	Rocha	416	421	84	105	123	137	144	162	175	191	207	218	276	318	342	395	475	543	582	628
	Treinta y Tres	135	141	105	130	152	164	172	182	196	214	228	251	266	273	294	339	393	436	463	499
	Cerro Largo	99	106	83	104	123	135	142	153	166	182	194	214	229	242	262	304	351	390	415	451
	Rivera	94	99	79	99	128	137	143	153	165	182	195	214	229	238	256	295	342	379	406	442
	Artigas	92	97	74	93	110	119	124	134	144	158	168	185	198	205	220	255	298	334	358	390
	Salto	118	120	101	135	160	173	186	200	218	238	257	283	304	314	340	395	463	524	568	620
	Paysandú	152	153	99	124	146	157	170	182	196	215	230	253	270	282	306	355	417	466	509	556
	Río Negro	113	120	72	113	131	142	148	157	181	197	210	232	250	257	277	330	381	422	451	492
	Soriano	122	132	116	147	173	189	201	215	233	256	275	305	324	335	364	425	494	551	589	642
	Colonia	85	97	156	196	233	254	267	287	311	343	364	417	451	467	515	603	708	796	867	928
	San José	90	92	24	30	37	40	43	43	50	55	60	66	72	75	82	97	118	140	154	146
	Flores	94	84	126	156	184	208	219	239	259	284	305	336	356	365	397	457	533	610	654	711
	Florida	61	61	24	30	37	40	42	45	48	53	56	62	65	67	73	85	100	112	121	112
	Lavalleja	69	75	104	130	153	167	175	189	205	223	237	262	280	287	309	356	413	457	489	529
	Durazno	93	94	64	81	96	103	108	115	125	136	151	170	181	187	202	238	277	308	330	359
	Tacuarembó	67	70	87	108	128	139	147	158	172	188	201	223	238	246	266	309	363	386	412	445
	Montevideo	47	189	248	288	361	389	411	437	470	516	554	614	656	680	733	853	997	1.113	1.199	1.312

Note. Based on DNC data adjusted to market prices.

Table A.5: Real estate to income ratio by department and year

		1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total	Canelones	0,19	0,09	0,20	0,25	0,25	0,23	0,23	0,25	0,23	0,22	0,23	0,21	0,23	0,22	0,21	0,21	0,22	0,23	0,22	0,22
	Maldonado	0,24	0,26	0,23	0,28	0,29	0,29	0,30	0,31	0,29	0,28	0,28	0,28	0,27	0,25	0,24	0,24	0,26	0,27	0,27	0,13
	Rocha	0,15	0,10	0,07	0,08	0,08	0,08	0,08	0,08	0,06	0,06	0,07	0,06	0,07	0,07	0,06	0,06	0,07	0,07	0,07	0,07
	Treinta y Tres	0,02	0,02	0,06	0,07	0,07	0,07	0,06	0,06	0,05	0,05	0,06	0,05	0,05	0,06	0,05	0,05	0,05	0,05	0,05	0,05
	Cerro Largo	0,10	0,03	0,09	0,11	0,11	0,11	0,10	0,10	0,09	0,09	0,10	0,09	0,09	0,09	0,08	0,08	0,09	0,09	0,09	0,09
	Rivera	0,04	0,08	0,08	0,09	0,10	0,09	0,09	0,08	0,07	0,07	0,08	0,07	0,07	0,07	0,07	0,07	0,07	0,07	0,07	0,07
	Artigas	0,08	0,03	0,07	0,09	0,09	0,09	0,08	0,08	0,07	0,07	0,08	0,07	0,07	0,08	0,07	0,07	0,07	0,07	0,07	0,07
	Salto	0,05	0,05	0,05	0,15	0,15	0,14	0,13	0,13	0,11	0,11	0,12	0,11	0,11	0,11	0,10	0,10	0,11	0,11	0,11	0,11
	Paysandú	0,16	0,06	0,13	0,15	0,15	0,15	0,14	0,14	0,12	0,12	0,13	0,12	0,12	0,12	0,11	0,11	0,12	0,12	0,12	0,12
	Río Negro	0,02	0,10	0,09	0,11	0,11	0,10	0,10	0,10	0,08	0,08	0,10	0,08	0,09	0,09	0,08	0,08	0,08	0,08	0,08	0,08
	Soriano	0,12	0,04	0,12	0,15	0,15	0,14	0,13	0,13	0,11	0,11	0,12	0,11	0,11	0,12	0,10	0,10	0,11	0,11	0,11	0,11
	Colonia	0,04	0,04	0,13	0,16	0,16	0,15	0,15	0,14	0,12	0,12	0,13	0,12	0,12	0,12	0,11	0,11	0,12	0,12	0,12	0,12
	San José	0,04	0,04	0,07	0,08	0,08	0,08	0,08	0,07	0,06	0,06	0,07	0,06	0,06	0,07	0,06	0,06	0,06	0,06	0,06	0,06
	Flores	0,05	0,01	0,05	0,06	0,06	0,06	0,06	0,06	0,05	0,05	0,06	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05
	Florida	0,09	0,01	0,08	0,10	0,10	0,09	0,09	0,09	0,07	0,07	0,09	0,07	0,08	0,08	0,07	0,07	0,08	0,08	0,08	0,08
	Lavalleja	0,01	0,07	0,07	0,09	0,09	0,08	0,08	0,08	0,07	0,07	0,08	0,07	0,07	0,07	0,06	0,06	0,07	0,07	0,07	0,07
	Durazno	0,02	0,02	0,09	0,11	0,11	0,10	0,10	0,10	0,08	0,08	0,09	0,08	0,08	0,09	0,08	0,08	0,08	0,08	0,08	0,08
	Tacuarembó	0,10	0,10	0,10	0,12	0,13	0,12	0,12	0,11	0,10	0,10	0,11	0,10	0,10	0,10	0,09	0,09	0,10	0,10	0,10	0,10
	Montevideo	0,23	0,90	1,17	1,31	1,40	1,31	1,28	1,22	1,13	1,07	1,02	1,00	0,93	0,86	0,85	0,87	0,93	0,95	0,95	0,97
Rural	Canelones	0,09	0,00	0,06	0,07	0,07	0,07	0,07	0,07	0,06	0,06	0,07	0,06	0,06	0,07	0,06	0,05	0,06	0,06	0,06	0,05
	Maldonado	-	0,00	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02
	Rocha	0,05	0,00	0,05	0,06	0,06	0,06	0,05	0,05	0,04	0,04	0,05	0,04	0,05	0,05	0,04	0,04	0,05	0,05	0,05	0,05
	Treinta y Tres	-	-	0,04	0,05	0,05	0,05	0,04	0,04	0,04	0,04	0,04	0,04	0,04	0,04	0,04	0,04	0,04	0,04	0,04	0,04
	Cerro Largo	0,07	-	0,07	0,08	0,08	0,08	0,08	0,07	0,06	0,06	0,08	0,06	0,07	0,07	0,06	0,06	0,07	0,07	0,07	0,07
	Rivera	-	0,05	0,05	0,06	0,06	0,05	0,05	0,05	0,04	0,04	0,05	0,04	0,05	0,05	0,04	0,04	0,05	0,05	0,05	0,05
	Artigas	0,06	0,00	0,06	0,07	0,07	0,06	0,06	0,06	0,05	0,05	0,06	0,05	0,06	0,06	0,05	0,05	0,06	0,06	0,06	0,06
	Salto	-	-	-	0,09	0,09	0,08	0,08	0,08	0,06	0,06	0,08	0,07	0,07	0,08	0,07	0,07	0,07	0,07	0,07	0,07
	Paysandú	0,09	-	0,09	0,10	0,11	0,10	0,10	0,09	0,08	0,08	0,10	0,08	0,08	0,09	0,08	0,08	0,08	0,08	0,08	0,08
	Río Negro	-	0,07	0,07	0,09	0,09	0,08	0,08	0,08	0,07	0,07	0,08	0,07	0,07	0,08	0,07	0,07	0,07	0,07	0,07	0,07
	Soriano	0,09	-	0,09	0,10	0,10	0,10	0,09	0,09	0,08	0,08	0,09	0,08	0,08	0,09	0,08	0,08	0,08	0,08	0,08	0,08
	Colonia	-	-	0,06	0,08	0,08	0,07	0,07	0,07	0,06	0,06	0,07	0,06	0,06	0,06	0,06	0,05	0,06	0,06	0,06	0,06
	San José	-	-	0,06	0,07	0,07	0,07	0,06	0,06	0,05	0,05	0,06	0,05	0,05	0,06	0,05	0,05	0,05	0,05	0,05	0,05
	Flores	0,04	-	0,04	0,05	0,05	0,05	0,05	0,05	0,04	0,04	0,05	0,04	0,04	0,04	0,04	0,04	0,04	0,04	0,04	0,04
	Florida	0,08	-	0,08	0,09	0,09	0,09	0,09	0,08	0,07	0,07	0,08	0,07	0,07	0,08	0,07	0,07	0,07	0,07	0,07	0,07
	Lavalleja	-	0,05	0,05	0,06	0,06	0,06	0,06	0,06	0,05	0,05	0,06	0,05	0,05	0,06	0,05	0,05	0,05	0,05	0,05	0,05
	Durazno	-	-	0,08	0,09	0,09	0,09	0,09	0,08	0,07	0,07	0,08	0,07	0,07	0,08	0,07	0,07	0,07	0,07	0,07	0,07
	Tacuarembó	0,07	0,07	0,08	0,09	0,09	0,09	0,08	0,08	0,07	0,07	0,08	0,07	0,07	0,08	0,07	0,07	0,07	0,07	0,07	0,07
	Montevideo	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0,03	0,02	0,03	0,03	0,03	0,03
Urban	Canelones	0,09	0,09	0,15	0,18	0,18	0,16	0,16	0,19	0,17	0,16	0,16	0,15	0,17	0,16	0,15	0,15	0,16	0,17	0,17	0,17
	Maldonado	0,24	0,26	0,21	0,25	0,26	0,27	0,28	0,28	0,27	0,26	0,25	0,26	0,25	0,23	0,22	0,22	0,24	0,25	0,25	0,11
	Rocha	0,10	0,10	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02
	Treinta y Tres	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01
	Cerro Largo	0,03	0,03	0,03	0,03	0,03	0,03	0,03	0,03	0,03	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02
	Rivera	0,04	0,04	0,03	0,04	0,04	0,04	0,03	0,03	0,03	0,03	0,03	0,03	0,03	0,02	0,02	0,02	0,02	0,02	0,02	0,02
	Artigas	0,02	0,03	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,01	0,01	0,01	0,02	0,02	0,02	0,02
	Salto	0,05	0,05	0,05	0,06	0,06	0,06	0,05	0,05	0,05	0,05	0,04	0,04	0,04	0,04	0,04	0,04	0,04	0,04	0,04	0,04
	Paysandú	0,06	0,06	0,04	0,05	0,05	0,05	0,05	0,04	0,04	0,04	0,04	0,04	0,03	0,03	0,03	0,03	0,03	0,03	0,03	0,03
	Río Negro	0,02	0,02	0,01	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01
	Soriano	0,04	0,04	0,03	0,04	0,04	0,04	0,04	0,04	0,04	0,03	0,03	0,03	0,03	0,03	0,03	0,03	0,03	0,03	0,03	0,03
	Colonia	0,04	0,04	0,07	0,08	0,08	0,08	0,08	0,08	0,07	0,07	0,06	0,06	0,06	0,06	0,05	0,06	0,06	0,06	0,06	0,06
	San José	0,04	0,04	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01
	Flores	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01
	Florida	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	Lavalleja	0,01	0,02	0,02	0,03	0,03	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02
	Durazno	0,02	0,02	0,01	0,02	0,02	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01
	Tacuarembó	0,02	0,02	0,03	0,03	0,03	0,03	0,03	0,03	0,03	0,03	0,03	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02
	Montevideo	0,23	0,90	1,17	1,31	1,40	1,31	1,28	1,22	1,13	1,07	1,02	1,00	0,93	0,86	0,82	0,85	0,90	0,92	0,93	0,95

Note. Based on DNC data adjusted to market prices.