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Wealth in Spain, 1900-2014: A Country of Two Lands

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Abstract

This study reconstructs Spain's national wealth from 1900 to 2014. We compare the market value and book value definitions. We then present a new asset-specific decomposition of the long-run movements in the value of wealth into a volume effect (through saving) and a price effect (capital gains or losses). We also investigate the role of offshore assets using administrative records. Our results show that the national wealth-to income ratio followed a J-shaped evolution over the last century, contrary to the U-shaped trend observed in other rich economies. Spain's wealth accumulation also differs in that both agricultural and urban land represented a larger share of national wealth in the early twentieth and twenty-first centuries, respectively. These findings are largely explained by capital gains coming from the housing sector, which account for 45% of the real growth of national wealth over the 1950-2010 period. When offshore assets are considered, Spain's international indebtedness reduced by approximately one quarter since the 2000s. Overall, this study highlights the importance of capital gains, housing, and offshore assets as key elements in the long-term accumulation of wealth.

Keywords: Wealth-income ratios, Historical balance sheets, Housing, Net foreign assets, Economic development. JEL Classification: D3, E2, F3.

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1 Introduction

Wealth is gaining increasing attention from both the academic community and public opinion. Wild swings in asset prices, the significance of cross-border positions within the Euro area and the global increase in inequalities–to name just three recent significant economic trends–point to the importance of studying wealth aggregates. Thus, constructing and strengthening national wealth statistics based on sectoral balance sheets has been the object of increasing attention from various institutions (Financial Stability Board and International Monetary Fund (2009), p8). In this sense, Spain is a country that clearly deserves internationally scholarly attention. Since entering the Eurozone in the late 1990s, the Spanish economy underwent a large housing bubble followed by an equally huge bust. The country also experienced a sharp deterioration in its net foreign asset position and a more recent rise in public indebtedness. Although academics and the media have been quick to analyze this process, the truth is that many studies are limited by the lack of a complete set of national balance sheets. Additionally, the absence of long-run series makes it more difficult to determine the historical significance of recent developments.

This study tracks the historical evolution of Spanish national wealth since the beginning of the twentieth century. By analyzing the Spanish case, we can address the main methodological problems that the international literature on wealth faces. More specifically, we recognize the difficulties of reconciling estimates of national wealth through the market value definition (i.e., the aggregate of the personal and public sectors' net worth) with the book value approach (the stock of domestic non-financial assets plus the net foreign position). For the market value approach, we provide a complete and detailed balance sheet for the private sector and government since 1900 following a census method using the asset and liabilities classification of modern national accounts. For the book value approach, we compute national wealth by estimating domestically produced assets through the perpetual inventory method, to which we add non-produced assets using a

census approach plus the net foreign position. One of the advantages of using this last definition is that it allows us to decompose housing wealth into buildings and underlying land, which is key to understanding the underlying forces driving up the value of dwellings in the last decades. To our knowledge, this is the first study comparing the evolution of both measures of national wealth for a period covering more than a century.

A second area in which we provide further methodological insights concerns the difficult task of estimating net foreign position due to the growing influence of tax havens. For this purpose, we present the first estimate on offshore assets held by Spanish residents using Swiss and Spanish administrative data. Finally, we decompose the accumulation of national wealth into a volume effect (through savings) and a price effect (capital gains/losses), but we go beyond previous studies and differentiate between national wealth accumulation in housing and non-housing (other types of capital and foreign wealth). We thus disentangle the key drivers of the long-run accumulation of wealth.

The findings from this study can be summarized as follows. First, both the market and book value national wealth to income ratios of Spain stood for most of its history in a relatively close range–between 400 and 500%–until the housing boom of the early 2000s led to an unprecedented rise to almost 800% in 2007. In this manner, Spain's national wealth to income ratio was the highest of all countries with available records in the early twenty-first century, mostly due to the huge housing bubble. Spain's singularity is reinforced by having followed a J-shaped evolution in its national wealth-to-income ratio during the twentieth century that differs from the U-shaped trends observed in other developed countries. Nonetheless, this J-shaped pattern is mainly the result of public wealth, since personal wealth is closer to a U-shaped trend.

The second main result arising from this study points that the shift from high agricultural land value to high urban value, which happened in other advanced countries, was particularly fast in Spain. Agricultural land value was exceptionally large in the early twentieth century, and urban land value became exceptionally large in the early twenty-first

century. Third, we find that the magnitude of offshore assets is non-negligible, reducing the rise in the international indebtedness in Spain by approximately one quarter since the 2000s. Finally, we present evidence that, in Spain, contrary to other rich countries, capital gains based on a sustained increase in the relative price of assets was a fundamental determinant of wealth accumulation during the very long term, but especially since the 1950s. Our results point to housing as the most important driver, accounting for 85% of total capital gains over the 1950-2010 period.

The rest of the paper proceeds as follows. Section II discusses previous research on other countries and Spain. In Section III, we briefly introduce the key concepts, methods, and sources employed. Section IV presents the most important long-term trends in the evolution of wealth aggregates. In Section V, we compare our series with previous studies on other countries. Finally, Section VI concludes. Appendix A and B provide all figures and tables, respectively, at the end of the paper. The paper has a companion methodological data appendix ("Spain Wealth Appendix") and the complete set of results is provided in an Excel file ("Spain Wealth Database").

2 Literature Review

The study of wealth based on the national accounts framework is a relatively new phenomenon. The 1993 U.N. System of National Accounts (SNA) first introduced an international set of guidelines to compute national wealth through an estimation of sectoral balance sheets, which include all assets and liabilities[1] Since then, statistical offices in most advanced economies and a few developing countries have produced comprehensive wealth estimates. Progress is still uneven, with some countries providing a very complete and long set of national balance sheets, while others offering only partial results.

This slow development occurred despite research on wealth gaining an increasing

[1]The SNA-1993 (Commission of the European Communities and Inter-Secretariat Working Group on National Accounts (1993)), was subsequently revised in the SNA-2008 (United Nations et al. 2009). The European Union adapted these accounting standards by creating ESA-1995 (European Union (1996)) and ESA-2010 (European Union (2013)).

interest among scholars and the public. One major stimulus has come through the study of the evolution, composition, and distributional patterns of household wealth. Davies et al. (2011) estimated household wealth for 39 economies for 2000, using sectoral balance sheets and survey data, which was extended to 2000-2016 using the Global Wealth Report series edited by Shorrocks et al. (2015). The other major impetus in wealth research has come through the work of Piketty and co-authors (Piketty (2014); Piketty and Zucman (2014)). Piketty and Zucman (2014) presented a new study on the long-term dynamics of the wealth-to-income ratios for a set of advance countries adopting the modern SNA guidelines with previous contemporary estimates. Their key finding is that the relationship between wealth and income has not been stable over time. On the contrary, wealth-to-income ratios followed a strong U-shaped evolution over the twentieth century, most prominently in Europe.

Together, these results have had a strong impact on how we understand the economic transformation of advanced countries, and incentivized researchers to reconstruct the dynamics of national wealth in other countries taking a long-term perspective. At the time of writing, we are aware of the reconstruction of the Swedish national wealth since 1810 (Waldenström (2016)), an analysis of South Africa since 1975 (Orthofer (2015)), a study on the national wealth of Greece (Charalampidis (2016)), and a study of China's wealth Piketty et al. (2016). In addition, this new literature on wealth has attracted important attention to the concept of national wealth and on the assets driving up wealth-income ratios in the most recent decades. On the one hand, some scholars argue about the different evolution of national wealth measured from a market or book value perspective (McGrattan et al. (2015)). This aspect, also highlighted by Piketty (2014), relates directly to understanding the dynamics of Tobin's Q (Tobin (1969)), but also to the discrepancies arising from using different methodologies to compute wealth. On the other hand, decompositions into different assets show that housing is the main driver of the recent rise in wealth (Piketty (2014), Table II), thereby deserving specific attention (Rognlie (2014),

Bonnet et al. (2014), Grossman and Steger (2017)). In particular, land appears as the main determinant of rising wealth-income ratios (Stiglitz (2016)), due most likely to the fast appreciation in urban land prices in rich countries over the last decades (Knoll et al. (2017)). From this perspective, the recent evolution of wealth-income ratios is connected to a large academic literature dealing with the increase in housing prices (Mankiw and Weil (1989), Favara and Imbs (2015), Saiz (2010), Glaeser et al. (2005), Gyourko et al. (2013)) and, in particular, with the pioneering study by Davis and Heathcote (2007), where the authors decomposed the historical value of dwellings in the US into two components: land and structure.

International scholars analyzing wealth normally point to Spain as a missing case (Goldsmith (1985), Piketty and Zucman (2014)), although in truth, there are some existing relevant studies. First, some tentative estimates were made at the beginning of the twentieth century (for example, Barthe (1917), Banco Urquijo (1924), Vandellós (1925)), although as Velarde Fuertes (1968) already pointed out, these results are plagued by important inaccuracies and generally lacked methodological rigor. Second, when Spain started to develop its national accounts, a group of researchers at the Universidad de Deusto (1968) conducted an impressive wealth census for 1965 that covered all non-financial assets (agricultural land, livestock, housing, business assets, consumer durables, etc.) in great depth. Each asset class was studied by a group of scholars, who used various calculation procedures, such as the perpetual inventory method, multiplying wealth quantities by market prices or updating production costs by considering capital depreciation and changes in asset prices. Goldsmith (1970) correctly argued that it would have been preferable to use a more precise and uniform method, although all researchers have since agreed that the University of Deusto's estimates are broadly reliable (Carreras et al. (2005), p1317).

Since the 1980s, the literature on Spain has grown impressively. On the one hand, a set of academics have developed new series for the capital stock based on the modern procedures of the perpetual inventory method, which accumulates investment flows to

compute the value of all produced assets. The first studies following a long-term approach were conducted by Myró (1983) and Cubel Montesinos and Palafox (1997), which have been recently complemented by a more precise analysis by Prados de la Escosura and Rosés (2010). Similarly, researchers of the Ministry of Finance and the IVIE made a very detailed estimation of the capital stock since 1964 (Dabán Sánchez et al. (2002), Mas Ivars et al. (2015)), while Mas Ivars et al. (2015)'s study of public capital starts in 1900. Although these works provide an invaluable point of reference, none actually refers to the wealth of the country, as non-produced assets (i.e., land and subsoil assets) are excluded by definition. Additionally, these studies do not consider foreign wealth.

The other major development occurred in the mid-1980s after the Bank of Spain started to develop a modern system of financial accounts that records all financial assets and liabilities. This set of results later incentivized the development of some complementary sources on wealth aggregates, such as various estimates of the value of residential buildings and the creation of the Survey of Household Finances in 2002. Using these records, Naredo et al. (2008) built the first comprehensive balance sheet for the different institutional sectors in Spain from 1995 to 2007. However, as we detail in the following section, some assets–most importantly, dwellings–are substantially overvalued. Our study aims to provide more precise estimates and to extend the series to the beginning of the twentieth century.

3 Concepts, methodology, and empirical estimate

In this study, we use the concepts of national income and wealth from the international system accounts (SNA 2008, ESA 2010). Wealth is calculated by providing, for a particular point in time, a balance sheet that records the value of assets economically owned and liabilities owed by an institutional unit or group of units at prevailing market prices. For a given resident sector i (i.e., personal, corporate, or government sectors), wealth (or net worth) is the sum of non-financial assets plus financial assets, less liabilities:

$W_i = A_i^{NF} + A_i^F - L_i$.

At the country level, national wealth can be defined by two related but different measures. The first follows what Piketty and Zucman (2014) call the "market value of wealth," which sums personal and government net wealth: $W_N^M = W_P + W_G$. In this definition, corporate capital is mostly captured by the market value of equity holdings owned by households and the government. This approach differs from SNA standards, referred to by Piketty and Zucman as the "book value of wealth," which is the sum of the non-financial assets of all domestic sectors and all resident sectors plus net foreign wealth: $W_N^B = A_P^{NF} + A_C^{NF} + A_G^{NF} + NFW$. Given that net foreign wealth is the sum of financial assets net of the liabilities of the three resident sectors: $NFW = A_P^F - L_P + A_C^F - L_C + A_G^F - L_G$, then the difference between both definitions can be traced to the corporate sector. The distinction between the two definitions is corporate wealth (or residual corporate wealth), which is the difference between corporations' book value of equity and its market value. Specifically, adding corporate wealth to the market value of national wealth matches the book value definition: $W_N^B = W_N^M + W_C$. Hence, both definitions converge when corporate wealth is zero, or, similarly, when Tobin's Q (Tobin 1969) equals one.

Conceptually, it is not clear which of the two measures is preferable because both have their merits. From a distributional perspective, the "market value" approach is certainly convenient given that corporate market value is reflected in the equity holdings of households and the government. A more delicate aspect, however, refers to measuring domestic non-financial assets if corporate wealth diverges from zero. In particular, the market value definition of national wealth measures corporate non-financial assets by the market value of their equity plus their net-non-equity liabilities (the difference between non-equity liabilities and financial assets). We can show this by defining domestic non-financial assets as the difference of market value national wealth with net foreign assets, and then solving for corporate fixed assets:

$$A_P^{NF} + A_C^{NF} + A_G^{NF} = W_N^M - NFW$$

$$A_C^{NF} = W_N^M - NFW - A_P^{NF} - A_G^{NF} \tag{1}$$

$$A_C^{NF} = L_C - A_C^F$$

Hence, if theoretical reasons exist for a Tobin's Q different from one, for example, because corporations' non-financial assets follow a different trajectory than equity markets, then the book value approach would track the evolution of a country's wealth more accurately. Empirically, determining which measure of national wealth is more accurate has a fundamental problem. Concretely, some discrepancies in the measurement of corporate fixed assets or, equivalently, the measurement of corporate wealth, are the result of using different methods and sources to compute both definitions. Thus, from this perspective, determining which definition is more precise requires that we balance the advantages and disadvantages of the measurement in the two approaches.

From a methodological perspective, wealth stocks and its subcomponents can be measured using different approaches. Generally, SNA advises computing wealth based on observed quantities and market prices (a census-like method), and to use alternative approaches when this method is not viable. In this study, we stick to this guideline and compute most wealth aggregates on this basis. All our estimates for financial assets and liabilities, as well as for agricultural land and housing wealth, follow the census approach. Alternatively, we apply the perpetual inventory method and the capitalization technique to measure the remaining wealth aggregates.

This study reconstructs national wealth in the most complete and comprehensive manner by using three different perspectives. First, we compute market value national wealth for 1900-2014 by calculating household and government wealth. For both sectors, we estimate financial wealth–financial claims net of liabilities–to which we add non-financial assets. Households' non-financial assets are decomposed into three categories: housing (which includes the value of both the structure and the underlying land), agricultural

land, and unincorporated business assets different from agricultural land. Similarly, for the government sector, we decompose non-financial assets into produced assets (buildings, buildings and constructions, machinery and equipment), land underlying public buildings, and forestland owned by local authorities.

Secondly, we compute the book value of national wealth for 1900-2014 by aggregating all types of non-financial assets in the Spanish economy, to which we add the net foreign wealth. The estimate is done regardless of the sector owning them, and we decompose these assets into the following groups: Housing, non-residential buildings, buildings and constructions, machinery and equipment, transport equipment, and natural resources (agricultural land and sub-soil assets). For both residential and non-residential buildings, we differentiate between the value of the building and the underlying land. Finally, from 1995 onwards, we also calculate the book value of national wealth using a second definition that computes the balance sheet of corporations, both financial and non-financial entities, and adding their net wealth to the market value definition of national wealth.

As a general rule, our estimation procedure starts by accounting for the total value of a given asset in Spain (i.e., equity), which we then distribute into the different sectors owning it. For the most recent period of 1970 onwards, this approach is simple because most of the information that we employ already follows this decomposition. For the historical period, however, we need to determine the sector owning a particular asset, something that would be easier for those assets predominantly owned by a single sector (i.e., household-owned dwellings).

Finally, in addition to building sectoral balance sheets and different measures of national wealth, we also present a decomposition of the accumulation of national wealth into a volume effect (through saving) and a relative price effect (through capital gains or losses) in both multiplicative and additive forms. We do this by following the methodology proposed by Piketty and Zucman (2014) in the appendix of their paper, which relates the accumulation of national saving to the evolution of national wealth and finds the capital

gains component as a residual.

On the one hand, the multiplicative decomposition between two given years (t and $t+1$) can be specified as follows:

$$W_{t+1} = (W_t + S_t)(1 + q_t), \tag{2}$$

where W_t and W_{t+1} are national wealth at times t and $t+1$, respectively; S_t is the net-of-depreciation national saving over year t; and $(1 + q_t)$ is the residual component that captures increases in the relative price of wealth with respect to consumption goods. To track the evolution of the wealth-to-income ratio (β), we then divide the previous equation by Y_{t+1} and obtain:

$$\beta_{t+1} = \beta_t \frac{(1 + q_t)(1 + g_{wt})}{1 + g_t}, \tag{3}$$

where $1 + g_t = \frac{Y_{t+1}}{Y_t}$, $1 + g_{wt} = 1 + \frac{s_t}{\beta_t}$ and s_t stands for the net-of-depreciation saving rate of Y_t in year t.

In addition, we go one step beyond, and conduct this decomposition for housing and non-housing wealth. To do this, we start from the definition of national wealth as the sum of domestic non-financial assets plus net foreign wealth: $W_N = A^{NF} + NFW$, which we further decompose into housing and non-housing wealth: $W_N = W^H + W^{NH}$. In this expression, housing wealth is the market value of dwellings, while non-housing wealth is the sum of other types of capital and net foreign wealth. Similarly, we decompose national savings into domestic investment (net of depreciation) and foreign savings: $S_N = I + S_F$, which then we decompose into housing investment and non-housing national savings: $S_N = I^H + S^{NH}$. Consequently, each component of national savings is mapped to its corresponding component in national wealth. We run equation (3) separately for each of these two components of national wealth:

$$\beta_{i,t+1} = \beta_{i,t} \frac{(1+q_{i,t})(1+g_{wi,t})}{1+g_{i,t}}, \tag{4}$$

where i stands for housing or non-housing national wealth.[2]

On the other hand, the additive decomposition between two given years (t and $t+1$), can be specified as follows:

$$W_{t+1} = W_t + S_{t,t+1} + KG_{t,t+1}, \tag{5}$$

where W_t and W_{t+1} are national wealth at times t and $t+1$, respectively; $S_{t,t+1}$ is the total savings flow between years t and $t+1$; and $KG_{t,t+1}$ is the total capital gains or losses between years t and $t+1$. To track the evolution of the wealth-to-income ratio (β), we then divide the previous equation by Y_{t+1} and obtain:

$$\beta_{t+1} = \beta_{ini} + \beta_{sav} + \beta_{kg} \tag{6}$$

where $\beta_{ini} = \frac{W_t}{Y_{t+1}}$ is the component coming from initial wealth, and $\beta_{sav} = \frac{S_{t,t+1}}{Y_{t+1}}$ and $\beta_{kg} = \frac{KG_{t,t+1}}{Y_{t+1}}$ are the components coming from savings flows and capital gains or losses, respectively.

Furthermore, in line with the multiplicative form, we go one step beyond and carry this decomposition for housing, other types of capital, and foreign wealth.[3] The additive decomposition has the advantage of allowing us to disentangle the fraction of savings and capital gains that each component represents in the total, which is very relevant in explaining the accumulation of national wealth in Spain over time. Thus, we run equation (6) separately for each of these three components of national wealth:

[2]Ideally, we would have liked to further decompose non-housing wealth into other types of capital and net foreign wealth. However, the multiplicative decomposition of wealth accumulation is based on the geometric averages of growth rates, which are only meaningful when wealth stocks take positive values. This is not the case for net foreign wealth in Spain.

[3]Note that in this case, we do not have the limitations mentioned for the multiplicative decomposition and can split non-housing wealth between other types of capital and foreign wealth.

$$\beta_{i,t+1} = \beta_{i,ini} + \beta_{i,sav} + \beta_{i,kg} \tag{7}$$

where i stands for housing, other types of capital, or foreign wealth.

While the results from this study use the market value definition of national wealth, in the appendix, we present the same analysis under the book value definition and the results are quite similar.

3.1 Non-financial assets

When computing non-financial assets, we follow a different approach for produced assets (buildings, machinery, and equipment) from that for non-produced assets (land and other natural resources). Agricultural land and housing, which clearly constitute the two most important asset components in the long run, are estimated through the census method, which multiplies the observed quantities (land areas or housing stock) by representative unit prices. In this basic procedure, both wealth aggregates include the value of the underlying land and produced assets (cultivated crops and dwellings, respectively). Our housing wealth series is somewhat lower than that obtained by Naredo et al. (2008). Instead of using the housing wealth series from the Bank of Spain, we combine and adjust the different available sources on housing prices (Bank of Spain, IVIE, and the Ministry of Public Works) to produce a more precise estimate.

In a second step, and following ESA standards (European Union (2013), p76), we estimate the stock of all produced assets in Spain based on the perpetual inventory method. This method requires an initial value for the stock of an asset, the service life of this asset type, together with investment flows and investment prices. Taking the change in the capital stock between two given years (t and $t+1$) as an example, this method starts from an initial capital stock of t (C_t), to which we add investment flow in $t+1$ (I_{t+1}), and finally subtract the amount of capital deteriorated from t to $t+1$. If we use δ to denote

the depreciation rate of existing capital, we can express the perpetual inventory method in the following form: $C_{t+1} = C_t + I_{t+1} - \delta(C_t + \frac{I_{t+1}}{2})$.

In practice, we implement the perpetual inventory method for 1850-2014 using data on investment flows and investment prices for four groups of assets: dwellings, other constructions, machinery and equipment, and transport equipment. However, we only provide results from 1901 onwards, the period for which we can also estimate non-produced assets.

We are not the first to use this type of approach to reconstruct produced assets in Spain, and we benefited greatly from previous analyses. Most notably, Prados de la Escosura and Rosés (2010) estimate the stock of produced assets for the same four asset categories for 1850-2000, while Mas Ivars et al. (2000) and the group of researchers at the IVIE institute (Mas et al. (2005), Cucarella Tormo and Mas Ivars (2009), Mas Ivars et al. (2015)) decompose this stock into 17 categories from 1964 onwards. However, we compute our own estimate for two reasons: first, to incorporate the latest recommendations from the OECD (2009) on the use of geometric patterns of depreciation (which differ from Roses and Prados de la Escosura's approach), and second, to include the most recent data on Spain's historical national accounts from Prados de la Escosura (2016a), which revised its previous series (Prados de la Escosura (2003)) with a new interpolation method. As a robustness check, we present the series of produced assets using the same depreciation pattern as Prados de la Escosura and Rosés (2010) in the methodological appendix. Overall, both approaches follow a similar trend, but the levels are about 25% lower in our benchmark series. Nonetheless, when computing the total book value of national wealth, both approaches show very close levels.

The only assets that we cannot calculate by either the census-like estimate or the perpetual inventory method are subsoil assets. Historically, their importance for the Spanish case has been very limited compared to other countries. Oil and natural gas reserves have been almost nonexistent (Tortella et al. (2003), Díaz Fernández (2014)), and only mining and quarries have had some minor contribution to Spain's total production. Un-

fortunately, no data exist for the volume of these reserves, so we multiply the value added from the mining and quarry industries by a factor of six. The implicit assumption is that one third of this value is the return on subsoil assets, with the remaining two thirds being the return on labor and produced capital, and that the return on these assets is constant at the 5.5% level (or one third divided by six). This procedure is highly conjectural, but given that the value-added from these industries has been below 2% of Spain's GDP, any inaccuracy should have an almost negligible effect on our national wealth series.

The third step is to estimate (or disentangle) the value of the land below the buildings. Following OECD and Eurostat (2015) recommendations, we start by decomposing our census-like estimate of housing using the residual approach. This is the same procedure followed by Davis and Heathcote (2007) to decompose the value of housing in the US for 1930-2000. Through this method, we calculate the value of land by deducting dwellings from the total value of the housing stock. Next, we compute the value of land underlying non-residential buildings, for which we count using an estimate of its structure obtained from the perpetual inventory method. We do this based on recent cadastral records of the total value of residential and non-residential buildings, which allows us to impute the relative weight of land in non-residential buildings with respect to residential ones.

In a fourth step, we determine the ownership by different institutional sectors on the stock of non-financial assets. Since the historical data on investment flows employed to estimate Spain's produced assets are not decomposed by institutional sector, we start by imputing households' share over the two most important assets of agricultural land and housing directly based on administrative records. We then calculate the unincorporated business assets owned by the household sector, taking as a starting point the results of the Survey of Household Finances (Banco de España 2002-2014), and then upgrading the declared values to account for undervaluation and top-coding. We extend the results until the early 1980s by assuming a similar evolution as the assets of non-financial corporations (Banco de España 1982-2014). For the public sector, we use Mas Ivars et al. (2015)'s series

on government produced assets, and add the value of the underlying land and forests. In principle, all other non-financial assets are attributed to the corporate sector as a residual, although, as noted previously, after 1995, we can also reconstruct the market value of non-financial assets owned by Spanish corporations using data from the Central Balance Sheet Data Office of the Bank of Spain.

3.2 Financial assets

Providing consistent series on the net financial wealth for the public, personal, and foreign sectors since the early twentieth century was done using different sources. For all three sectors, reconstructing financial assets and liabilities from 1970 to the present is mostly a straightforward exercise based on the reported figures in the Financial Accounts of the Bank of Spain. Our main adjustment, as we detail below, is by providing the first complete estimate of offshore wealth.

Reconstructing the financial position for the rest of the twentieth century is a far more complex process given the lack of consistent estimates. Our calculations for the personal sector are based on a two-fold operation. First, we calculate the aggregate market value of each asset type, something that is simpler for claims (currency, deposits, loans, etc.) assessed at their nominal value than for other assets (bonds and shares) that are valued at the prevailing market prices. The second step involves computing households' share by deducting the holdings of other institutional sectors (mostly corporations or the public sector) using a wide variety of auxiliary accounts (financial yearbooks, balance sheets of banking and insurance companies, government accounts, etc.).

To derive offshore wealth, we mainly use data from Zucman (2013, 2014) for 1999-2014 and the unique information recorded since 2012 by tax authorities on the assets held abroad by Spanish residents, classified by asset type (real estate, stocks, investment funds, deposits, etc.) and country of location. We then extrapolate the series backwards in time using the total value of offshore wealth, which flourished during the 1991 tax amnesty,

and also by including the estimates on financial assets held in offshore havens provided by Zucman (2015). Nonetheless, due to the uncertainties related to these calculations, we do not include offshore assets in our benchmark series and only present them when decomposing total financial assets and the net foreign asset position.

Overall, our results on households' financial position benefited greatly from the immense research by previous scholars and to the relative high quality of some Spanish historical sources. For example, two outstanding examples of very detailed sources that are normally unavailable in other countries are the statistics on corporate capital and the aggregate balance sheet of the banking sector published since the early 1920s. Additionally, Spain's relative underdevelopment, and the fact that the country became increasingly detached from the world economy since the First World War made our calculations simpler. In many ways, it is easier to estimate household financial wealth in the past than in the present since the ownership structure is simpler, with less financial intermediation and cross-border positions.

Nonetheless, various problems should be noted. While the volume levels for each financial asset are generally well-covered, the depth and representativeness of market prices are below the desired level in some cases. One of the clearest cases occurs with households' equity holdings, which includes shares traded through stock markets and those that are not. Quoted shares can be valued at their prevailing market prices using the available sources gathered by historians on the Madrid Stock Exchange, but for non-listed firms, the standard procedure for historical periods is to apply the same ratio between the paid-up capital and the observable share price for listed companies. Thus, the number and relative performance of quoted corporations versus non-listed companies indirectly affects our calculations. In the future, more research could be done in this area.

A second set of problems deals with establishing households' ownership over each asset class. In most cases, we make our calculations by quantifying the amount of an asset held by other institutional sectors and then assigning the residual to individuals. In

general, these computations are more accurate for some assets (e.g., public debt), given the great variety and detail of the original sources, than for other assets (i.e., credits and loans). If scholars provide more accurate estimates on any field in the future, our figures would be revised. Nonetheless, it should be noted that any change can have a secondary effect on the ownership ratio of other assets and liabilities, and thus it is possible to argue that the general trends are broadly reliable.

Estimates for the government sector before 1970 are much easier to produce. We proxy public net financial wealth by computing in the asset side of all state-owned equity holdings (e.g., the public railway company RENFE) and deducting as liabilities the market value of public debt. We are aware that these later results do not consider all financial assets and liabilities because they exclude, for example, cash holdings and institutional loans. Nonetheless, it seems clear that as one goes further back in time, the two most relevant changes in the government's financial position occur either from an increased role of the State in the corporate sector or due to an adjustment in the public debt stock.

Computing Spain's net foreign wealth prior to 1970 cannot be done through the census-like method given that sources on the stock of foreign assets and liabilities are very scarce, and so we accumulate the current account balance and add the variation in foreign exchange reserves. This is a relatively widespread procedure since a surplus in the current account makes a country a net creditor to the rest of the world (and vice versa). However, the main drawback of this method is that it does not capture the relative change in assets prices owned by both residents and non-residents. In practical terms, our series are based on the results provided by Prados de la Escosura (2010) for 1850 to 1913. We then extend this same methodology for the following period, but adjusted with only the census-like estimate provided by the Bank of Spain on the net foreign assets for 1932 to 1934. Later, from 1935 onwards, we follow a similar approach and make a final adjustment to match the results with the net foreign asset position reported for 1970.

4 Results

This section presents the most important long-term trends in the evolution of wealth aggregates. As many scholars have done, we report most results as a share of national income. In this way, stocks are more easily interpretable in real terms and relative to the total income of Spanish residents.

4.1 Personal wealth

Figure A.1 presents the ratio between personal wealth to national income since 1900. The results indicate that, for most of the sample period, the wealth of Spanish households usually stood between three and five times national income, although the recent economic boom led this ratio to record levels of nearly 700%. The main turning points of this uneven process of wealth growth and decline are easy to spot. The personal wealth-to-income ratio stood at a relatively high level (around 5.5 times the national income) in the period before 1914, but economic growth fueled by Spanish neutrality during the First World War, combined with a short period of high inflation, led to a significant decline in the relative importance of wealth. From 1920 to 1935, the oscillations in net worth largely reflected the general evolution of the economy and the performance of asset prices. Wealth grew significantly during the twenties, but households suffered a significant shock in their balance sheets during the tumultuous 1930s. Then, the ratio between personal wealth to national income increased sharply after the Civil War. This paradox occurs because from 1935 to 1940, Spanish real national income fell precipitously (c. 16%), but wealth remained almost constant, as destruction was compensated for by the rise in land prices.

However, in a short time, the personal wealth to income ratio declined steadily and remained at their lowest levels in the late 1950s and 1960s. Thus, in a period of rapid industrialization, income and wealth grew mostly at the same pace, and it was only in the late 1960s and early 1970s, when there was a short upswing in asset prices, that they rapidly reverted with the economic crisis of the late 1970s. Finally, from the mid-1980s,

and especially during the housing boom after the turn of the century, personal wealth started to grow dramatically until it reached an unprecedented level (741%) in 2007. In 2014, the most recent year with available data, the personal wealth to national income ratio stood at 651%, a level similar to that in 2004 (652%).

The analysis of the personal wealth composition provides several key factors to explain this evolution (Figure A.2). Overall, one of the most surprising facts is that non-financial assets, in particular, agricultural and housing land, have always represented the bulk of households' assets. In aggregate, real assets constituted 74% of gross assets in 1900 and 80% in 2014. Behind this seeming continuity is a profound transformation. In the first decades of the century, the composition of Spanish personal wealth followed the conditions of an underdeveloped economy, as agricultural land and farm capital (livestock and machinery) were the main assets that individuals owned. Until the 1950s, the most important changes in the ratio of wealth to national income occurred as a by-product of the change in the relative share of agriculture in the economy and due to the evolution of land prices. However, the irreversible decline of agriculture that finally occurred in Spain from the mid-1950s onwards was matched, in a very short time, by successive real estate boom cycles that made housing the main component of private wealth. As Figure A.2 shows, it is not the replacement cost of dwellings but the land underlying them that mostly determined the evolution of housing in the post-war decades. From this perspective, the evolution of Spanish household wealth over the twentieth century can be described as the transition from agricultural to residential land.

The significant weight of real assets should not conceal the equally remarkable transformation in the composition of households' financial assets (Figure A.3). Until the Civil War, debt securities were the most important claim, with a share that fluctuated around 40 to 60% of gross financial assets. This fact attests not only to the prominence of public debt and railway debentures in relation to equity shares in capital markets (Hoyo Aparicio (2007)), but also implicitly to the investment preferences of wealthy families. Consid-

ering that wealth (particularly financial assets) was heavily concentrated (Alvaredo and Artola Blanco (2017)), and given that the banking system was largely underdeveloped and lacked any form of deposit insurance, it seemed normal for rich households to lend directly to the government or corporations. Unsurprisingly, the high inflation since 1936 constituted a major wealth shock, as the value of most fixed income securities was rapidly wiped out.

From the 1960s onwards, the composition of personal financial wealth in Spain started to resemble the conditions of a developed country. Banking deposits became the most widespread tool for channeling households' savings and stock market fluctuations started to have a sizable impact on the net worth of families. Nonetheless, two noticeable trends are worth pointing out. First, in Spain, pension assets have had an almost residual weight until the present day. In short, the rise of an unfunded social security system since late Francoism, combined with an everlasting housing boom, has undoubtedly influenced how households accumulated and invested wealth. Second, after the end of Franco's regime in 1978, Spain experienced a process of Financialization, which led to an exponential rise in offshore assets. In 2012, offshore assets amounted to 195 billion Euros, that is, 23% of both national income and net personal financial wealth. Interestingly, this estimate is higher than the 8% obtained by Zucman (2013) for all world countries. Hence, offshore assets constitute a non-negligible part of the portfolio of households in Spain and must be considered when analyzing the long-run evolution of wealth. This rise in offshore assets, together with the increase in the value of dwellings and financial assets, have pushed personal wealth concentration upwards since the late 1990s (Martínez-Toledano (2017)).

Figure A.4 shows the share of household liabilities as a percentage of national income. By any standard, private indebtedness stood at very low levels during the first half of the twentieth century (i.e., below 20% of national income), something that seems at odds with the fact that household balance sheets were relatively strong, and therefore individuals could have increased their leverage for investment purposes. However, as many

contemporaries and historians already pointed out (Carmona and Simpson (2003)), the main private asset at that time (agricultural land) was scarcely used as collateral to obtain a loan, given the associated high transaction costs. Thus, the development of household credit was closely connected with the real estate cycle. Loan activity took off in the mid-1960s, experienced a mild reduction with the late 1970s crisis, and then resumed a vigorous growth path until the 2010 peak.

4.2 Public wealth

Most scholars are normally interested in the state's liabilities given that public debt can have a sizable impact on taxation and investment. However, properly assessing the government's balance sheet also requires that we include all non-financial and financial assets. Additionally, following SNA and ESA guidelines, financial assets are to be valued at market prices, and thus liabilities are reduced if public debt trades at a discount to its nominal value. This particularity, combined with the fact that the government can rapidly increase its debt and have a negative net worth position for a long period of time, marks a clear distinction with respect to private agents.

Figure A.5 presents the liabilities and net worth of the government as a percentage of national income. Both measures tend to follow similar trends, indicating that changes in the debt stock were the main driving force behind the evolution of government wealth. At the start of the twentieth century, public debt stood at very high levels due to the dire state of Treasury finances, and, in particular, to chronic deficits, the loss of the last remnants of the colonial empire (Cuba and the Philippines became independent in 1898), and creditors' demands for high interest rates following various default events (Comín (2012)). Public liabilities gradually decreased thereafter, favored by a reduction in the debt burden through tax increases and inflation during the First World War. Later, during Franco's dictatorship (1939-1975), the government balance sheet improved sharply, mostly driven by the irresistible decline in the debt burden caused by financial repression and

inflation (Comín (2015)). The last decades were marked by a two-fold increase in public debt, first during the 1980s and early 1990s, and second after the recent economic crisis. Public liabilities in relation to national income (134%) currently stand at their highest point since the late nineteenth century.

Figure A.6 shows the evolution of government assets by differentiating between non-produced (land) and produced assets (infrastructure, buildings, etc.), plus financial claims (equity, loans, cash, etc.). For a long-term analysis, it seems convenient to analyze each category separately. Agricultural and forestland may now seem purely anecdotal for public finances, but they truly constituted one of the most important assets during the first half of the twentieth century. The subsequent fall in the share of publicly owned land has largely reflected the relative decline of the primary sector, although it is worth remembering that even now the government owns approximately one quarter of all agricultural land in Spain.

Public capital has clearly been the most important government asset in the long term. As Mas Ivars et al. (2015) explain, public investment stayed at low levels during the first half of the twentieth century, and, if one excludes the immediate post-war years, the public capital stock relative to national income experienced a slight decline during this period. Afterwards, the growth in infrastructure spending and the rise of the welfare state since the 1970s propelled a sustained rise in the ratio of public capital to national income. State-owned financial assets were negligible before the Civil War, but equity holdings started to grow rapidly from 1940 onwards, driven by Franco's decision to nationalize some key industries (railways and telecommunications) and promote new industrial enterprises (Carreras et al. (2000)). Privatization of government-owned companies in the 1990s paved the way for a retreat from economic intervention, but even now, the state owns equity holdings in some very profitable industries.

4.3 National wealth

To the best of our knowledge, this is the first study presenting results on national wealth from both book value and market value perspectives, and covering a period of over a century. Specifically, national wealth is measured as the aggregate of personal and public net worth, the market value definition, or as the stock of domestic non-financial assets plus the net foreign position, the book value approach. We also provide a variant metric of the book value approach by computing non-financial assets from corporate balance sheets. Overall, all three series show a very close evolution over this long period (Figure A.7). The national wealth to income ratio stood in a relatively close range during the twentieth century, between 400 and 500%, until the real estate boom of the early 2000s led to an unprecedented rise to almost 800% in 2007.

In Spain, this close resemblance can be explained by the composition and ownership trends in the stock of domestic non-financial assets. As Figure A.8 shows, from a balance sheet perspective, the major transformation in Spain over the twentieth century involved the transition from an agrarian-based economy towards one driven by real estate. In particular, land, both agricultural and that underlying buildings, has been key in explaining the evolution of national wealth. On the contrary, other produced assets–infrastructure, equipment, and machinery–constitute a small residual, both in the present and in the past. Furthermore, as these two main assets (agricultural land and housing) were predominantly owned by households, differences in the measurement of national wealth from a book value or market value perspective, due to the mismeasurement of government or corporate assets, remains a relatively minor issue.

Nonetheless, the discrepancies between both metrics of national wealth shed light on the major methodological challenges that scholars face. One is related to the difficulties of calculating the net foreign wealth and its indirect impact on national wealth when added to the stock of non-financial assets. The results concerning Spain's net foreign asset position (Figure A.9) show that it was broadly balanced during most of the period, but with the

noticeable exception of the initial and ending periods (1850-1913 and 1990s-2015), when the country was heavily dependent on foreign finance. The country's high indebtedness during the late nineteenth century is especially remarkable given that although Spain still held some colonies (Cuba, Puerto Rico, and the Philippines), it depended heavily on foreigners to finance both the increasing public debt and the first wave of capital investment (railways and mining). Overall, although we are confident that our methods and sources provide the main trends in a correct manner, we should point out that computing net foreign wealth before 1970 through the accumulation of current account flows cannot fully account for the changes in the market value of foreign assets and liabilities. Also, as Figure A.9 shows, our calculations for households' assets in tax havens can have a significant impact on Spain's international position. Clearly, compiling better data on offshore assets could provide a clearer perspective on this matter in the future.

The other methodological concern related to the reconstruction of a national balance sheet concerns the use of either the market or book value approach. In Spain, the results show that the level and trends are similar, thereby suggesting that the book value estimate through the perpetual inventory method correctly approximates the evolution of non-financial assets. In addition, these findings are consistent with the narrative of Spain's economic performance over this period. In the early 1970s, corporate equities boomed to unprecedented levels, turning corporate wealth negative, while in the late 1970s and through the 1980s, corporations experienced a prolonged period of low equity valuations due to the political uncertainty driven by the transition from Franco's dictatorship to democracy and a sharp economic crisis. From this perspective, Tobin's Q values differ due to the asymmetric evolution of equity and non-equity markets, and not only due to methodological differences in the measurement of corporate non-financial assets.

Nevertheless, a note of caution is needed before extending our findings to other countries. Although we follow the latest recommendations on the use of the perpetual inventory method (OECD (2009)), these are not yet harmonized at the international level

by the SNA, implying that important methodological differences persist in the valuation of fixed assets across countries. In addition, and more importantly, this study benefits from the outstanding reconstruction of Spain's historical national accounts by Prados de la Escosura (2016a) for 1850-2014. In particular, Prados de la Escosura proposes an interpolation method for splicing historical national accounts to overcome the problems of the conventional retropolation approach, which overstates the level of investment and of other components of GDP in the past, and underestimates their growth over time (Prados de la Escosura (2016b)). Thus, the perpetual inventory method with retropolated investment series employed in studies of most countries artificially inflates the initial stock of fixed assets, showing a flatter later development. Certainly, measuring corporate wealth is a delicate and complex matter that deserves further research.

In addition, we investigate whether the long-term accumulation of national wealth was determined by new savings (volume effect) or by changes in the relative price of wealth with respect to income (capital gains effect). Table B.1 shows the results for different periods relevant for an international comparison. We present this analysis for the market value national wealth series, the results of which are practically identical to those of the book value results given their close resemblance over the long run. From 1900 to 2010, the annual growth of national wealth was 3.1%. In turn, we can decompose this trend into a volume effect of 1.6% and a capital gains effect (net of war destruction) of 1.5%. In other words, the fact that 51% of the total growth in national wealth in the very long-term comes through savings confirms the conventional wisdom on the matter. However, that capital gains accounted for the remaining 49% is a factor that has not been sufficiently studied.

When dividing this era into two main sub-periods (1900-1950 and 1950-2010), it seems evident that capital gains had an opposite impact. From 1900 to 1950, national wealth grew very modestly in real terms (1%), resulting in a slight increase in the wealth to-income ratio from 508% to 536%. The savings-induced effect accounted for 0.8% of the real wealth accumulation, while capital gains accounted for 0.1%. On the contrary,

the 1950-2010 years were characterized by a strong increase in the wealth-to-income ratios boosted by capital gains. National income grew at a remarkable rate (4.2%) during this period, but was outpaced by an even stronger growth in national wealth (4.8%). As opposed to previous decades, capital gains had a positive role in national wealth accumulation in these years, accounting for 55% of the growth.

To provide a more in-depth analysis, we divide national wealth between housing and non-housing national wealth, and then calculate the savings rate and capital gains for both sub-sectors (Table B.1). The results show some remarkable trends. During the 1950-2010 period, the annual growth rate of housing wealth (6.3%) was significantly larger than that for the rest of the economy (3.2%). Hence, investment forces only cannot explain this sharp divergence. Wealth growth in the housing sector induced through savings (2.4%) was similar to the rate observed in the non-housing sector (2%). The major difference thus relates to the growing importance of capital gains in housing wealth, which explain 61% of wealth accumulation in this sub-sector since 1950. Furthermore, when dividing this era into two periods (1950-1980, 1980-2010), capital gains played an increasing role in the housing stock. The rise in real house prices constituted 52% of the wealth accumulation from 1950 to 1980, but then surged to 73% with the most recent boom.

Table B.2 summarizes these trends relative to the long-term evolution of wealth in Spain. As noted previously, the most outstanding fact relates to the important role of capital gains, which in turn can be explained by changes in the prices of farmland and housing. Initially, the capital losses (-1%) in other types of capital from 1900 to 1950 were driven by the falling value in agricultural land, particularly during the First World War years. Later, from 1950 to 2010, Spain experienced a period of rapid growth and industrialization, which came together with higher rates of saving and, consequently a new wave of investment. However, in this new context, asset price variations in the housing market played a fundamental role in the rising value of national wealth, to the point that rising housing prices explain 85% of the capital gains observed since 1950. No matter which

metric is chosen, housing has become the most important driver of Spain's balance sheet.

5 International Comparison

In this section, we put our results for Spain in an international perspective. We mostly focus on long-term dynamics and compare our results to those for other countries published by Piketty and Zucman (2014) and Waldenström (2017). Overall, our findings for Spain coincide in broad terms with the general trends in other countries, but some notable differences are worth pointing out. One of the most striking results from Piketty and Zucman (2014) is that European economies followed a marked U-shaped evolution in their wealth-to-income ratios over the twentieth century. In "New world" countries (Canada and the US), on the contrary, the trend is much smoother (fluctuating around 3 to 5 times the national income), but still shows a similar U-shaped pattern.

As Figure A.11 shows, Spain is significantly different. It started from lower values than core European countries (5 to 5.5 times the national income as opposed to 6 to 7 times in these countries), and then followed a significant decrease during the World War I years. Contrary to other countries, Spain's national wealth fluctuated for the rest of the century at relatively high values, between 4 and 5 times the national income; only from the late 1990s did wealth-to-income ratios start a fast-growing trend, which concluded in a striking increase during the 2000s. From this perspective, a J-shaped curve may represent better the broad evolution of Spain since 1900 than a U-shaped figure.

The smoother evolution and the higher levels of Spain's wealth over the twentieth century make it closer to "New world" countries than to other European economies. However, some very different factors explain this seemingly similar evolution. In Spain, the long-term dynamics of national wealth were mostly dictated by the evolution of two real assets, agricultural land and housing, which represented an almost constant 60 to 70% of the total non-financial assets. On the contrary, in other countries, the influence of "pure"

productive assets (i.e., machinery, buildings and construction, and equipment) played a larger role.

Figures A.12 and A.13 depict the evolution of agricultural land and housing as a percentage of national income, respectively. The first shows how the share of agricultural land in Spain ultimately followed a similar long-term decline as in other European economies, but with some delay, which was exacerbated by the partial re-ruralization in the 1940s. This evolution is consistent with the latecomer dimension of Spain, with agriculture playing a large role well into the twentieth century. The second figure shows that housing wealth had a relatively similar weight as in other economies during the first half of the century, but rose much faster since the 1960s, attaining the highest share among countries with available data at present. Indeed, the evolution of these two assets determined the high values of Spain in the central decades of the twentieth century, a period in which these ratios reached their lowest levels in other advanced economies. Overall, these results indicate that land has played a much stronger role in the evolution of wealth in Spain compared to other advanced countries, since both agricultural and housing wealth are largely driven by this non-produced element.

Finally, in Table B.3 we compare the decomposition of national wealth accumulation between the volume and capital gains effect during three periods (1900-2010, 1900-1950, and 1950-2010) and for countries with available data (France, the UK, Germany, Sweden, and the US). In the longest period (1900-2010), volume effects were the dominant force in total wealth accumulation for all countries. Spain's case is very different, because capital gains explain 49% of the total accumulation of wealth in real terms over this period.

However, it seems preferable to take 1950 as a cut-off point given that most wealth-to-income ratios approached their lowest levels in this year. During the first half of the twentieth century, national wealth-to-income ratios were dominated by a price effect in core-European countries, as capital losses accounted for almost all of the decrease in the wealth-to-income ratios. On the contrary, savings explained a large part in the evolution of

national wealth in the US because this country did not suffer an external shock. The trend in Spain during these years is similar to that in core-European countries, as capital gains negatively impacted wealth accumulation, even if the absolute change in wealth-to-income was not as pronounced.

From 1950 to 2010, Spain shows the most remarkable differences. Savings explain a large part of wealth accumulation in France, Germany, Sweden, and the US, while capital gains are only a key driver of the accumulation of national wealth in the UK. Spain stands out at this respect because capital gains account for 55% of the total accumulation of national wealth. Some concerns can be raised when choosing 2010 as the end of the analysis, given that the housing bubble was in the first stages of a severe correction. An alternative decomposition for 1950-2014, which captures the fall in housing prices since the 2007 peak, yields very similar trends for Spain. The capital gains component is 52% of wealth accumulation. In both methods, the results confirm that capital gains had an important role in wealth accumulation in Spain during 1950-2014, with increasing asset prices having a much larger role than in other countries. As we argued, this is due to the extraordinary evolution of housing wealth in Spain with respect to other countries over the last decades.

6 Conclusion

This study reconstructs Spain's national balance sheet since the beginning of the twentieth century to the present, under both the market value and book value definitions. We also present a new asset-specific decomposition of long-run movements in the value of wealth into a volume effect (through saving) and a price effect (capital gains or losses). Furthermore, we provide a new long-run series of Spain's net foreign asset position that considers the growing importance of offshore assets.

Overall, the national wealth to income ratio followed a J-shaped curve during the

twentieth century, which differs from the U-shaped evolution that characterizes core-European economies. Another peculiarity of Spain is that agricultural land and housing have always represented the most important components of national and personal sector balance sheets. Contrary to other developed economies, price variations in these two assets played a significant role in shaping wealth accumulation, and can thus explain why capital gains constituted a fundamental driver in wealth accumulation in Spain in the very long term. The rise in asset prices became more important during 1950-2010, especially due to housing wealth, which accounts for 83% of total capital gains.

Our analysis points to three areas in which research on wealth can be developed in the future. First, we argue for the decisive importance of housing and agricultural land as the key drivers of Spanish national wealth, a fact that probably extends to other southern European economies and to most developing countries. From this perspective, further research is needed to understand the role of capital gains in the rise of national wealth of Spain (i.e., an annual growth rate of 1.5%) for 1900-2010, while this same factor played a negligible role in most other countries (with rates close to zero). Two potential explanations could be mismeasured investment and/or pure valuation effects in the agricultural and housing sectors (i.e., due to demographic changes, agglomeration effects, high taste for home ownership, or openness to capital markets following European integration, to name just a few candidates). Given that these assets are complex given that they combine a produced element (dwellings, crops, or improvements) with a non-produced one (land), it seems highly advisable to collect more specific information (statistics on prices, land quality, surveys, etc.) on a regular basis.

Second, the relatively similar results from the book and market value definitions of Spanish national wealth should not conceal that important methodological problems remain. More efforts and conceptual clarification are needed to determine whether discrepancies between these approaches can be traced to the estimate of fixed assets through the perpetual inventory method, or truly to the existence of a mismatch between corporate

assets at market and book value.

Third, as we argued, offshore assets can change the foreign asset position of a country significantly. Until now, the information available is quite poor and scholars must make some strong assumptions to provide consistent estimates. Hence, further cooperation between national central banks, statistical offices, and tax agencies could provide the basis for a substantial improvement in the available data.

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Appendix

A Figures

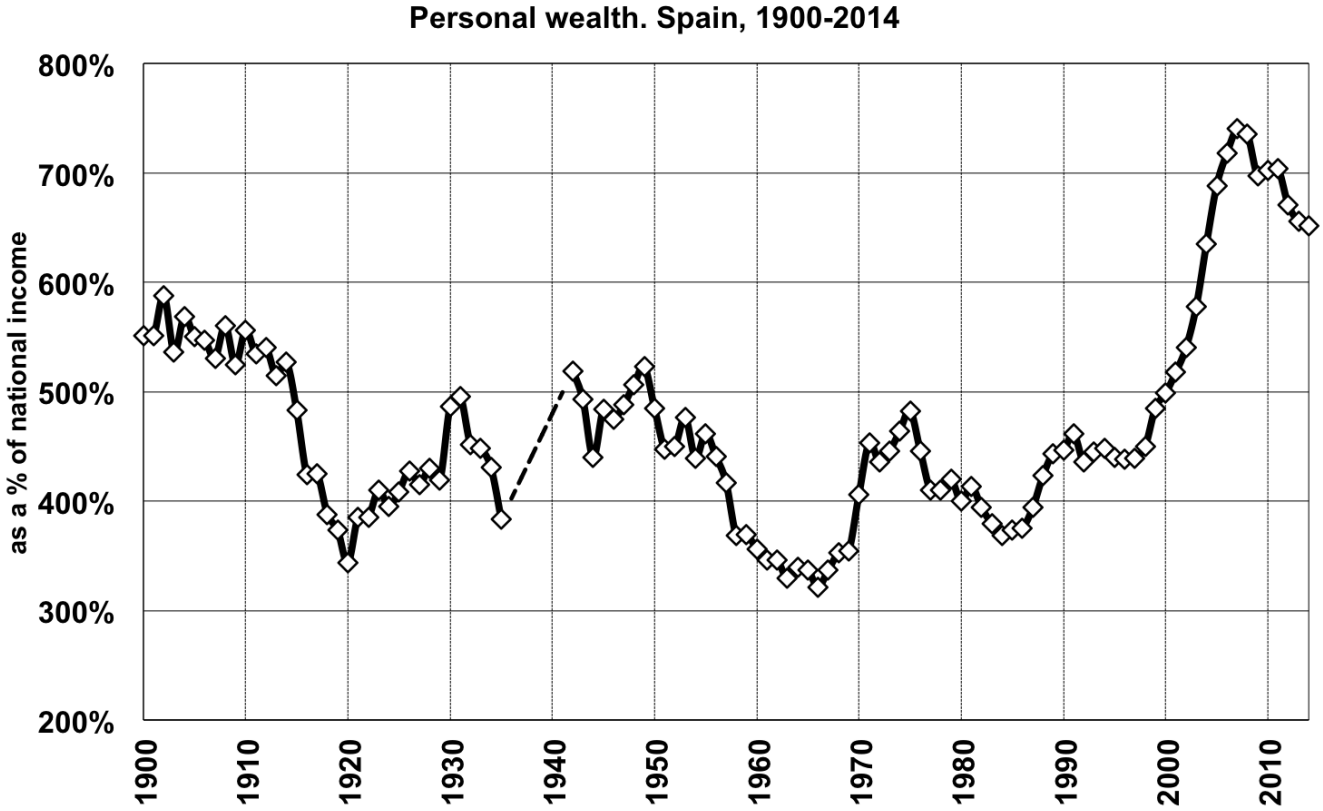

Figure A.1: Personal wealth. Spain, 1900-2014

Notes: This figure depicts personal wealth as a fraction of national income for 1900-2014 in Spain. Personal wealth is the sum of non-financial and financial assets minus financial liabilities for households and the NPISH sector. Computations were done using National Accounts and other sources. Due to lack of data for the Civil War period, 1936-1941 are linearly interpolated. See Table 1 in the data appendix.

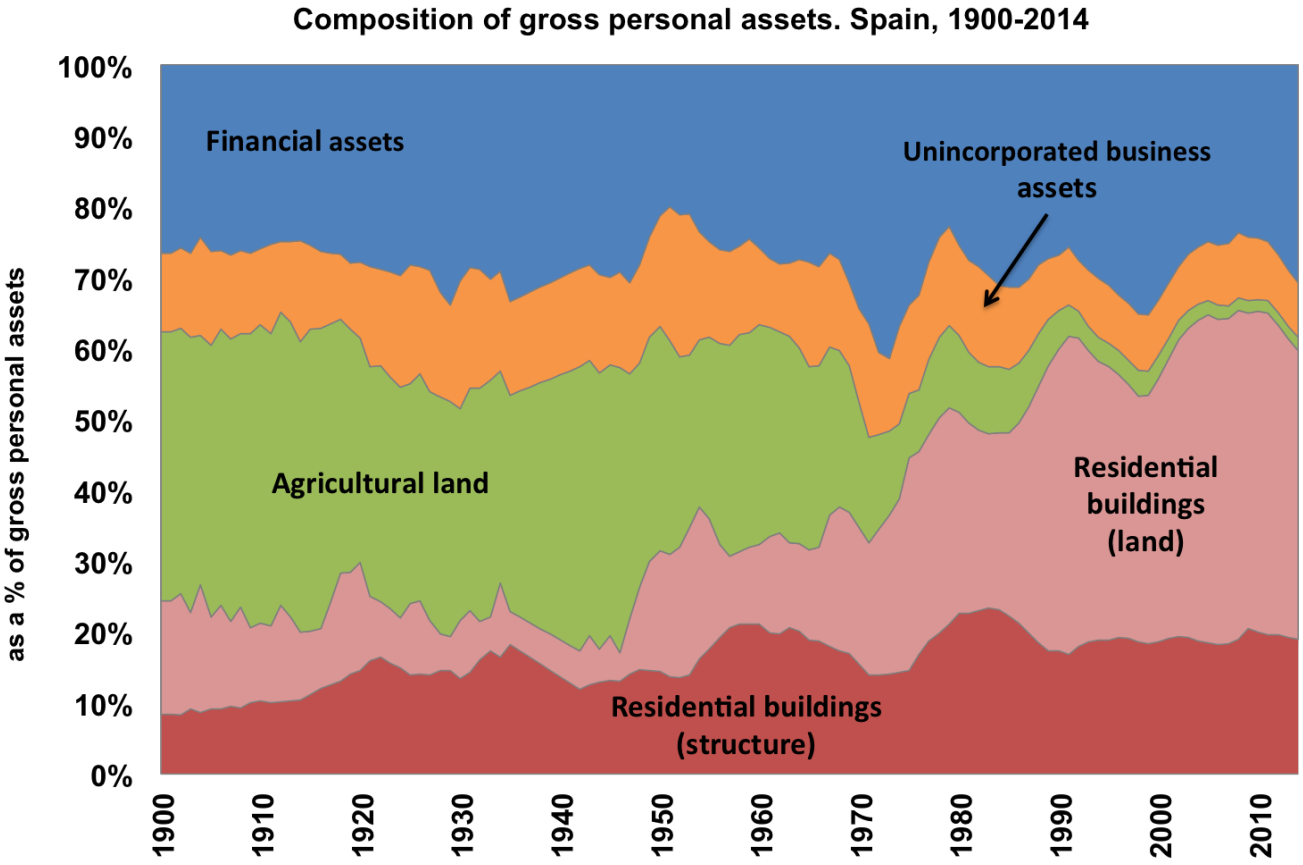

Figure A.2: Composition of gross personal assets. Spain, 1900-2014

Notes: This figure displays the composition of gross personal assets as a fraction of total gross personal assets for 1900-2014 in Spain. Gross personal assets are decomposed into residential buildings (replacement cost of the structure), land underlying residential buildings, agricultural land, unincorporated business assets, and financial assets. Computations were done using National Accounts and other sources. Due to the lack of data for the Civil War period, 1936-1941 are linearly interpolated. See table 3.f. in the data appendix.

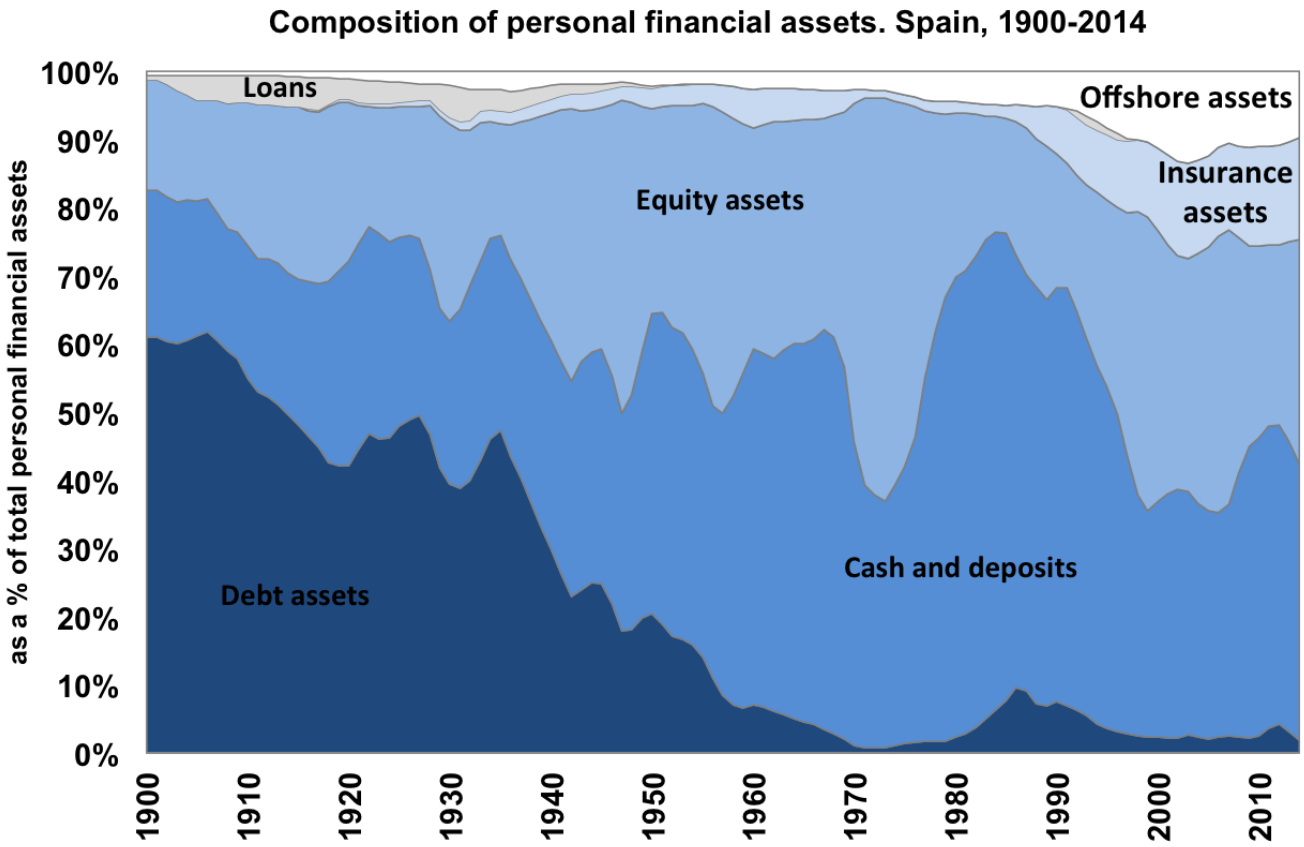

Figure A.3: Composition of personal financial assets. Spain, 1900-2014

Notes: This figure displays the composition of personal financial assets as a fraction of total personal financial assets for 1900-2014 in Spain. Personal financial assets are composed of debt securities, cash and deposits, equity shares, insurance claims, loans, and offshore assets. Note that the asset category "other" is excluded in this graph since we have only the series from the 1970s onwards. Computations were done using National Accounts and other sources. Due to the lack of data for the Civil War period, 1936-1941 are linearly interpolated. See Table 3.g. in the data appendix.

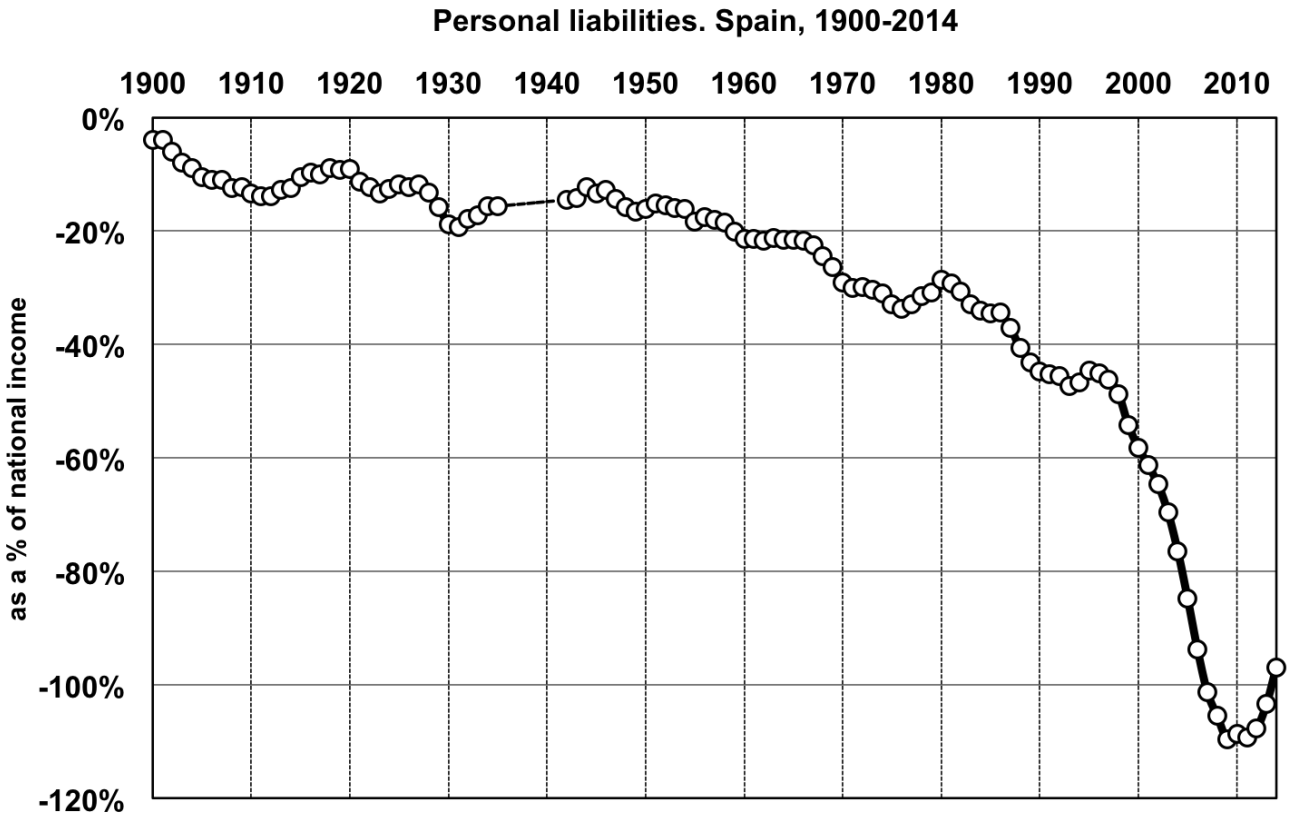

Figure A.4: Personal liabilities. Spain, 1900-2014

Notes: This figure depicts personal financial liabilities as a fraction of national income for 1900-2014 in Spain. Computations were done using National Accounts and other sources. Due to the lack of data for the Civil War period, 1936-1941 are linearly interpolated. See Table 3.a. in the data appendix.

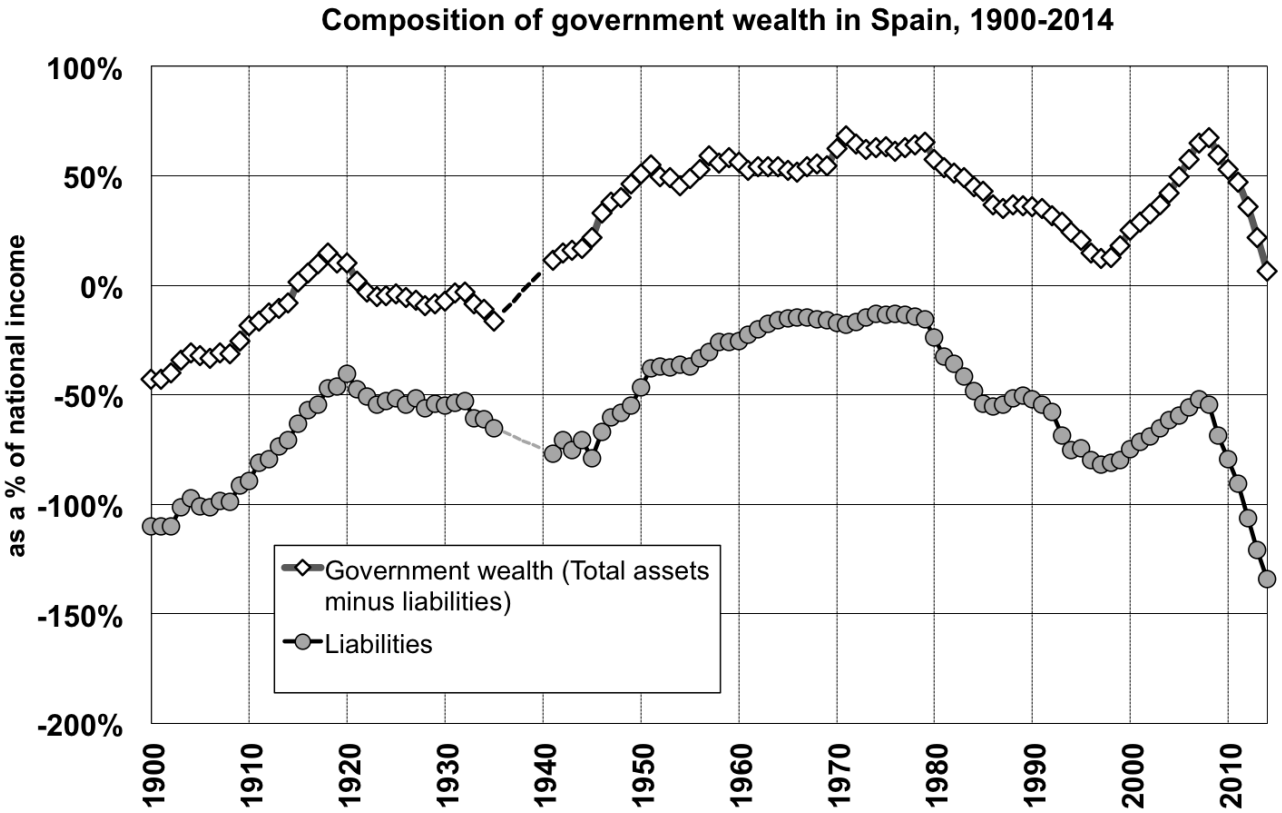

Figure A.5: Composition of government wealth. Spain, 1900-2014

Notes: This figure displays government wealth (total assets minus liabilities) and total government liabilities as a fraction of national income for 1900-2014 in Spain. Computations were done using National Accounts and other sources. Due to the lack of data for the Civil War period, 1936-1941 are linearly interpolated. See Table 3.a. in the data appendix.

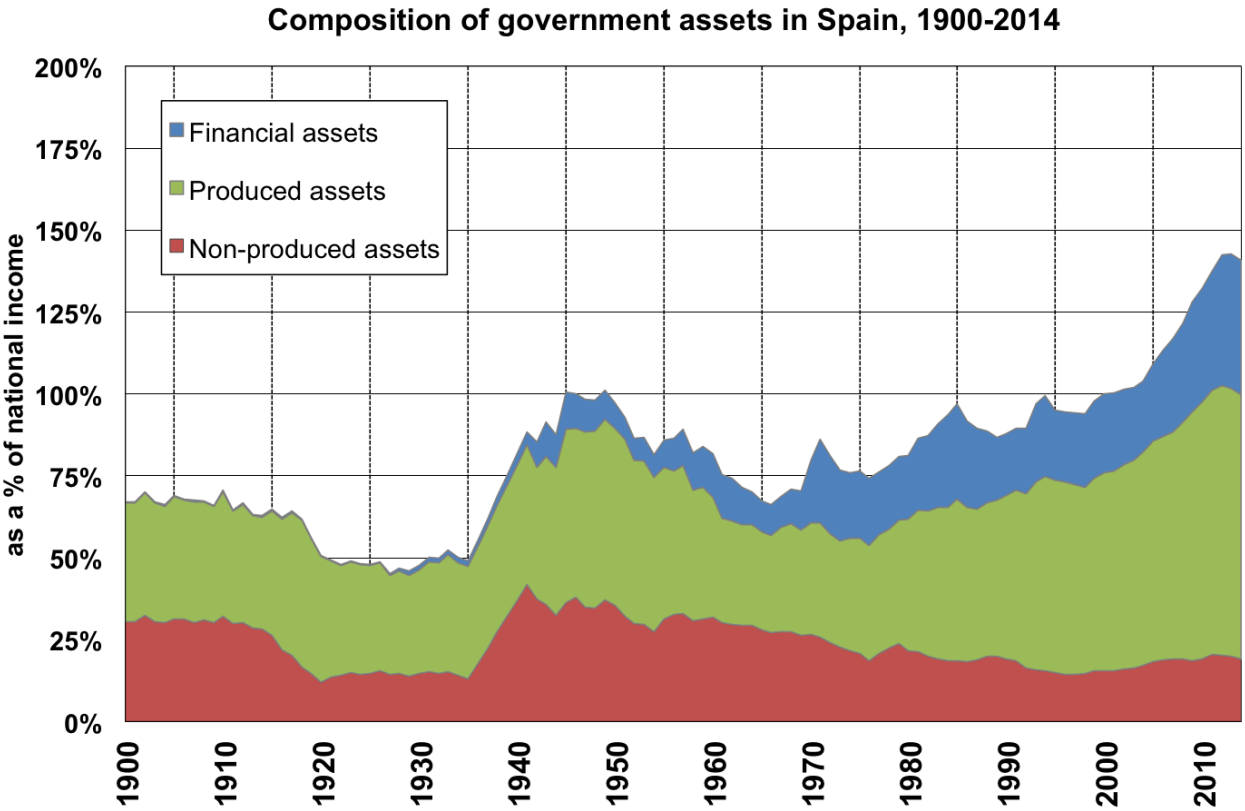

Figure A.6: Composition of government assets. Spain, 1900-2014

Notes: This figure depicts the composition of government assets as a fraction of national income for 1900-2014 in Spain. Government assets are decomposed into produced, non-produced (land underlying buildings and forests) non-financial assets, and financial assets Computations were done using National Accounts and other sources. For 1900-1970, government non-financial assets include government-produced assets, land underlying buildings, and forests, and financial assets are proxied by computing all state-owned equity holdings on the asset side. Due to the lack of data for the Civil War period, 1936-1941 are linearly interpolated. See Table 3.a. in the data appendix.

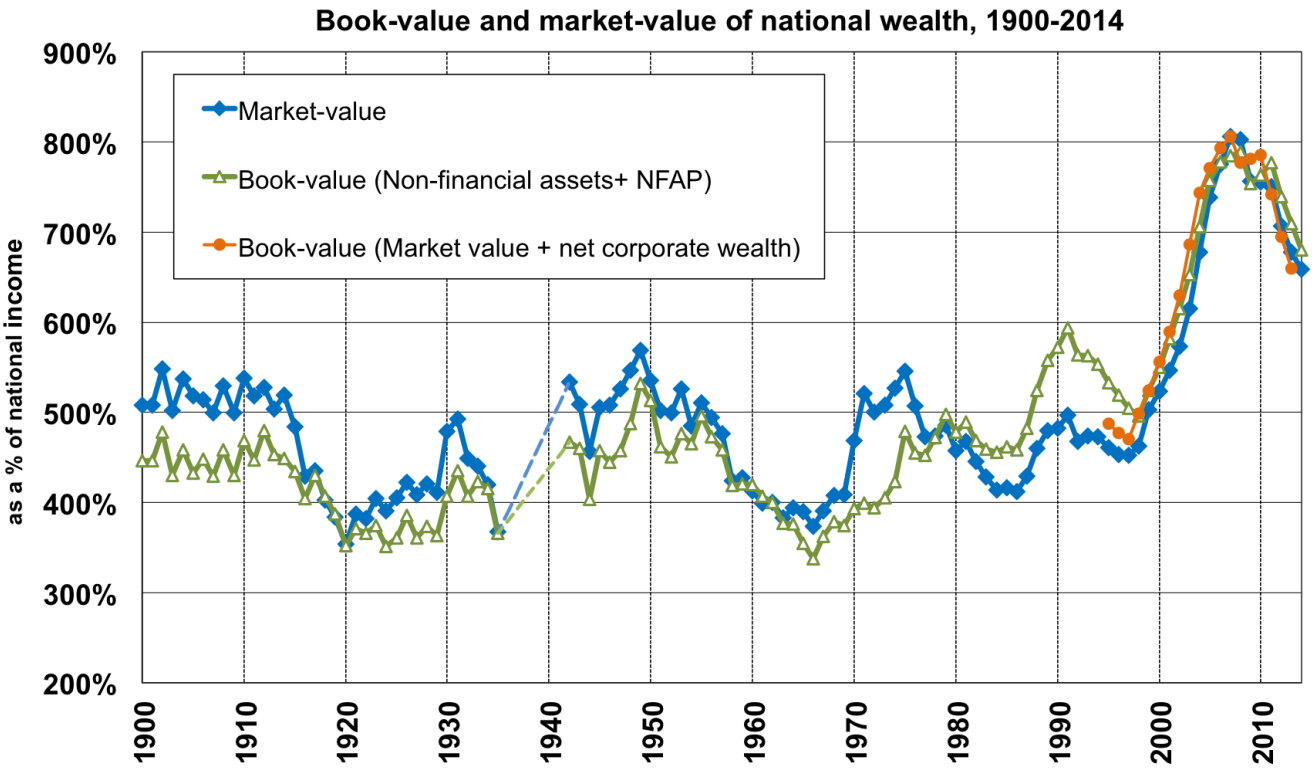

Figure A.7: Book value and market value of national wealth, 1900-2014

Notes: This figure compares national wealth at market and book value as a fraction of national income for 1900-2014 in Spain. National wealth at market value (blue line) is the sum of personal and government net worth. In contrast, national wealth at book value (green line) is the sum of the non-financial assets of all domestic sectors plus net foreign wealth. The difference between both definitions can be traced to the corporate sector, in particular to the mismatch (or residual wealth) that exists between the corporate book value of equities and the market value. Specifically, adding corporate wealth to the market value of national wealth (orange line) equals the book value definition. Both definitions converge when corporate wealth is zero or, similarly, when Tobin Q equals one. Due to the lack of data for the Civil War period, 1936-1941 are linearly interpolated. See Tables 3.a. and 3.c. in the data appendix.

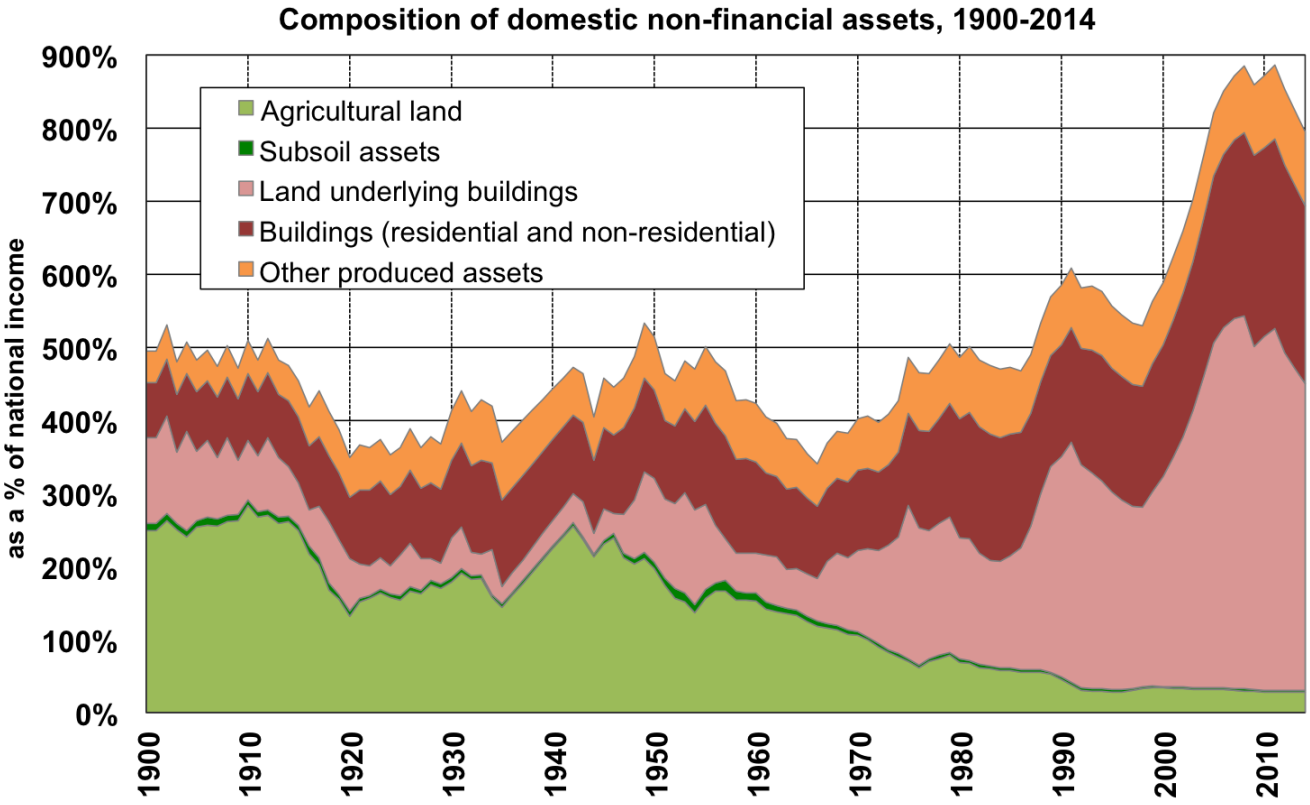

Figure A.8: Composition of domestic non-financial assets, 1900-2014

Notes: This figure depicts the composition of domestic non-financial assets as a fraction of national income for 1900-2014 in Spain. Domestic non-financial assets are decomposed into buildings (replacement cost of the structure), land underlying buildings, natural resources (agricultural land and subsoil assets), and other produced assets (buildings and constructions, machinery and equipment, and transport equipment). Due to the lack of data for the Civil War period, 1936-1941 are linearly interpolated. See Table 3.c. in the data appendix.

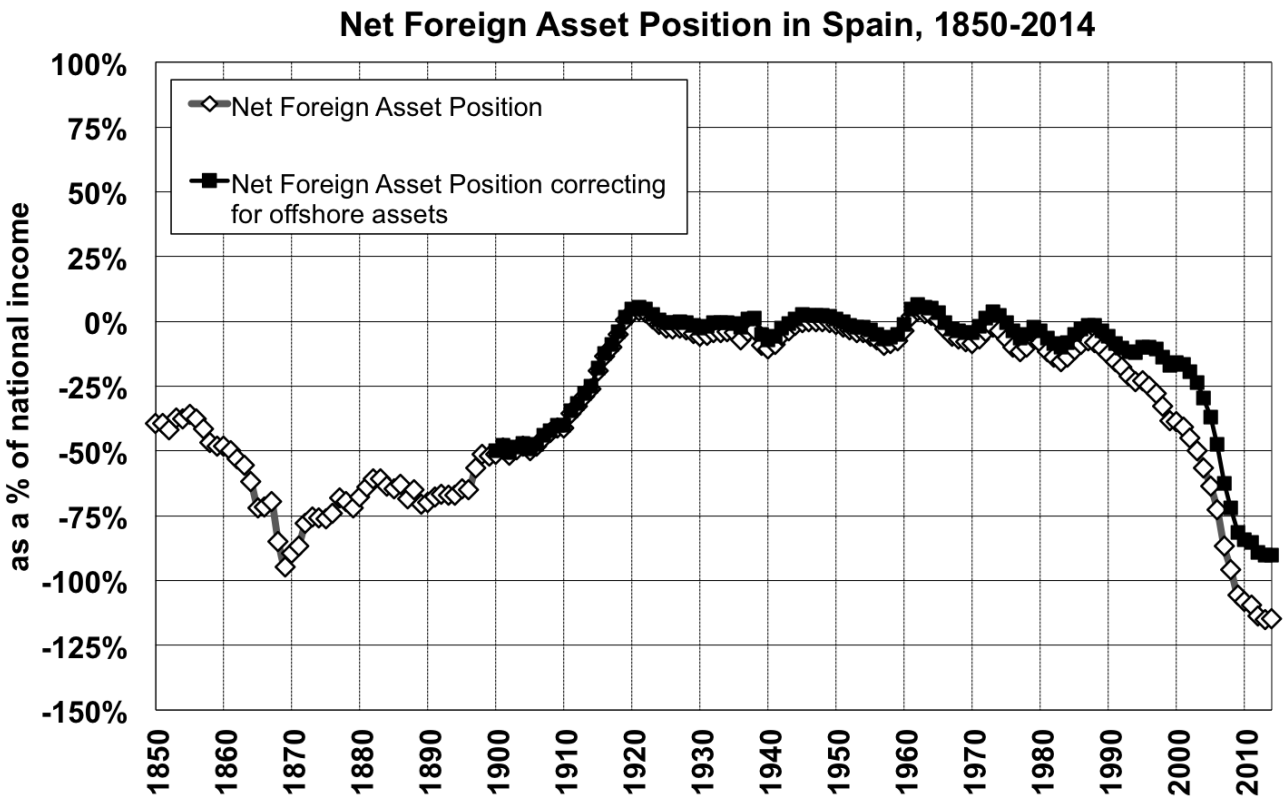

Figure A.9: Net foreign asset position in Spain, 1850-2014

Notes: This figure displays the net foreign asset position in Spain for 1850-2014, together with the net foreign asset position correcting for offshore assets for the sub-period 1900-2014. The net foreign asset position was calculated from 1970 onwards using the Financial Accounts of the Bank of Spain, and for the historical period by revising Prados de la Escosura and Rosés (2010)'s data on the current account balance. Offshore assets are derived using mainly Zucman (2013, 2014, 2015)'s data and statistics gathered since 2012 by tax authorities on the assets held abroad by Spanish residents. See Table 3.b. in the data appendix.

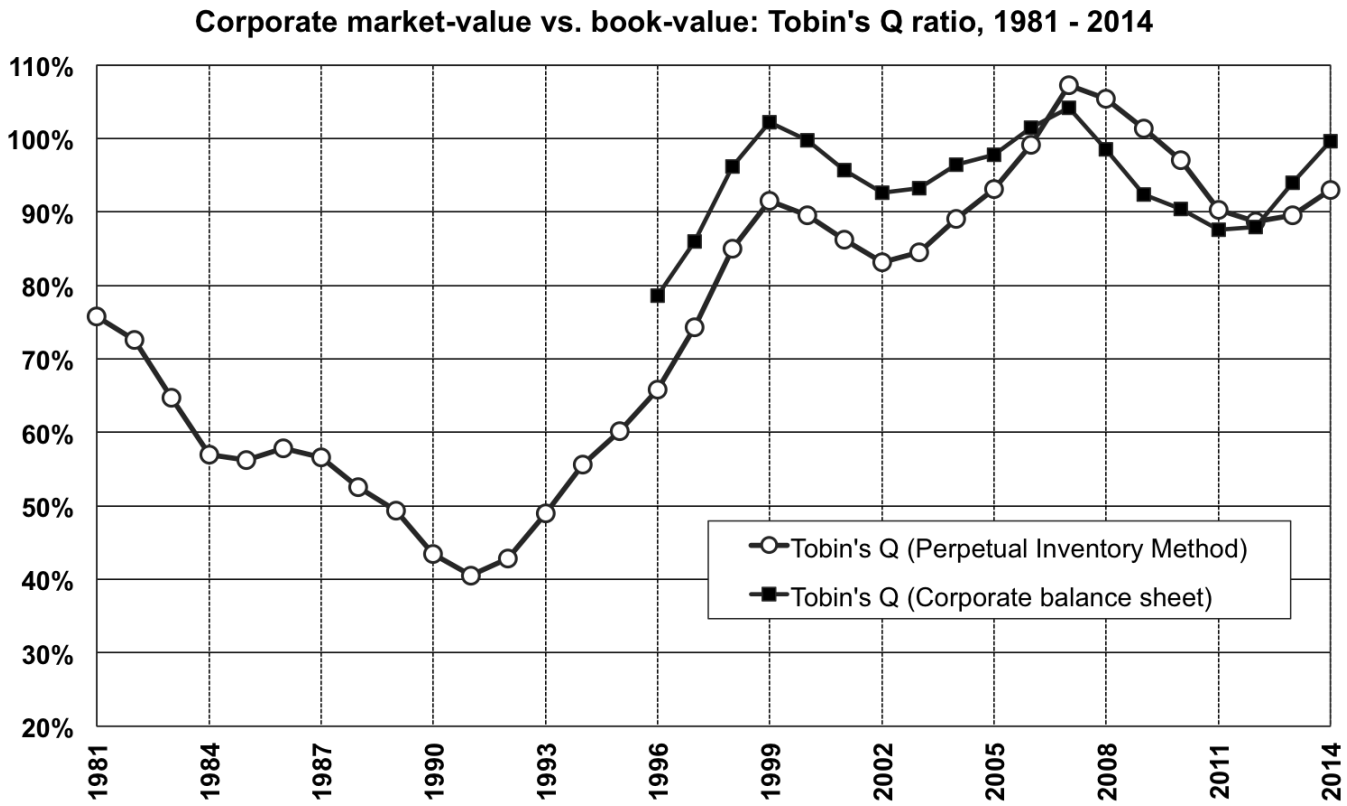

Figure A.10: Corporate market value vs. book value: Tobin's Q ratio, 1981–2014

Notes: This figure presents Tobin's Q, calculated using the Perpetual Inventory Method (1981-2014) and the Central Balance Sheet Data Office of the Bank of Spain (1996-2014). The results derived through the first procedure are assessed at book value, while those gathered using the second method are based on market prices. Tobin Q is the ratio of the market value of equity over corporate net worth. See Table 3.c. in the data appendix.

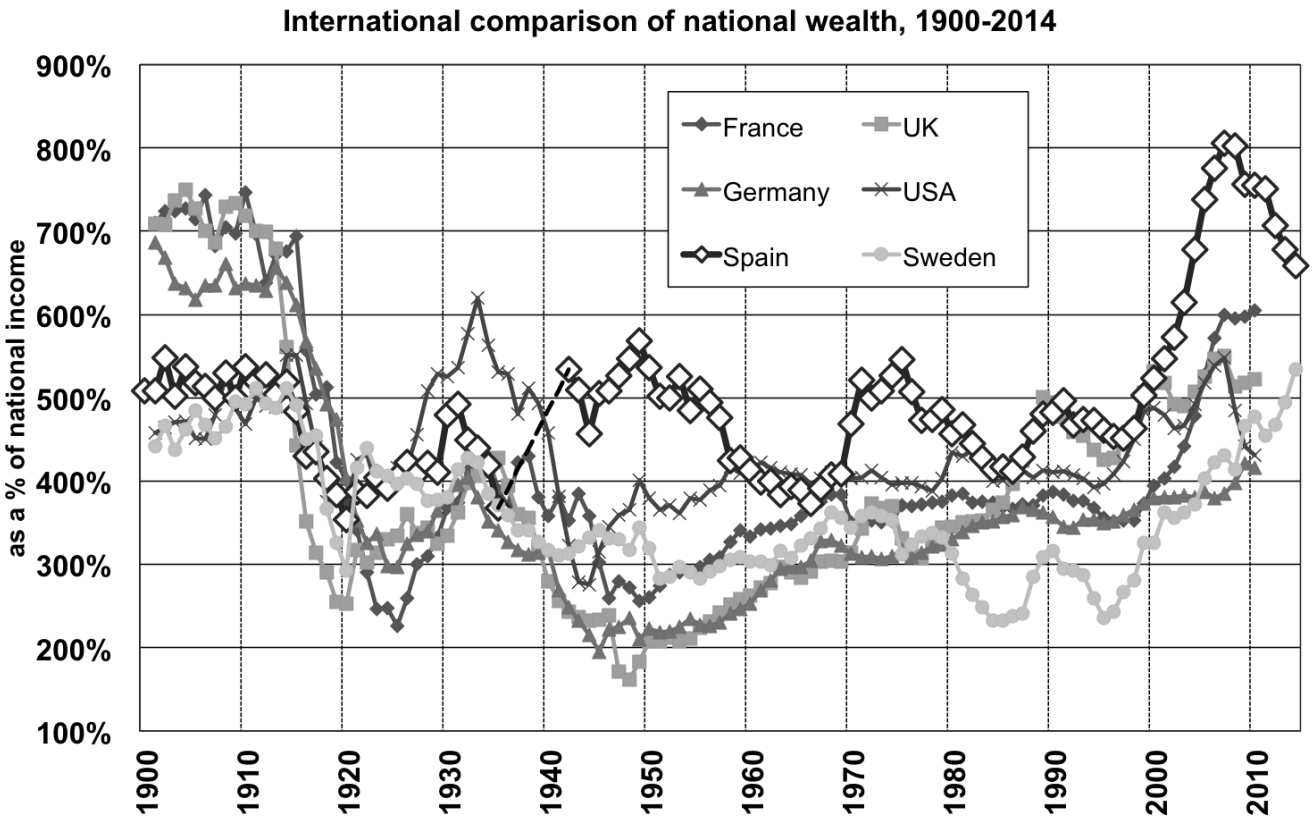

Figure A.11: International comparison of national wealth, 1900-2014

Notes: This figure depicts national wealth as a fraction of national income for 1900-2014 in Spain, France, Germany, Sweden, the UK, and the US. The series for France, Germany, the UK, and the US are taken from Piketty and Zucman (2014), and for Sweden from Waldenström (2017). See Table 5.b. in the data appendix.

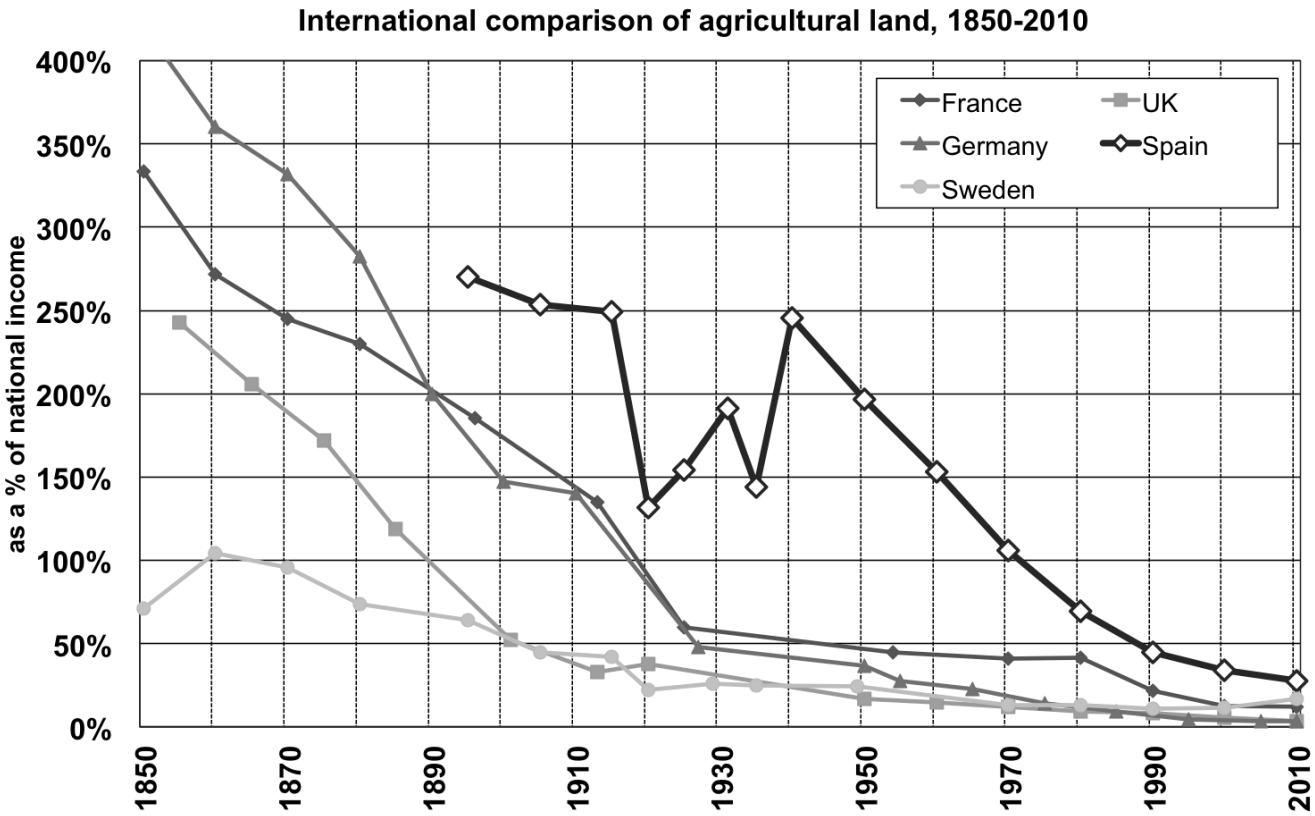

Figure A.12: International comparison of agricultural land, 1850-2010

Notes: This figure depicts agricultural land as a fraction of national income for 1850-2014 in Spain (data only available since 1986), France, Germany, Sweden, and the UK. The series for France, Germany, and the UK are taken from Piketty and Zucman (2014), and for Sweden, from Waldenström (2017). See Table 5.e. in the data appendix.

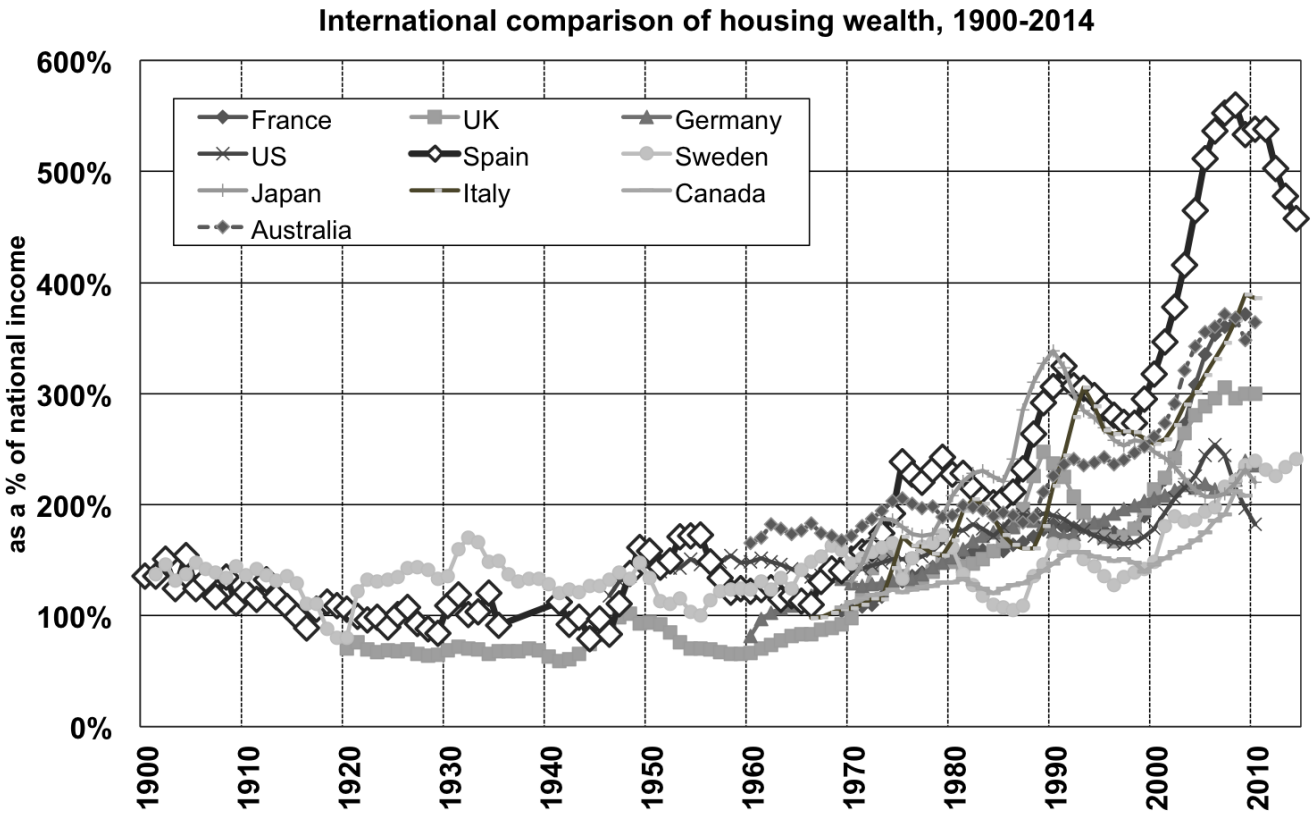

Figure A.13: International comparison of housing wealth, 1900-2014

Notes: This figure depicts housing wealth as a fraction of national income for 1900-2014 in Spain, Australia, Canada, France, Germany, Italy, Japan, Sweden, the UK, and the US. All series are taken from Piketty and Zucman (2014), except for Sweden, which are from Waldenström (2017), and for Spain, which are from our own calculations. All series incorporate the value of dwellings and the underlying land. See Table 5.f. in the data appendix.

B Tables

Accumulation of national wealth in Spain, 1900-2010 (Multiplicative decomposition)

	Market-value national wealth-income ratios (%)		Decomposition of national wealth growth rate (%)			Decomposition of housing wealth growth rate (%)			Decomposition of non-housing wealth growth rate (%)		
			Real growth rate of national wealth	Savings-induced wealth growth rate	Capital gains-induced wealth growth rate	Real growth rate of housing wealth	Savings-induced wealth growth rate	Capital gains-induced wealth growth rate	Real growth rate of non-housing wealth	Savings-induced wealth growth rate	Capital gains-induced wealth growth rate
	βt	βt+n	gw	gws=s/β	q	gw	gws=s/β	q	gw	gws=s/β	q
1900-2010	508%	756%	3,1%	1,6%	1,5%	4,1%	1,9%	2,2%	2,3%	1,5%	0,8%
				51	49		46	54		66	34
1900-1950	508%	536%	1,0%	0,8%	0,1%	1,2%	1,0%	0,2%	1,0%	0,7%	0,3%
				86	14		82	18		74	26
1950-2010	536%	756%	4,8%	2,1%	2,6%	6,3%	2,4%	3,8%	3,2%	2,0%	1,2%
				45	55		39	61		63	37
1950-1980	536%	457%	5,1%	2,5%	2,5%	6,9%	3,3%	3,5%	3,9%	2,1%	1,7%
				49	51		48	52		55	45
1980-2010	457%	756%	4,5%	1,7%	2,7%	5,7%	1,5%	4,1%	2,5%	1,9%	0,6%
				40	60		27	73		75	25

Table B.1: Accumulation of national wealth in Spain, 1900-2010 (Multiplicative decomposition)

Notes: This table presents the accumulation of national wealth in Spain for 1900-2010 using the multiplicative decomposition. Computations were done using national accounts and other sources. The Table reads as follows: The annual real growth rate of national wealth in Spain was 3.1% over 1900-2010. This can be decomposed into 1.7% and 1.4% savings-induced and capital gains-induced wealth growth rates, respectively. The table also presents the accumulation of housing and non-housing national wealth (other types of capital and foreign wealth) separately. The small numbers below the savings and capital gains growth rates are the fraction of each in the total growth rate.

Accumulation of national wealth in Spain, 1900-2010 (Additive decomposition)

	Savings (% of total cumulated net savings)			Capital gains (% of total capital gains)		
	Housing	Other types of capital	Foreign	Housing	Other types of capital	Foreign
1900-1950	32%	66%	2%	38%	-1%	63%
1950-2010	59%	83%	-42%	83%	16%	1%
1950-1980	42%	93%	-35%	70%	-1%	31%
1980-2010	67%	79%	-46%	85%	20%	-5%

Table B.2: Accumulation of national wealth in Spain, 1900-2010 (Additive decomposition)

Notes: This table presents the accumulation of national wealth in Spain for 1900-2010 using the additive decomposition. National wealth is decomposed into housing, other types of capital, and foreign wealth. The Table reads as follows: Housing accounts for 32% of total cumulated net savings over 1900-1950.

Accumulation of national wealth in Spain, United States, United Kingdom, Germany, France and Sweden, 1900-2010

	Decomposition of wealth growth rate (%)								
	1900-2010			1900-1950			1950-2010		
	Real growth rate of national wealth	Savings-induced wealth growth rate	Capital gains-induced wealth growth rate	Real growth rate of national wealth	Savings-induced wealth growth rate	Capital gains-induced wealth growth rate	Real growth rate of national wealth	Savings-induced wealth growth rate	Capital gains-induced wealth growth rate
	gw	gws=s/β	q	gw	gws=s/β	q	gw	gws=s/β	q
Spain	3,1%	1,6%	1,5%	1,0%	0,8%	0,1%	4,8%	2,1%	2,6%
		51	49		86	14		45	55
United States	3,5%	2,7%	0,7%	3,7%	2,9%	0,7%	3,3%	2,6%	0,7%
		79	21		81	19		79	21
United Kingdom	1,6%	1,4%	0,2%	-0,8%	0,7%	-1,5%	3,7%	2,0%	1,7%
		88	13		-88	188		54	46
Germany	2,0%	2,8%	-0,7%	-0,8%	0,5%	-1,3%	4,4%	4,7%	-0,3%
		133	-33		-63	163		106	-6
France	2,1%	2,0%	0,2%	-0,8%	0,3%	-1,0%	4,6%	3,4%	1,2%
		91	9		-43	143		75	25
Sweden	3,1%	3,1%	-0,1%	4,2%	1,8%	0,6%	3,6%	4,3%	-0,6%
		102	-2		74	26		117	-17

Table B.3: Accumulation of national wealth in Spain, the US, the UK, Germany, France, and Sweden, 1900-2010

Notes: This table presents the accumulation of national wealth in Spain, the US, the UK, Germany, France, and Sweden for 1900-2010. Computations were done using national accounts and other sources. The results for the US, the UK, Germany, and France come from Piketty and Zucman (2014), and for Sweden, from Waldenström (2017). The small numbers below the savings and capital gains growth rates are the fraction of each in the total growth rate.

Wealth in Spain, (1900 – 2014). A Country of Two Lands

Appendix

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INTRODUCTION

The main challenge of this research has been to build a consistent wealth series for Spain that will cover the lack of an official national balance sheet for the present and the past. This appendix is dedicated to present the key concepts, methods and sources employed.

Concepts

National income and wealth are two concepts extensively developed in the international accounting systems (SNA-2008 and ESA-2010). Wealth is calculated by providing, for a particular point in time, a balance sheet that records the value of assets economically owned and liabilities owed by an institutional unit or group of units. To carry this analysis, the system of national accounts divides the economy into five resident sectors –households, non-profit institutions serving households (NPISH), financial corporations, non-financial corporations and the general government–, and a sixth sector which corresponds to the rest of the world.

At the country level, we follow the two definitions of national wealth used by Piketty and Zucman (2014). The first one, called the "book value of wealth", basically follows the SNA standards by computing, for each resident sector i, their non-financial assets (A_i^{NF}), and adding the net foreign wealth (NFW)[1]. Grouping households and non-profit institutions into the 'personal sector' and financial and non-financial corporations into the 'corporate sector', book-value of national wealth (W_N^B) can be expressed as follows:

$$W_N^B = A_P^{NF} + A_C^{NF} + A_G^{NF} + NFW$$

The other definition of national wealth, named "market value of wealth" (W_N^M), is the sum of personal wealth (W_P) and public sector wealth (W_G):

[1] In the SNA, the rest of the world sector only holds financial positions, with non-financial assets holdings being accounted as financial. In ESA-2010, non-financial assets of non-residents are classified in AF.519: "Other equity".

$$W_N^M = W_P + W_G$$

The link between these two definitions can be traced to the corporate sector. To see this, start with a closed economy, where financial assets cancel out with liabilities, and national wealth equals the national stock of non-financial assets. Given that in an open economy net foreign wealth equals the sum of financial assets A_i^F minus liabilities L_i of resident sectors: $NFW = A_P^F - L_P + A_C^F - L_C + A_G^F - L_G$, then the "book-value of national wealth" equals the market-value definition plus the wealth of the corporate sector:

$$W_N^B = W_N^M + W_C$$

Hence, both definitions of national wealth are equal when the residual wealth of the corporate sector (W_C) is zero or, equivalently, when the famous Tobin's q (Tobin, 1969) formula equals 1.

In this paper, we develop national wealth series based on these two definitions, and provide also an estimate of the residual corporate wealth for the most recent period.

Asset classification

The other major recommendation of the SNA/ESA involves creating a balance sheet that separates between non-financial assets, financial assets and liabilities (Table 1). In this paper, we have followed the proposed guidelines, although, given the lack of detailed sources, some necessary adjustments have been made. At a country level, we separate between produced and non-produced assets. In the first, we include dwellings, other buildings, infrastructures, machinery, and transport equipment. In the second, we separate between agricultural land, land underlying buildings, and mineral reserves. Valuables (art, antiques, jewelry, etc.) are excluded due to insufficient data. Also, neither human capital nor consumer durables are part of the wealth definition used in this paper. By doing so, we follow SNA/ESA guidelines which do not consider human capital an economic

asset, and classify investment in durables as current consumption. Overall, the book value definition of national wealth is based on the sum of these non-financial assets plus the net foreign asset position.

Wealth of the major institutional sectors has also been detailed into separate balance sheets by distinguish between non-financial assets, financial assets and liabilities. In the personal sector, we group households and non-profit institutions serving households[2]. Household non-financial assets are presented following a simplified structure around three categories (housing, agricultural land and unincorporated business capital), while financial assets and liabilities are classified by strictly sticking to SNA/ESA principles.

In the general government (or simply, the public sector) we include the central government, the state government ("Autonomous communities" in Spain), the local government as well as social security funds. Public non-financial assets have been divided between produced ones (i.e. the capital stock of buildings, infrastructure, etc.) and non-produced one (basically, forest land and land underlying buildings). Then, for the historical period, we proxy financial assets by the value of state-owned equity holdings (for example, the public railway company RENFE) plus financial assets owned by social security funds. Finally, the liabilities include the market-value of public debt and the technical reserves of the funded pension system.

The other institutional sectors cannot be analysed in such detail. The available data makes possible to calculate Spain's net foreign wealth, although it is only feasible to differentiate between assets and liabilities from 1971 onwards. Information on selected corporate assets and liabilities are used as an auxiliary source in this paper, but presenting a complete balance sheet for both non-financial and financial institutions is only possible for the most recent period.

[2] For the sake of brevity, in what follows, we refer to households in a broad sense that includes non-profit institutions serving households.

Time coverage

This paper reconstructs the balance sheet for the Spanish national economy and for the selected institutional sectors (personal, government and foreign sectors) since 1900. Our results start at beginning of the twentieth century, since it is only at this period when it is possible to obtain the basic sources to compute wealth aggregates. Some very conjectural estimates could be made for the preceding century, but we have preferred to provide only results based on homogeneous series. It is also worth pointing that we do not provide any figures for the Civil War and the immediate following year (1936-1940), given that most statistics do not include references for this period. Besides, the whole concept of wealth seems difficult to assess at that time. On the one hand, most of household assets (land, dwellings and financial securities) lacked any organized markets, as the stock market was closed and very few real estate transactions were carried, and so imputing representative prices seems almost impossible. Besides, with two competing forces fighting over Spain, each with different government structures, debts and currencies, establishing the size of the public sector is not as straightforward as in other periods of history.

Another important point that should be kept in mind refers to the period of observation of our wealth variables. Generally-speaking, non-financial assets are measured as mid-year averages in the original sources, while financial claims are valued at the end of the year. To provide a convergence between both, we make a mid-year average of financial assets and liabilities by making a simple mean between the values of year t and t-1.

DOMESTIC ASSETS

Produced assets

Our estimate of produced assets covers the ESA-2010 category of fixed assets (AN.11), which includes dwellings, other buildings and structures, machinery and equipment, weapons systems, cultivated biological resources, and intellectual property products. Inventories (AN.12) and valuables (AN.13) are excluded from this category, and thereby not considered in our book-value estimate of national wealth. This omission is not a major problem, as data from other countries show that both assets represent a relative small share of national wealth[3].

Ideally, fixed assets should be measured through the 'census-like' approach, which multiplies the observed quantities of each asset type by their corresponding market prices. In practice, however, direct observation of some fixed assets may be difficult, especially for the corporate and the general government sectors. Due to this reason, the SNA-2008 recommends its measurement using the "perpetual inventory method" (PIM).The basic principle of this method is that asset values can be estimated by cumulating historical flows of investment, corrected for depreciation, and adjusted at current market prices. More concretely, to obtain the capital stock in year $t+1$ (C_{t+1}) from an initial value of the capital stock in year t (Ct), the PIM adds the investment flow in year $t+1$ (I_{t+1}) and detracts the depreciation of existing capital in year $t+1$. If we name δ the depreciation rate of existing capital, the accumulation method can be expressed in the following form:

$$C_{t+1} = C_t + I_{t+1} - \delta\left(C_t + \frac{I_{t+1}}{2}\right)$$

[3] For example, in France valuables and inventories have, respectively, fluctuated around 21-26% and 4-14% of national income. Since 2002, the Survey of Household Finances of the Bank of Spain covers valuables owned by individuals. Results point to a very low share (c. 1%) in total household wealth.

Hence, for implementing this method, three elements are crucial: an initial estimate of the value of an asset type, high-quality series of investment flows and prices, plus depreciation rates over time.

Unfortunately, the SNA-2008 does not provide strict guidance to national statisticians on which specific procedure to follow when implementing the PIM, something which may obstruct the international comparison of produced assets. Depreciation rates depend on the age efficiency and the retirement profiles of assets, and different assumptions about them will imply different depreciation patterns. Nevertheless, the SNA-2008 refers to the OECD (2009) manual, which explores in greater detail the practical implementation of the PIM, and gives some particular recommendations. Importantly, the OCDE advises to use geometrical patterns of depreciation "because they tend to be empirically supported, conceptually correct and easy to implement" (OECD, 2009, p. 12). Given that the use of initial levels of produced assets and the quality of investment series are an empirical matter (and not a conceptual one), the advice to use "geometric patterns" indeed points towards homogenizing the international implementation of the PIM.

In this paper, we implement the perpetual inventory method for the period 1850 – 2014 using data on investment flows and investment prices from Prados de la Escosura, (2016a) for four groups of fixed assets: dwellings, other constructions, machinery and equipment, and transport equipment[4]. However, we only provide results from 1900 onwards for two reasons: first, it is since 1900 when we can also estimate the stock of non-produced assets; and second, any mismeasurement of the initial stock of produced assets at 1850 will have a negligible impact on the PIM estimates from 1900 onwards.

We are not the first study using this type of approach to reconstruct produced assets in Spain and we have benefited greatly from previous analyses. Most notably, Prados de la Escosura and Roses (2010) estimate the stock of produced assets for the same four asset categories for the period 1850 – 2000, while Mas et al. (2000) and the group of researchers at the IVIE institute (2005, 2011, 2015) decompose this stock into 17 different categories from 1964 onwards. However,

[4] Machinery and equipment is a broad concept that includes "agriculture" and "other" assets, plus intellectual property since 1995.

we decide to compute our own estimate to incorporate the latest recommendations from OECD (2009) on the use of geometric patterns of depreciation, and, also, to include the recently available data on Spain's historical national accounts from Prados de la Escosura (2016a).

Regarding the geometric pattern of depreciation, we stick to the "double-declining balance method" (OECD, 2009, p. 52), where the depreciation rate of an asset i takes the following form: $\delta_i = 2/T_i$, with T_i being the average service life of asset type i. This depreciation pattern coincides with the one adopted by the IVIE institute since 2011, but differs from Prados de la Escosura and Roses' (2010) approach, who use the "modified" geometric pattern as an in-between approach of the arithmetic and the geometric patterns.

To choose the service life (T_i) for each of the four groups of assets, we take the values from Prados de la Escosura and Rosés (2010) in Table 1 of their paper. In line with them, we also divide the asset lives into three broad periods (1850-1919, 1920-1959 and 1960-2000), to capture the diverse evolution of assets lives over time (i.e. certain asset types depreciate much faster nowadays than in the 19th century). However, we make a further correction. For the three asset types which service lives change over time (only "Dwellings" have a constant service life of 70 years over the period 1850-2000), we do not assume that service lives are constant over the mentioned periods and, then, suddenly change from one period to the next one. Doing this would affect the estimate of produced assets by the PIM, as in the years when a new period is introduced there is a sudden increase in the amount of capital depreciated as a result of lower service lives in the most recent periodsd. Instead, we set the average service live of an asset type at the middle of the mentioned periods, and link the three periods using linear interpolation, therefore smoothing the evolution of service lives over time. Given that the middle year of the period 1960-2000 is 1979, we add an extra benchmark year in 2007. For this year, we use the service lives profile for "Machinery and equipment" and "Transport equipment" used by Denmark in its national accounts (Görzig 2007, table 6), and keep constant the service life profile of "Other constructions". We use the Danish service life profile as it is in line with the one

used in this study. In the robustness checks section we compare the evolution of produced assets using constant versus varying service lives.

One important difference in this paper with respect to Mas Ivars et al., (2015) relates to the use of the historical series of investment flows to implement the PIM. In this study, we employ the reconstruction of Spain's national accounts from Prados de la Escosura, (2016a) for the period 1850-2014, who revises and updates his previous series of GDP (1850-2000) with a new interpolation method to splice historical national accounts. This method is designed to overcome the problems of the conventional 'retropolation' approach, which overstates the level of investment and of other components of GDP in the past, and underestimates their growth over time (Prados de la Escosura, 2016b), especially when official national accounts started to produce estimates for countries that had not completed their structural transformation towards modern, service-oriented economies. Applying the perpetual inventory method with retropolated investment series –as it is the case in the IVIE institute–, inflates artificially the initial stocks of fixed assets, and shows lower growth rates (i.e. a flatter posterior development).

We use the same values than Roses and Prados (2010) for the initial value of the stock of produced assets in 1850, with a stock of fixed asset equivalent to 86% of national income. In their paper, Prados de la Escosura and Roses choose this value by applying a 'steady state' formula, where fixed assets equal the value of investment over the sum of capital depreciation rates and GDP growth rates around 1850 which, then, they multiply by two. This value may contain an important degree of uncertainty. However, this choice has little incidence on the performance of the PIM after some decades, as Roses and Prados de la Escosura (2010, figure 1) show: by 1890, any assumption about the initial stock of fixed assets in 1850 has almost no impact on the PIM estimate. Hence, by presenting our results from 1900, we avoid any mismeasurement in our PIM series derived from the choice of an initial stock of fixed assets.

A final adjustment has to be made on our PIM series to account for war destructions during the Civil War period (1936-1939). We take the percentage of capital destroyed from Prados de la Escosura and Rosés (2010, pg. 144): Transport equipment (40%), machinery and equipment (13%), buildings (4%) and infrastructures (6%). Given that we do not distinguish between buildings and

infrastructures but between dwellings and other buildings, we assume 4% destruction for dwellings and 5% for other buildings (average of 4 and 6 %).

Housing

In this paper, we estimate the value of housing from two perspectives. First, we estimate the total market value of the housing stock using the 'census approach', which captures both the value of the structure (produced element) and the land underlying (non-produced element). Second, we estimate the value of the structure by estimating the value of dwellings following the PIM previously discussed. As an specific consideration to the housing sector, we assume that the asset life of dwellings is 70 years (as in Roses and Prados de la Escosura, 2010), and that, following the "double-declining balance method", the annual depreciation rate is 2.9% (i.e. two divided by seventy). One additional element has to be considered when applying the PIM to housing investment data, as these data include commissions from existing home sales. In the United States (Davis and Heathcote, 2007), the Bureau of Economic Analysis quantifies the impact from including commissions in the value of the replacement cost of dwellings in 8.5 per cent. In Spain, we are not able to quantify the value of these commissions so we do not correct our series. As a result, our estimate of dwellings using the PIM may be somewhat overestimated.

Our initial point is to estimate the total market value of the housing stock, including both the structure and the land underlying. Although this asset is probably the most important component to study wealth in Spain from long-term perspective, unfortunately, the quality of sources and the methods employed vary notably during the 20th century, and clearly more research in needed for the past and the present. Housing wealth during the period of 1900 to 1954 is calculated by multiplying, at a provincial level, the number of dwellings by the average prices recorded by property registrars. The number of houses can be obtained from the decennial censuses and interpolating for the years in between. From 1900 to 1930, figures are derived from the oldest and simplest survey, the *Nomenclátor*, which recorded the total number of buildings at a local level,

differentiating both between dwellings and other types of constructions[5]. After the Civil War, the information is of higher quality, as the government started in 1950 to carry a modern housing censuses on decennial intervals[6]. The only adjustment relates to the destructions caused by the Civil War. We assume that from 1931 to 1935 the building activity continued at the same rate as in the preceding decade, and afterwards 5% of the housing stock was destroyed between 1936 and 1939. The resulting trend is very similar to the 250.000 housing units that contemporaries estimated that were destroyed during the Civil War (Tafunell, 2005a, p. 463).

From 1900 to 1954 housing prices have been derived from the Registrars' Yearbook (Ministerio de Gracia y Justicia 1910-2015). This source has already been used by Carmona et al. (2014) to construct a hedonic index of housing prices. Our computations are slightly different in two aspects. First, in this paper we are only interested in market prices, and so we exclude post-mortem transmissions and other special transactions. Secondly, given that there is hardly any difference between the evolution of their hedonic price index and real prices, we simply opt to compute housing prices by making a simple average in each province. Nonetheless, it should be noted that the original source is plagued by small typographical errors that most times do not alter results. The only exception occurs in 1910 and 1927, when results seem highly implausible and thus we opt to interpolate linearly with the nearest two years. Finally, housing wealth has been calculated by multiplying the number of units by the average price at a provincial level.

Although property registrars' have continued to publish the same statistics until the present, the legal changes that occurred in Spain from 1950s onwards makes highly advisable to use alternative sources. Until that moment the real estate market had been dominated by a system of vertical property (i.e. the building and the underlying land could only have one owner), but since the 1950s there was a transition to a system of horizontal property and ownership became gradually

[5] (Dirección General de Estadística, 1924; Dirección General del Instituto Geográfico, Catastral y de Estadística, 1933)
[6] (Instituto Nacional de Estadística, 2011, 2001, 1995, 1986, 1976, 1962, 1953)

extended. Unfortunately, property registrars did not change their data format, and therefore it is not possible to distinguish buildings and single apartments in transactions.

As an alternative, we have assumed that since 1954 and until 1975 the change in housing wealth (i.e. dwellings multiplied by nominal prices) followed the same trends than the housing rents recorded in the national accounts (Instituto de Estudios Fiscales, 1969; Instituto Nacional de Estadística, 1971; Instituto Nacional de Estadística and Ministerio de Economía y Comercio, 1982). We have compared our estimate with the one provided by the Universidad de Deusto (1968) for 1965, and the results are broadly in range. However, we do hope to improve the results for this period in future versions.

For the most recent era (1975-2015), we provide a more accurate estimate of housing wealth using new statistics. Presently, there are two main sources on the market value of housing: the *Indicadores del Mercado de Vivienda* of the Bank of Spain (1987-2015) and the BBVA Foundation report of Uriel Jiménez et al. (2012). Both sources follow a similar methodology by multiplying the total constructed area by the average price. These two metrics are expressed in square meters. Surface area is computed in both studies using the census of dwellings, and both obtain almost identical results[7]. For constructing our series of housing wealth, we use the Bank of Spain's series, since it covers a longer period (1987-2015) than the work of Uriel Jiménez et al. (2012)[8].

For calculating the average price per square meter, both studies use the series of average prices elaborated by the Ministry of Public Works based on property appraisals. However, whereas the Bank of Spain uses the average price of free housing, Uriel Jiménez et al. (2012) use both the average price of free and social housing. As this latter method is more accurate, we use the data provided by Uriel

[7] In order to know the exact methodology followed to construct this series see the definitions' appendix of *Indicadores del Mercado de Vivienda* and Uriel et al. (2009) for the series included in the 2012 report of *Fundación BBVA*.

[8] We thank Jorge Martínez Pages for sharing the series on the total constructed area, since it is not directly available in *Indicadores del Mercado de la Vivienda*.

Jiménez et al. (2012) for constructing our series of housing wealth. However, the shortcoming of using this latest one is that it does not cover the period after 2010. Thus, for the period 2011-2015, we directly use the series of average price of free housing of the Ministry of Public Works, and adjust for social housing by multiplying prices by the price ratio between free and social housing over the average free housing price in 2010.

Until now we have explained how we construct our series of housing stock for the period 1990-2015. We complete the series backwards to 1975 using the nominal house price index (1975-2015) used in Mack et al. (2011). These authors provide two versions of a housing price index. From 1986 to 1994 they use the price series produced by the Ministry of Housing (1986-1994) on the average price on all dwellings types (new and existing), and from 1995 onwards the already mentioned series of the Ministry of Public Works. For the period 1986-2015, the two series are virtually identical, but for from 1975 to 1986 they show considerable differences. The first annual house price series was the one produced by Tecnigrama, which measures average prices for all dwelling types located in Madrid. The second series is the one constructed by Taltavull de la Paz et al. (2015), based on mortgage loan data from the National Statistics Institute (*INE*). Although in theory this latter one should be more accurate, the truth is that it shows an implausible fall of more than 50% in housing prices in the early 1980s. For this reason, we use the data series derived from Tecnigrama, since we believe that it better captures the trend in Spanish housing prices between 1975 and 1985.

One final adjustment needs to be done to link the 1975-1986 series with the 1986-2015 data. First, we divide the housing wealth series that has already been obtained by the stock of dwellings in 1990, the reference year of the census. Secondly, we extend the results backwards in time based on the growth rate in the volume of dwellings, according to other census data (1970 and 1980). Finally, we obtain the value of the housing stock by multiplying the estimated volume of dwellings by the nominal house price index in each year.

Other produced assets

Besides dwellings, we estimate three other components of fixed assets using the PIM: other constructions, machinery and equipment, and transport equipment. The correspondence between these categories and the ESA-2010's decomposition of fixed assets (AN.11) is as follows: "Other constructions" is equivalent to "Other buildings and structures" (AN.112); "Machinery and equipment" incorporates the equally named category in ESA-2010 (AN.113) as well as "Weapons systems" (AN.114) and "Cultivated biological resources" (AN.115). In addition, from 1995, "Machinery and equipment" includes "Intellectual property products" (AN.117). Finally, as a separate category, we present estimates of "Transport equipment", which correspond to the equally named group of assets (AN.1131) in ESA-2010.

To implement the PIM on these three asset categories we follow the procedure explained before, using the asset lives of Prados de la Escosura and Rosés (2010, p. 145) and applying the "double-declining balance method" of depreciation. Furthermore, we decompose the category "Other constructions" into non-residential buildings and structures. To do this, we use information on non-residential buildings from the latest IVIE study of Spain's produced assets (Mas et al. 2015), where "Other constructions" (category 1.2) are decomposed between economic structures (categories 1.2.1 to 1.2.6) and other types of constructions (category 1.2.7), the latter capturing non-residential buildings. During the years for which the IVIE carries this analysis (1964-2013), the share of non-residential buildings on "Other constructions" was relatively stable, ranging from 66% in 1964 to 71% in 2013. For this period, we use IVIE's share of non-residential buildings and we apply it to our estimate of "other constructions". Then, to extend this decomposition backwards to 1900, we assume that the share of non-residential buildings was constant at 65%. For the year 2014, we assume that this share was equal to the last year in IVIE's data: 2013. Although this is the best approximation we could came up with to decompose "Other constructions" between structures and non-residential buildings, these values should be viewed

as a rough approximation, particularly during the period 1900-1963. If better data become available in the future, our figures would be revised accordingly.

Non-produced assets

Non-produced assets, as defined by ESA-2010, can be divided into three broad categories: Natural resources (AN.21), Contracts, leases and licences (AN.22) and Purchases less sales of goodwill and marketing assets (AN.23). In this study, we estimate the value of all natural resources (AN.21) but, due to lack of information, we do not cover the latter two categories: AN.22 and AN.23. Nevertheless, the value of these two categories in other countries is very small (i.e. in France, they represent between 4% and 6% of the total value of non-produced assets over the period 1978-2014). Hence, by assessing the value of natural resources, we are already capturing almost all non-produced assets.

Agricultural, pastoral and forest land

The valuation of agricultural land involves the use of various sources of diverse quality. For the first period, that starts at the beginning of the 20th century and lasts until the outbreak of the Civil War, we start by gathering estimates on the surface of arable, pastoral and forest land by crop type (GEHR, 1983). The original series only provides surfaces in hectares for some specific benchmark years (1900, 1910, 1922 and 1931), from which we construct an annual estimate by making a linear interpolation for the years in between. The challenge then lies in linking these data with a reliable series of land prices, a fact that has always been problematic in Spanish history given the late development of its fiscal cadastre. As an alternative, we use the land prices per hectare and crop published by Bringas Gutiérrez (2000), who carried an extensive survey on property auctions for a period ranging from the early 19th century until 1935 using also benchmark years (1905, 1915, 1920, 1925, 1931 and 1935). From his data, we thus construct an approximate land price index by interpolating the values in between. Thereafter, we relate both magnitudes (arable land by crop and average price per hectare and crop) to estimate the total value of agricultural land.

After the Civil War the quality of statistics declines substantially. High inflation, the development of a black market of foodstuffs and the lack of any rigorous fiscal control makes more difficult the assessment of agricultural land prices. Later, the situation improves, and by 1963 the research team of the University of Deusto made a detailed estimate of Spain's land prices using the first results provided by the agrarian census carried by the government the year before[9]. This impressive work was later replicated by the Ministry of Agriculture in 1970, 1972, 1974 and 1976 (Ministerio de Agricultura, Pesca y Alimentación 1975-1985). As for the most recent period, the available data are far less problematic. The Ministry of Agriculture published a first preliminary survey on land prices for years 1979-1983 (Pousa Soto and Sánchez Rodríguez, 1986), which thereafter has been upgraded and made permanent (Ministerio de Agricultura, Pesca y Alimentación 1984-2014). Our calculations for the 1960s and 1970s take these estimates and interpolate for the years in between. Since the 1979 till the present day we multiply the weighted average price per hectare by the utilized agricultural area.

Linking the 1935 and 1963 estimates is more problematic. As a solution we considered that land surface stayed unchanged and that the evolution of prices per hectare followed the patterns of the indemnity paid by the public National Institute of Colonization to private landowners through this period (Gómez Manzanares, 1979). Some caution should be taken when using this land price index. While historians (Mangas Navas and Barciela, 1990) agree that public indemnities were generous (i.e. near market conditions), it is also true that the available data do not take into account differences between regions or crop types. Besides, the land price index shows some very questionable results in its first two years (1942 and 1943), pointing to decline in nominal prices in a context of high inflation. Given that these figures are very difficult to justify, we have opted to make our last direct estimate in 1944, when agricultural land amounts to 212% of

[9] Although the wealth estimate of Universidad de Deusto was referred to 1965, their series on agricultural wealth was done for the year 1963 (Universidad de Deusto, 1968, p. 190). When upgrading their estimates, the authors assumed that land prices remained constant in value, something implausible at a time of relative high inflation (c. 10% per annum). For this reason, we use their data as referring to 1963.

national income, and extrapolated this ratio for the preceding three years (1941-1943).

Mineral and energy reserves

Historically, the importance of subsoil assets in Spain has been very limited when compared to other countries. Oil and natural gas reserves have been almost inexistent (Tortella et al. 2003, Díaz Fernández 2014) and only mining and quarry have had some minor contribution to Spain's total production. Unfortunately, we do not count with data on the amount of these reserves so we multiply the value added from these industries by a factor of six, as already explained. This procedure is highly conjectural, but given that the value added from these industries has been below 2% of Spain's total GDP, any inaccuracy should have an almost negligible effect on our national wealth series.

Land underlying buildings

Finally, we need to account for the value of land underlying buildings. This part of the analysis is of special importance given the increasing role of land under constructions in advanced economies, as recently shown for the housing sector by Knoll et al. (2017). For dwellings, this procedure is simple, we apply the residual approach suggested by the OECD and Eurostat (2015, pp. 78–80), which consists of detracting the perpetual inventory method estimate of the value of dwellings from our census-like estimate of housing. In this manner, we obtain a decomposition of housing between land and structure for the period 1901–2014. We are the first study which decomposes housing wealth in Spain into land and structure using the 'residual approach' for a period over a century, but we have benefited from the study of Uriel et al., (2009), and Uriel Jiménez and Albert Pérez (2012), who apply this same method for the 1990 – 2010 period.

Incorporating the value of land underlying non-residential buildings is a more complex exercise given the absence of census-like estimates for these assets. We start by dividing our estimate of "Other constructions" between economic

structures (i.e. roads, ports, bridges, etc.) and buildings, using the decomposition of this same category in Mas et al. (2015) for the period 1964 – 2014. Over these years, this decomposition is relatively stable (around 65-70% of the total being economic structures), so that we assume a constant share over the previous period too. To account for land underlying non-residential buildings, we use the valuation of residential and non-residential buildings in the most recent years from the Spanish cadastre (2006-2014), which already subsumes the value of both land underlying buildings and its structure. Interestingly, over these years the relative value of non-residential buildings on total buildings was relatively constant at around 45%. As in other countries, cadastral sources do not capture accurately the market valuation of buildings but we use it to compare the relative value of housing versus non-residential buildings. By doing so, we account for the share of land in residential buildings with respect to non-residential ones. To extend this relation backwards we use as a reference the evolution of land in the case of housing.Overall, the most conflicting estimates of non-financial assets are subsoil assets and land underlying non-residential buildings, which together represent between 4% and 16% of the total value of non-financial assets over the period 1901 – 2014 . In our opinion, the general trend of these two assets is correctly captured by our estimates while any imprecision in their level is not having a decisive effect in our total estimate of non-financial assets. Nevertheless, we admit that this procedure is subject to improvement and if better data become available we will update our series.

PERSONAL WEALTH

Non-financial assets

The modern SNA distinguishes a broad range of non-financial assets. However, given the lack of homogeneous sources, we group household assets into three main categories: housing, agricultural land and unincorporated business capital.

Housing

To be consistent with the sectoral division of the SNA/ESA, we adjust housing wealth by excluding dwellings that do not belong to the personal sector. Given the lack of data on housing ownership trends, it has been assumed that during the period of 1900-1975 all houses were held by individuals. This fact is in accordance with the anecdotal evidence that exists for some cities (Rodríguez Chumillas, 2002), and also with the results of the 1970 census, which pointed out that 95% of dwellings were owned by households.

After, we use the census of dwellings to measure household ownership on a decennial basis and interpolate for the years in between. Holdings by corporations and the general government are stated in these statistics. Unfortunately, information on houses owned by non-residents is scarcer, although the anecdotal evidences points that they might have a significant part in coastal and touristic areas. As a first approach, we use the statistics on housing transactions of the Ministry of Public Works for the period of 2006-2015. This data set reports the transactions in which non-residents were involved (c. 1% of the total), from which we compute a three-year moving average. This share is directly deducted from the housing wealth for the latest decade, and for the years prior to 2006 we apply the average ratio of the period 2006-2015.

Also, it must be emphasized that even though in this paper personal wealth includes both households and non-profit institutions, our series of housing wealth only report in a consistent manner the dwellings owned by households. The

reason has mostly to do with the lack of information, as the 1991 census was the only that reported separately the dwellings owned by non-profit institutions. Since in that year the share owned by this sector amounted to only 0.1% of the total housing stock, we believe that it makes very little difference between including or excluding dwellings owned by non-profit institutions.

Agricultural land

Using the value of agricultural land, we calculate the ownership of different institutional sectors through history. Households have been the main owners of agricultural land in Spain, although the government and corporations have owned an increasing share. For the period prior to the Civil War, there are some estimates on the area covered by public forests (GEHR 1991), from which we prefer to use a constant value of 6.5 million of hectares (around 14% of total land), which is then multiplied by the average price of forest land (Bringas Gutiérrez, 2000). As we explain later, during Francoism there was a sustained increase in the land in the hands of public institutions, until it reached 25% of the total in the 1972 census. Public ownership of agricultural land has remained almost unchanged until now.

Data on corporate ownership of agricultural land is far scarcer. Before the Civil War there is no systematic information on ownership patterns, so we rely on the results of the special survey carried in 1932 by the Second Republic (*Registro de la Propiedad Expropiable*) to carry the agrarian reform. Results gathered by researchers show different regional patterns, but overall it is safe to say that around 1% of total land was in the hands of corporations[10]. We apply this same ratio for the years from 1905 to 1941, which then gradually increases up to 4% in 1972 and then, following the results of the most recent agrarian census, up to 8% by the turn of the century.

Unincorporated business capital

[10] (Mata et al., 1985; Muñoz et al., 1980; Romero González, 1982)

The unincorporated sector includes all productive assets held directly by individuals (i.e. farmers, merchants, industrialists, entrepreneurs, etc.), as sole proprietorships and partnerships. For practical reasons, during the period of 1905 to 1980 assets employed in the agricultural sector with respect to the rest of the economy are calculated separately.

A) Farm capital

In the modern system of national accounts, farm capital basically includes livestock (animal resources yielding repeat products), other buildings, machinery and equipment. Prior to 1964 the first asset class has been calculated drawing on the census compiled and reviewed by the GEHR (1991) that classifies livestock species (horses, cattle, sheep, etc.). Each kind are then related to the average price reported in two benchmark years (1910 and 1919) by Cascón (1934) and Ceballos Teresi (1921), and later with the estimate for 1963 of the Universidad de Deusto. Given that we have still not found more systematic price series of livestock for other periods, we have opted to make a provisional estimate that relates the value of livestock to agricultural land (i.e. 10% in 1919) and extend the results for the missing years.

The estimate on farm fixed assets follows a similar reasoning, except that data is of inferior quality. Cascón (1934) provides a full balance sheet for various farms in 1910, which points that farm machinery amounted to 27 pesetas per hectare on average (or 1.7% the value of agricultural land). For the early 1930s, Carrión (1932) gives a more rough estimate of 50 pesetas per hectare (c. 2% the value of agricultural land), while the researchers of the Universidad de Deusto provide for 1963 a detailed assessment of Spanish farm capital that amounts to 2.5% of agricultural land. These three estimates are in accordance with the prevailing idea that Spanish agricultural became increasingly mechanized.

Reconstructing farm capital (including both livestock and machinery) from 1964 until 1980 is easier, given that Mas et al. (2015) provide a detailed estimate of the capital stock that quantifies the value of non-financial produced assets in the primary sector. Interestingly, their results are very similar to the ones provided by

the Universidad de Deusto and the Ministry of Agriculture on some particular years (1965, 1967, 1969, 1970, 1972 and 1976).

Farm capital is then divided by institutional sectors. The basic assumption is that ownership trends follow the same evolution as with agricultural land, with households initially holding 85 per cent of farm capital in 1905 and then progressively been reduced up to 50 per cent in the present day.

B) Non-farm capital

To estimate non-farm business assets it is not feasible to conduct a similar approach, given the lack of the most basic accounting information until the recent period. As an alternative, non-farm asset is calculated from 1900 to 1980 by first drawing the mixed income of sole proprietorships and partnerships, then separating labour and capital returns and finally capitalizing this last series by the corresponding rate of return. Estimates for the later period (1981-2015) are more straightforward the series has been computed by extending the results from the Survey of Household Finances.

During the period of 1900 to 1980 the mixed income of non-farm entrepreneurs has been estimated differently in two sub-periods. From 1900 to 1954, the basic data source is provided by the industrial tax [*Contribución industrial, de comercio y profesiones*]. This tax consisted on a fixed rate that was levied on non-farm economic activities according to some basic indicators (type of industry, location, number of employees, etc.). The tax was imposed to all partnerships and individual entrepreneurs, but corporations were exempted and thereby assigned to a new tax [*Contribución de Utilidades*]. Thus, although the evaluation of the industrial tax was somehow crude and simple, it has been used by historians to analyse the industrialization process and regional inequality in Spain (Betrán Pérez, 1999; Rosés et al., 2010).

These statistics include the number of taxpayers and the tax paid, classified both by region and economic sector (Dirección general de Contribuciones 1900-1934; Dirección General de Contribuciones y Régimen de Empresas 1956; Instituto de Estudios Fiscales 1990). Thus, to calculate actual income it has been assumed that

the tax amounted, on average, to a rate that fluctuated between 3 to 7 per cent of earnings during this period. The imputed rate has been set at a slightly lower bound than the one imposed to the smallest joint-stock corporations and in accordance with changes in tax legislation[11].

Income non-farm entrepreneurs for the period of 1954 to 1980 have been derived from Spanish national accounts (Instituto de Estudios Fiscales, 1969; Instituto Nacional de Estadística, 1971; Instituto Nacional de Estadística and Ministerio de Economía y Comercio, 1982)

As it was mentioned before, the resulting series corresponds to the mixed income earned by entrepreneurs. Therefore, a standard separation between labour and capital income has been carried according to the factor shares provided by Prados de la Escosura et al. (2009) on the Spanish economy. Finally, capital income has been capitalized by the return on equity of non-financial companies, as stated by Tafunell (2000), to arrive to the value of unincorporated business assets.

From 1981 to 2015 two basic sources have been used to calculate unincorporated business assets: the Survey of Household Finances (SHF) (Banco de España 2002-2014) and Central Balance Sheet Data Office of non-financial corporations (Banco de España 1982-2014). For years 2002 to 2014 information on household wealth is clearly more abundant and of higher quality due to the availability of SHF micro-data. The SHF reports the value of unincorporated business assets declared by households for some specific benchmark years (2002, 2005, 2008, 2011 and 2014)[12]. However, since household surveys tend to underestimate the market value of virtually all asset classes (financial claims, housing, etc.) due to under-coverage of the wealthiest sectors or misreporting (Hurst et al., 2013; Vermeulen, 2016), the declared values on unincorporated business have been

[11] The imputed tax rate varies across time. It stands at 5% from 1900 to 1919, rises to 6% with the fiscal reform of 1920 and then to 7% with the second reform of 1932. After the Civil War, the imputed tax rate is of 6%, which thereafter decreases to 4% in 1946 and 3% by 1950. The details to make such assumptions have been derived from Dirección General de Contribuciones y Régimen de Empresas (1956, 2–3)

[12] Results for the SHF 2014 edition are not yet publicly available, but hopefully they should be published at beginning of 2017.

upgraded. Basically, the share of unincorporated business assets (excluding agricultural land) over housing, as computed from SHF micro-data, has been multiplied by the aggregate value of dwellings held by households, as calculated by other sources (see next section). The rationale behind this process is that the bulk of unincorporated assets are invested in commercial property (office buildings, businesses premises, undeveloped land, etc.) and, thus, the degree of underreporting should be similar as with dwellings. Overall, the resulting figures are on average 23% higher than the raw data reported in SHF micro-data. The ratios provided in the SHF surveys have been interpolated for the years in between (i.e. 2003-2004; 2006-2007, etc.) and multiplied by the value of household dwellings.

The major challenge involves extrapolating these results backwards for years 1981-2001. The basic assumption taken is that unincorporated business assets followed the same trends as non-financial assets of non-financial companies, the latter being reported by the Central Balance Sheet Data Office of the Bank of Spain (more information in the section on corporate wealth in this appendix).

Financial assets

Sources on financial assets and liabilities are in general much more detailed. Since December 1980 until the present we use the Financial Accounts of the Spanish Economy published by the Bank of Spain. Basically, there are two set of statistics: one based on ESA-95 (1980-1994), and another constructed with ESA-2010 (1995-2014). From 1970 to 1979 data is quite similar, albeit of inferior quality (Banco de España, 1986). The main difference lies in the fact that the statistics published at the time were only a first estimate that, to our knowledge, have never been updated or revised. The most important drawback is that the balance sheet for non-financial corporations and households were consolidated into one group, but also it seems evident that the equity holdings of the public sector were being considerably underestimated. For these reasons, we have adjusted this dataset with the available data.

In contrast, for the period 1900 to 1969 we had to construct new estimates. This process basically involves taking the aggregate volume of each asset type, and them computing households' share by deducting the holdings of other institutional sectors (mostly corporations or the public sector). Besides using previous research carried by historians, our main sources are financial yearbooks and the published balance sheets of banking and insurance companies.

Currency and deposits

Our basic reference is Martín Aceña (1986; 1988), who presents Spanish money aggregates differentiating between currency, bank accounts, bank deposits and savings banks deposits for the period between 1900-1962. Later, for 1963 to 1969 we use the official data published by the Bank of Spain to extend his series. Both datasets have been elaborated by including only money held by the public (including households, non-financial corporations and the public sector, but excluding financial institutions). The financial accounts of the 1970s present similar data, but bring together households and non-financial institutions, while those elaborated after 1980 differentiate between both sectors.

Using these results, we calculate for the historical period the share held by households on total money aggregates. For currency, this process is straightforward. Financial accounts presently show that almost all bank notes and coins (around 96%) held outside financial institutions correspond to households, so we extend backwards this ratio considering that it has been constant over time. With bank accounts and bank deposits we follow a similar procedure, using different ratios (50% and 80%). Finally, regarding savings banks' deposits we simply opted to assign all to households, given that these financial institutions were mostly designed to serve low and middle-income families at that time.

Debt securities

The stock of debt securities corresponds to the aggregate value of bonds issued by the public sector and corporations. Due to practical reasons, both set of securities are assessed separately.

During the period of 1900-1969, we start with Fernández Acha (1976) series on public debt, who details the debt profile of the central government in terms of maturity (perpetual, non-perpetual), currency (national or foreign) and the issuer (central government, the Treasury or subsidiary institutions). These data are supplemented by our own calculations on the small volume of bonds issued by regional and local governments. For the period of 1901 to 1919, Núñez Romero-Balmas et al. (1998) present an estimate on this debt stock using tax statistics. Afterwards, the *AFSAE* Yearbook and the *Anuario Financiero de Bilbao* extend the series from 1920 to 1944. From this date and until 1964, García Añoveros (1969), provides a more comprehensive estimate on the total liabilities of local authorities, which includes not only securities issued, but also loans provided by the Bank for Local Government Funding [*Banco de Crédito Local*]. Since the debt of this last institution is already computed by Fernández Acha (1976) in his estimate of central government debt, we exclude it to avoid double counting. Finally, for the last years we interpolate the figures with the relevant figures of the Financial Accounts of the Bank of Spain.

Secondly, we adjust the nominal value of debt to its market price using the average annual prices quoted in the Madrid Stock Exchange. This reassessment has some importance in the years prior to the Civil War, when most public debt securities traded with a significant discount over par value (usually around 70-80%), but has almost no incidence during Franco's era. Treasury debt [*Deuda del Tesoro*] –which includes both short-term securities and non-marketable debt– is priced at its nominal value.

Lastly, to compute households' share we deduct the holdings of the following groups:

1) Central Bank. The balance sheet of the Bank of Spain included within its assets some special kinds of Treasury debt and a small portfolio of marketable

public debt. Overall, central bank holdings had some importance at the beginning of the 20th Century and especially in the aftermath of the Civil War.

2) Private Banks. Martín Aceña (1986; 1988) presents the securities portfolio of Spanish private banks from 1900 to 1962 using the official statistics published by the Spanish Banking Council [*Consejo Superior Bancario*]. Within these reports, public debt was stated as a separate item of the securities portfolio. However, for the years prior to 1920 this last information is not available, so we use the estimates provided by Martínez Méndez (2005), who basically extends a constant share. For the period from 1963 to 1969 we use the same statistics of the Spanish Banking Council.
3) Saving Banks. Titos Martínez *et al.* (1993) present the public debt portfolio of Spanish savings banks from 1941 to 1969. For the years before the Civil War we also use the estimates provided by Martínez Méndez (2005). Furthermore, we include the public debt holdings of the Postal Savings Bank [*Caja Postal de Ahorros*] and the small portfolio of securities held by the public banking sector [*Crédito Oficial*] using the information available on the annual reports of both institutions.
4) Insurance companies. In the early 1910s the Spanish Ministry of Finance imposed a severe control on the investments of the technical reserves by private insurance companies. The annual reports of the General Directorate of Insurance (Dirección General de Seguros y Ahorro 1955-1970) include a detailed analysis of the sector's balance sheet, from which it is possible to obtain the figures corresponding to public debt securities. Separately, the reports of the Spanish public insurance institutions (the INP and later the Social Security) recorded the volume of public debt held against its technical reserves (Instituto Nacional de Previsión 1931-1945; Ministerio de Trabajo 1953; Ministerio de Trabajo y Seguridad Social 1985)
5) Rest of the World. Since 1898, only non-residents that had provided an *affidavit* could own the external perpetual debt payable in gold currencies. Therefore, for the 20th century this kind of securities and foreign loans are by definition in the hands of non-residents. Their share is important until 1916 and afterwards in the late 1960s, but in the years in between Spain had almost no public foreign debt.

Corporate debt has been computed relying on two different sources. From 1902 to 1919 the official tax statistic states the debentures issued by joint-stock corporations (Dirección general de Contribuciones 1901-1934). This series is far from perfect, as researchers (Tafunell, 2005b) have already pointed that tax authorities did not update with sufficient diligence the volume of corporate securities, so that numbers should be taken as a rough estimate. Since 1921 and until 1969 data has been obtained from financial yearbook calculate(AFSAE 1916-1970). The advantage of this publication is that, despite not being an official register, it has been regarded as a far more reliable source by historians studying corporate profits and the business cycle in the long term (Carreras et al. 1993; Tafunell 1998; 2000).

This latest source is also of great value as it details the debt issued by different corporate sectors (railways, electricity, banking, etc.), and makes possible to make some minor deductions to avoid double counting errors. In this sense, we deducted the covered bonds [*cédulas hipotecarias*] issued by the official public financial sector, which have already been computed as a special kind of public debt.

Overall, debt was an important source of corporate finance until the Civil War, but afterwards its role declined sharply. This trend is in accordance with the fact that during the first decades of the 20th century more than half of the corporate debt was issued by railway companies, so that the nationalization of this sector in 1941 had a profound impact in the overall volume. The difference between railroad and other corporations issuing debt (mostly utilities) is also of great importance for converting the nominal value of corporate debt into market prices. The railroad sector was more leveraged and its revenues were severely impacted by the First World War, so that its bonds normally traded with an important discount over par (around 70-80%, but at times even at 50%). In contrast, the creditworthiness of other corporations was far higher and their bonds traded nearer to their nominal values. To take into account this difference, from 1905 to 1936 we compute separately the market value of railway and other corporations bonds with the series published by Hoyo Aparicio (2007). Since the Civil War onwards there is no systematic information on corporate bond prices, but to make

them resemble the general trends of the public debt market, we compute them at their nominal value.

Finally, as with public debt, we deduct the holdings of the following groups to obtain household's wealth:

1) Private Banks. As pointed previously, the official statistics published by the Spanish Banking Council present the portfolio of private banks, including as a joint item all corporate securities [*Otros valores*]. The main problem is thus to differentiate between debt and shares. For the period prior to the Civil War we rely on the detailed composition of the securities portfolio of some banks (Banco Vizcaya, Santander, Aragón, López Quesada) that was published in the 1924 edition of *AFSAE*. Per this source, within the corporate securities portfolio there was a separation between debt and stocks around 70/30 per cent. Thereafter we do not have any further direct sources, but to make our series consistent with the evolution of the aggregate volume of corporate debt and the holdings of other financial institutions (as detailed bellow), we make that the share corresponding to corporate debt in banking balance sheets gradually decreases from 70 to 20 per cent.
2) Saving Banks. The series presented by Titos Martínez et al. (1993) for years 1941 to 1969 is very similar, except that it does detail the separation between corporate bonds and shares from 1959 onwards, pointing that, on average, private debt securities amount to 80% of the total. Prior to this year we extend backwards this share until 1941. Finally, for the period of 1905-1935 we extrapolate the same results as obtained by Martínez Méndez (2005).
3) Insurance companies. The annual reports of the General Directorate of Insurance also include the corporate debt portfolio held by these companies since 1915 until 1969.
4) Rest of the World. At the beginning of the 20th century an important part of the Spanish railway debt was listed in foreign stock markets (mostly Paris). However, after the First World War the government promoted the repatriation of funds, so that by the time Franco nationalized these companies, foreign debt holdings had almost disappeared. To take into account the changes of these three decades, we rely on the approximate ownership ratios provided by

historians (Cuéllar, 2015; López Morell, 2005; Tedde de Lorca, 1980, 1978) and the yearbook of the Madrid Stock Exchange (Colegio de Agentes de Cambio y Bolsa 1919-1942) on the three most important companies (*Norte, MZA* and *Andaluces*). Since these corporations accounted for c. 75 per cent of the bonds issued by railways, we extrapolate their overall trends to the remaining companies.

From 1970 to 1979 the Financial Accounts of the Bank of Spain present a consolidated statement of household's and non-financial corporations debt holdings, that is, including securities issued by the public sector and financial corporations, but not of non-financial corporations. To recalculate our series, we start from 1980, the first year in which household debt holdings are separately computed and then extend backwards the missing information assuming that it followed a similar path as the consolidated statement.

Loans

The economic literature has highlighted that households in developing countries frequently tap informal credit markets to finance their investments. Although scholars have not made a detailed research on the matter, the scarce evidence found for Spain during the first half of the 20th Century points that informal lending provided by rich individuals [*prestamistas o usureros*] also played a significant role (Carmona and Simpson, 2003). The only systematic sources of information that can be found for this period refer to mortgage loans. Since 1900 the Ministry of Finance levied a specific tax on the interests of mortgage loans. Commercial and savings banks were exempted, while the Mortgage Bank [*Banco Hipotecario de España*] only had to pay the tax on its covered bonds [*cédulas hipotecarias*].

For the first three decades of the 20th century, from the total amount of interests paid on mortgage loans, as reported by tax authorities (Dirección general de Contribuciones 1901-1936), it is possible to deduct the amount corresponding to covered bonds, as reported in the annual statement of the Mortgage Bank and in Lacomba et al. (1990). The resulting series corresponds to the interests paid on

loans granted by households to other individuals. Then, it is necessary to capitalize this series to obtain the volume of outstanding loans. The literature points that in Spain during this period interests on informal credits usually stood around 6 to 9% (Carmona and Simpson, 2003, p. 280). As such, we take as a reference the interest on covered bonds (that normally was 5%) and add 2% more to reflect the higher risks and lack of liquidity associated with these investments.

Data is absent for the period after the Civil War, although it is reasonable to assume that informal lending was progressively displaced by the rise of banking institutions. Thus for 1941 we take the volume of outstanding loans that existed in 1935 and draw a process of a gradual disappearance until 1954.

Equity and investment fund shares

Equity shares correspond to the aggregate value of stocks issued by corporations and other limited liability companies. Mutual and investment funds are an important part of financial markets nowadays, but they did not exist in Spain until the mid-1960s and can be omitted in the construction of historical estimates.

As Hannah (2015) has recently pointed out, calculating the volume of these assets is especially problematic for various reasons. First, joint-stock companies that provide separate legal personhood and limited responsibility can exist in different forms. Secondly, it is very rare to have an official census on the number and capital of each set of companies, so it is necessary to use unofficial records. Thirdly, the available historical sources normally refer to the aggregate paid-up capital of corporations, that is, the funds originally provided by shareholders. These set of figures then need to be converted to market values. The easiest cases occur with those corporations that are listed in the stock market, given that equity holdings can be recorded at the prevailing prices at one particular time. Unfortunately –both presently and in the past– most companies are not listed in exchanges, and thus it is necessary to provide some assumptions on the book value reported on corporate balance sheets to estimate market values.

When dealing with this problem, the Bank of Spain had traditionally opted as most historians have done: applying to non-listed firms the same ratio that exists between the book and market value of companies quoted in the stock market. However, recently it has started to follow a different approach by which the annual profits of non-listed firms in a particular economic sector (i.e. utilities, manufacturing, etc.) are capitalized at a the rate as similar companies listed in exchanges (Banco de España, 2005). Although this approach provides better results, there are no sufficient historical sources to carry it. Instead, in this paper the traditional approach of applying a ratio between the paid-up capital and the equity market value is carried.

As a starting point, the same sources used for corporate bonds have been drawn to compute the equity value of Spanish corporations [*sociedades anónimas*]. For the period of 1905 to 1918 the paid-up value of corporations is derived according to the official tax statistic (Dirección general de Contribuciones 1901-1920), and from 1924 to 1969 from the *AFSAE* yearbook, as published by Tafunell (2005a). Data for the years in between (1919-1923) has been interpolated due to the inconsistency of both sources. Then, to convert this series into market prices we use the quoted ratio between market prices to paid-up capital of the Spanish stock exchanges. For the period of 1900-1936 Houpt et al. (2010) have kindly provided this data for the Bilbao Stock Exchange, while for years 1941-1969 it can be derived from the official index of the Madrid bourse (Servicio de Estudios de la Bolsa de Madrid, 1992)[13].

Limited liability companies [*sociedades limitadas*] have also been included, but unlimited partnerships [*sociedades colectivas* and *sociedades comanditarias*], a form of business association widely used at the beginning of the century, are excluded as they did not issue shares and therefore computed within the unincorporated sector. Limited liability companies started to exist in 1920 and have had a growing importance in business activities since. However, unlike with corporations, data is of inferior quality as there is only two complete census of

[13] In future versions we intend to replace the first series with one built with data of the Madrid Stock Exchange. Stefan Houpt and Stefano Battilossi are currently working on a project to reconstruct a market capitalization index.

these set of companies referring to 1944 and 1949 (Dirección General de Contribución sobre la Renta, 1944; Instituto Nacional de Estadística, 1951). As a complementary source, Tafunell (2005a, 766–770) provides a revised version of the official statistic of the Mercantile Register on the annual number of charterings and paid-up capital for the whole period. This series is completed from 1950 onwards with data on the number and value of capital increases, reductions and corporate dissolutions.

With these different sources a new series on the paid-up capital of limited liability companies is constructed. First, it is assumed that before 1950 net changes in the equity of existing companies (increases, reductions and dissolutions) in relation to newly incorporated companies amounted to the average observed from 1950 to 1969 (34 per cent). Secondly, the flow of new corporate charters and net changes in equity is accumulated from 1920 until 1936. Thirdly, this series is then matched with the 1949 census estimate and accumulate backwards and forwards in time with the more complete data of the Mercantile Register. Finally, given the lack of sources, it is important to point that these set of estimates are not converted into market prices, although the difference should be as large as with corporations, as limited liabilities companies normally held fewer reserves.

From the aggregate volume of equity holdings, it is then necessary to deduct holdings of the following institutional sectors to compute household's share:

1) Private Banks. As discussed above, the aggregate balance sheet of the banking sector provides figures on the holdings of corporate securities, from which is necessary to make an assumption on the distribution between bonds and shares. The weight of stocks starts at 30 per cent before the Civil War and rises gradually up to 80 per cent by 1969.
2) Savings Banks. In the same manner, the available data presents the evolution of stocks held in the balance sheet of savings banks.
3) Insurance companies. The annual reports of the General Directorate of Insurance include the shareholdings of these companies since 1915 till 1969.
4) Non-financial corporations. Beyond some anecdotal evidence on utilities and industrial companies (Aubanell-Jubany, 1994), there is very little systematic data on inter-corporate stockholdings. The only noticeable exception than

could be found comes from the 1955 estimate made by Banco de Bilbao (1957) on the Spanish national income, which included as an appendix a detailed survey on the balance sheet of a sample of circa 100 non-financial corporations. From these data it is possible to estimate that around 20 per cent of shareholdings were held by corporations. Later, in 1970, the Financial Accounts of the Bank of Spain point to a share around 30 per cent. To construct a time series, these two points are interpolated and then extended backwards in time assuming a level of 5 per cent in 1930 and 1 per cent in 1914.

5) Public sector equity holdings. As discuss in the section below, the public sector started to build an important number of shareholdings in industrial and service companies from the 1940s onwards. These stakes could be valued either at book value or market value, and so are deducted separately from the overall volume of corporate shares.
6) Rest of the World. As Broder (1976) and Prados de la Escosura (2010) have pointed, at the beginning of the 20th century foreigners were heavily involved in two economic sectors: railways and mining. Investment in the first kind of business was made through Spanish companies. Information provided by Olivares and Ortúñez (2002), Tedde de Lorca (1980) and Cuéllar (2015) for the three major railway companies during this period enables to construct the precise share accruing to foreigners, and then assumed a similar weighting for the other railroad companies. Foreign investment in the mining sector was different as it was mostly channelled through foreign-based companies (i.e. Rio Tinto Company, Compagnie Royale Asturienne des Mines, Société Minière et Métallurgique de Peñarroya, etc.). The census developed by tax authorities (Dirección general de Contribuciones 1901-1919) points that in the 1910s the above mentioned companies usually represented around 20 per cent of the paid-up capital in the mining sector. Thereby this ratio is applied for the whole period of 1900 to 1935. Later, for the 1940s and 50s it is assumed that foreigners were completely absent, as Franco forced the last foreign investors to sell their stakes (Carreras, 2003). Later, as other historians have pointed, the liberalisation of Spanish economy from 1959 onwards enabled a growing flow of foreign investments. It is thus assumed that their share gradually grew from

1 per cent in 1960 to the level pointed in the Financial Accounts of the Bank of Spain in 1970 (4 per cent).

For the period of 1970-1979 the Financial Accounts of the Bank of Spain present a consolidated statement of the equity holdings belonging to households and non-financial corporations, which include securities issued by financial and foreign corporations, but not by non-financial corporations. To recalculate our series, we start from 1980, the first year in which household equity holdings are separately and completely computed, and then extend backwards in time assuming an evolution similar to the market capitalization of the Madrid Stock Exchange (Servicio de Estudios de la Bolsa de Madrid, 1992).

Insurance, pension and standardized guarantee schemes

Insurance and pension assets correspond to the value of accumulated reserves against outstanding claims made by households. In practice, these assets are not held directly by households, but rather as technical reserves by private and mutual insurance companies.

For practical reasons, the technical reserves of private companies and public institutions are calculated separately for the period of 1905 to 1969. Data on private sector insurance schemes start in 1915, when the Spanish Ministry of Finance imposed a control on the investments made by insurance companies. Thereafter, official reports state the amount and composition of technical reserves (Dirección General de Seguros y Ahorro 1955-1970). Although insurance schemes had already been present in Spain for a long time (Tortella Casares et al., 2014), the value of reserves in 1905 is so low (42 million pesetas, or 0.3 per cent of the Spanish national income) that it is feasible to dismiss its importance prior to then. For the first two decades figures are only available in five year intervals (1915, 1920, 1925, 1930 and 1935) and thus have been interpolated for the years in between. From 1941 to 1969, the reports appear on a yearly basis. In principle, most technical reserves are constituted to cover life insurance contracts, but some can also refer to the liabilities incurred with households and non-financial companies for other reasons (for example, fire or vehicle insurances). Since no

information is available on the ownership trends by institutional sector, households' share in 1980 (84 per cent of all technical reserves) has been extrapolated backwards in time.

The development of public insurance schemes has undergone through two different phases in history that need to be briefly explained. In 1908 the government created the INP [*Instituto Nacional de Previsión*] as a system that grouped various schemes that covered workers' risks (disability, sickness, old age, etc.) based on the contributions of employees and employers (Comín, 2010). The most important economic right (pensions) were provided based on accumulated savings and investment returns. Later, in 1962, the government created the modern Social Security as an unfunded, defined-benefit system that included the previous existing schemes of the INP.

Unfortunately, data sources on public technical reserves are quite scarce. During the period of the INP, the government published a complete balance sheet on irregular intervals (1913, 1918, 1923, 1928, 1933-1935, 1940, 1945-1947, 1949-1952) and thus figures have been linearly interpolated for the years in between[14]. Later, during the years of transition to the new Social Security system there is a complete lack of consistent sources. From 1962 onwards, the most comprehensive accounting data was published in Ministerio de Trabajo y Seguridad Social (1985).

From 1970 to 1979 technical reserves are directly derived from the Financial Accounts of the Bank of Spain.

Other accounts

The Financial Accounts of the Bank of Spain group in this category some miscellaneous assets: financial derivatives, short-term commercial credit and all other accounts pending payment. As readers may imagine, there are virtually no

[14] The first two reports appeared in the official *Gazeta de Madrid*. Information from 1923 onwards has been derived from Instituto Nacional de Previsión (1931-1945) and Ministerio de Trabajo (1953).

sources to compute them in a consistent way for the historical period. Nonetheless, their magnitude is relatively small and their share has been declining since 1980.

Offshore wealth

The Spanish financial institutions automatically report to the Spanish Tax Agency the income (dividends, interest, and capital gains) and wealth (deposits, stocks, investment funds, life insurance, and pension funds) held by their clients. To compile the Financial Accounts, the Bank of Spain uses very similar sources to record households' assets and liabilities (Banco de España, 2011). Thus, implicitly, these two official statistics do not include assets held by individuals in foreign countries[15].

Zucman (2013) estimates that around 8% of households' financial wealth is held through tax havens, three-quarters of which goes unrecorded. Moreover, he also provides evidence that the share of offshore wealth has increased considerably since the 1970s. This fraction is even larger for Spain. According to Zucman (2015), wealth held by Spanish residents in tax havens in 2012 amounted to 80 billion euros, which accounts to 9.4% of household's net financial wealth. Péramo (2016) has also made a very rough estimate on Spanish offshore assets that arrives to a similar figure. Hence, offshore wealth is not a negligible part of the portfolio of households and must be taken it into account when analyzing the long-run evolution of wealth.

In order to construct our series of offshore wealth we rely on two main data sources: Zucman's (2013, 2014) data, which come mainly from the Swiss National Bank (SNB) statistics, and the unique information provided by the 720 tax-form. Since 2012, Spanish residents holding more than 50,000€ abroad are obliged to file this form specifying the type of asset (real estate, stocks, investment funds, deposits, etc.), value, and country of location. This new form

[15] See Zucman (2013) for a general explanation on the problems related to recording offshore wealth in Financial Accounts. The only exception occurs with bank accounts held abroad, because the Bank for International Settlements collects data on those assets.

aims to reduce evasion by imposing large fines in case taxpayers are caught not reporting or misreporting their wealth. In an attempt to increase future revenue and reduce further evasion, the Tax Agency also introduced a tax amnesty in 2012.

When constructing our series of offshore wealth, we calculate separately reported assets, that is, claims held abroad by Spanish residents and declared to the Spanish tax authorities, from unreported offshore wealth. For the latter, we mainly use Zucman's (2013, 2014) statistics on offshore portfolios held in Swiss banks, which have been published for more than two decades by the Swiss National Bank (SNB). Given the outsized role that Switzerland plays in the wealth management industry, we believe that this is the best available source we can use. Nonetheless, we then extrapolate these results for tax havens in the rest of the world.

Our starting point for the reported offshore wealth is the 720 tax-form for years 2012 to 2014. Then, we compare the magnitude of assets declared in Switzerland with our estimate on the total wealth held in this country (both declared and undeclared). The SNB provides on the one hand information on the total amount of fiduciary deposits held in Switzerland by non-residents by country of origin and, on the other hand, the total amount of portfolio assets held by non-residents in Switzerland. We follow the methodology of Zucman (2014; 2015) to calculate the total amount of offshore wealth held by Spaniards in Switzerland. Zucman provides the ratio of offshore wealth held by Europeans in Switzerland[16]. With this fraction and the SNB statistics on fiduciary deposits, we can then obtain the share corresponding to Spanish residents.

Secondly, we compare total wealth held in Switzerland by Spanish residents with assets declared in this country in the 720 tax-form. In 2012, the comparison shows that 23% of offshore wealth was reported to tax authorities. This figure is consistent with Zucman's (2013) estimate that around three quarters of offshore wealth held abroad goes unrecorded. We then extrapolate this series to obtain

[16] See Table S1 in Zucman (2014) Data Appendix and Table A26 in Zucman (2013) Data Appendix. Both series have been elaborated using SNB data.

total reported offshore wealth in other countries (Luxembourg, the Panama, etc.) using the fraction of reported wealth not held in Switzerland from the 2012 720 tax-form, which is 76%.

Total unreported financial offshore wealth can be then derived by first applying to the latter series the fraction of financial wealth declared in tax havens in order to have an estimate of total reported financial offshore wealth held by Spaniards in tax havens[17]. Finally, using the fraction of unreported financial wealth held by Spaniards in Switzerland we can derive the total amount of unreported offshore wealth[18].

By adding up the estimations of unreported financial offshore wealth with the reported one, we obtain the final aggregated series. Our results range between 1999 and 2014, since the statistics on total offshore held in Switzerland are only available for this period of time.

As a last step, we extrapolate the series backwards using the total amount of offshore wealth that flourished in the 1991 Spanish tax amnesty (10,367 million euros as reported by the newspaper *ABC*) and make a linear interpolation for the years in between. We assume that this corresponds to the declared assets, and then add the total amount of offshore non-declared wealth using the average ratio of unreported versus reported offshore wealth from years 1999 until 2014. Finally, we extrapolate the series backwards up to 1900 by using the proportion of European financial wealth held in offshore havens estimated by Zucman (2014). His data is based on decennial averages, and so we linearly interpolate for the years in between. We believe that our historical series from 1902 until 1991 is quite robust given that our 1991 estimate using the declared wealth from the tax amnesty perfectly matches with the historical series from 1900 until 1990 with this different methodology.

[17] This fraction is calculated based on the information provided in the 720 tax-form and the classification of tax havens by Zucman (2013).

[18] This fraction is calculated based on the reported financial wealth held in Switzerland in the 720 tax reform and the series of total offshore wealth held by Spaniards in Switzerland using SNB data and the methodology in Zucman (2013, 2014).

Using the 720 tax-form we also provide a decomposition of our series of offshore wealth by asset type. Offshore wealth appears disaggregated into financial and non-financial wealth and financial wealth further more disaggregated into deposits, stocks, investment funds and life and other insurance.

2012 offshore declared assets amounted to 194,586 million euros, which represents around 23% of both national income and net personal financial wealth. Our estimate is larger than Zucman's (2013) 8% estimate for the whole world. This discrepancy can be explained as we do include non-financial assets in our estimates (i.e. dwellings in foreign countries), whereas Zucman only considers financial claims. However, in any case, the difference is large enough to claim that offshore wealth is relatively larger in Spain than the world average.[19]

Even though our estimates are a step forward the measure of offshore wealth because of the unique information from the 720 tax-form, the available data sources are still quite poor. The Bank of Spain and the European Central Bank could start measuring offshore wealth by using fiscal information, such as the 720 tax-form in the case of Spain, as well as increasing the cross-border flow of information. Further research and data are needed to better understand the levels and trends in offshore wealth across countries and over time.

Liabilities

Households' liabilities are constituted by all credits and loans provided to finance investment and consumption. Their magnitude has been reconstructed from the perspective of institutional lenders (i.e. banks), and added the informal lending provided by other household.

Using the statistics of financial institutions to reconstruct households' liabilities is not without problems. The main issue is that virtually no institution stated in its

[19] We are not the first at claiming that offshore wealth is larger in Spain that the world average. As it was mentioned in the beginning, Zucman (2015) estimates that Spanish financial wealth in offshore havens amounted to 80 thousands million euros 2012, which represents more than 9% of total net financial wealth.

balance sheet whether credits were provided to households or companies, so that it is necessary to follow a case by case approach:

1) The Bank of Spain. Although the main function of the central bank was to act as the lender of last resort, the Bank also operated as a private firm that granted loans to private individuals [*cuentas de crédito con garantía personal*], mostly entrepreneurs (i.e. merchants, industrialists and tradesmen). Martínez Méndez (2005) reconstructs their volume for the period of 1900 to 1935. After the Civil War, the balance sheet of the Bank of Spain includes these loans as a separate category, but from 1945 onwards it differentiates between loans granted directly to households, from those that had been given through the public sector. Given that these last ones were separately recorded in other official banks (see next section), we exclude them from this category. Results show that personal loans granted by the Bank of Spain had some significance until the First World War.

2) Official banking sector. Since the 19th century, the government promoted the creation of official banks to provide loans for some specific sectors. The first and most important was the Spanish Mortgage Bank [*Banco Hipotecario de España*], but in the following years others were also developed, such as the Industrial Bank [*Banco de Crédito Industrial*], the Bank for Local Government Funding [*Banco de Crédito Local*], the Agrarian Bank [*Banco de Crédito Agrícola*], Bank for Maritime and Fishing Activities [*Crédito Marítimo y Pesquero*] and the Construction Bank [*Banco de Crédito a la Construcción*]. After the Civil War, these firms were grouped into a single holding [*Crédito Oficial*], although they continued to publish separate balance sheets.

   As the reader can imagine, not all of these banks provided loans to the household sector. In the absence of detailed statistics, only the credits provided by the Mortgage, Construction, Agrarian, Maritime and Fishing Banks have been computed. These banks have been selected under the assumption that until the late 1960s the activity in the primary and real estate sectors were dominated by households. Also, it can be argued that public

lending would have been carried out to benefit mostly individuals (and not corporations). Besides, the scarce evidence presented by Casares (1984) on the most important official bank –the Mortgage Bank– confirms that almost of all its debtors were individuals.

3) Private banks. Martín Aceña (1986; 1988) uses the statistics of the Spanish Banking Council to reconstruct the balance sheet of the private banking sector from 1900 to 1962. From 1962 to 1969 we extend his series using the same source. The original statistics recorded as a single item all loans provided to the private sector. However, from 1942 onwards, in the *AFSAE* yearbook, the Spanish Banking Council provided a summary that differentiated between loans provided against collateral [*créditos con garantía*] from personal ones [*créditos personales*]. Results show that during the period covered (1942-1969), the share of personal loans was rather stable, averaging around 82%, so we extend the same weighting to the previous years.

4) Savings banks. As pointed previously, for the period before the Civil War Martín Aceña (1986) makes an estimate on the accounts and deposits held by savings banks. Also, by using the data of Martínez Méndez (2005), it is possible to estimate the securities portfolio of these institutions. Thus, it can be assumed that the difference between both magnitudes amounted to the loans provided to the private sector. From 1941 onwards the data is of higher quality, as Titos et al. (1993) provide their consolidated balance sheet using official statistics. Finally, to this set of data small number of loans provided the official Postal Savings Banks has been added.
   Given that for much of their history, savings banks only served middle and low-income individuals, all loans have been classified as liabilities of the household sector.

5) Insurance companies. Besides owning a large portfolio of financial securities, insurance companies could also grant mortgage loans. Their magnitude has been traced since 1915 using the official reports of the Spanish Ministry of Finance (Dirección General de Seguros y Ahorro 1955-1970). As we have already assumed that mortgages granted by the official banking sector were

held by private individuals, we have also computed these loans as a liability of the household sector.

6) Informal lending. Loans granted by households have already been estimated as a financial asset of the personal sector from 1900 to 1954. Since these credits constitute a liability of other individuals, they must be included in this study.

   Data on liabilities form 1970-1979 are provided in the Financial Accounts. As with other items of the balance sheet, the information refers to the aggregated loan volume of non-financial corporations and households. Thereby, the both are disentangled by applying the same ratio (38%) that existed in December 1980 according to the later revisions.

GENERAL GOVERNMENT WEALTH

Non-financial produced assets: public capital

The produced non-financial assets include the public capital stock (infrastructure, public buildings, etc.). The excellent work of Mas Ivars et al. (2015) provides an annual estimate of the public capital stock during the period 1900-2013 that has been established through the perpetual inventory method. The authors present two series: one of public investment and another on the capital stock provided by private agents but with a strong public service bias (i.e., railways). In this study, we only include the first, given that the second series can be better calculated as part of the financial wealth of the general government.

Non-financial non-produced assets: agricultural land and land underlying buildings

Non-produced assets of the general government have never been systematically studied, but for a long-term study it is necessary to have at least some rough estimates on both public-owned agricultural land and land underlying public buildings.

During the first decades of the twentieth century, around 6.5 million hectares of forest (11-13% of the agricultural area) were owned by public institutions, mostly municipalities. Moreover, since the end of the Civil War, the Francoist regime started a systematic policy of agricultural colonization which involved buying land plots that were afterwards rented to peasants. Nowadays, the agrarian census points that c. 25% percent of agricultural land is owned by the general government.

Our calculations public agricultural land are done in the following way. For the first three decades of the twentieth century, we use the various available estimates on public forest area (GEHR 1991) to fix a standard surface of 6.5 million

hectares. These figures are then multiplied by the average price of forest land of Bringas Gutiérrez (2000). After the Civil War and until the 1972 agrarian census, we use two sources to compute the agrarian surface owned by government institutions. First, the official statistics on forest land point to a sustained growth in public forest, reaching around 9 million hectares by the late 1960s. To this figure, we accumulate the surface of arable land that was purchased by the Institute of National Colonization during this period, according to Bosque Maurel (1984). The value of land is then calculated following the same method that has been explained in the first section.

Finally, the modern agrarian census provides information on the ownership of the general government (INE 1973; 1984; 1991; 2002). This surface is then multiplied by the average land prices, as published by the Ministry of Agriculture (Ministerio de Agricultura, Pesca y Alimentación 1984-2014).

In addition, we estimate the value of land underlying public buildings based on our own estimate of land underlying non-residential buildings and on IVIE's study of Spain's stock of produced assets (Mas Ivars et al., 2015). One advantage of IVIE's study is the decomposition of the "Other constructions" category into economic structures and non-residential buildings, which they further decompose into public and non-public ones. Hence, we use the share of public non-residential buildings in the "other constructions" category present in IVIE over the period 1964-2013, and we apply this share to our own estimate of "Other constructions". Over this period, this share in IVIE's data is relatively constant, fluctuating in values between 5% and 8%. To extend backwards the value of land underlying non-residential public buildings for the period 1900-1963, we assume that this share was 5% over this period, in line with the values observed in the initial years of IVIE's study.

Financial assets

Until 1970 we approximate the value of financial assets owned by the public sector by computing state-owned equity holdings. Their study must be done following the same caveats as the ones pointed with regard to households' shareholdings. In practical terms, this means that although historians have already

analysed the development of state-owned enterprises and written numerous case studies (Carreras et al., 2000; Comín and Martín Aceña, 1991), there is still not a comprehensive census on the number and value of the corporations in which the state held total or partial ownership. This lack of comparable series is by no means an accident, as it simply reflects the fact that, for most part of history, the initiatives of the different Spanish ministries (most importantly, Finance and Industry) were not coordinated, and, in consequence, the state did not have a complete balance sheet of public equity holdings. This situation did not change until the mid-1970s (Dirección General del Patrimonio del Estado 1977-1981), but truly it was not until the development of the modern financial accounts when it is possible to have a complete picture.

Secondly, defining state-owned enterprises is more challenging than for the private sector. In principle, all joint-stock companies in which the state has total or partial ownership must be counted, but also all quasi-corporations that may not have a separate legal personality, but that do perform market-orientated activities. As we will later show, much of the previous research has neglected these last kind of entities, even though they may be as relevant as the traditional state-owned companies.

Thirdly, valuation of state-owned enterprises can also be a tricky issue, and thus we follow a case-by-case approach. In some situations, it is reasonable to assume that public-owned firms operated as private companies, and thus turning from book to market values can be done by using metrics similar to the ones observed in other economic sectors. However, in other important cases, the persistent unprofitability of state-owned enterprises makes it reasonable to assume that the book values reported in balance sheets are the most appropriate measure[20].

Finally, it should be noted that, unlike with households' investment position, the Financial Accounts of the Bank of Spain for the 1970s are not an accurate source to study the equity holdings of the public sector, as they systematically

[20] Interestingly, the Bank of Spain currently employs the same method when analyzing companies that are unprofitable on a sustained basis. (Banco de España, 2005, p. 23)

underestimate the assets of the public sector. For this reason, our historical estimates have been extended until 1979 in a way that can be later matched with the new and revised Financial Accounts of the 1980s.

In this appendix, we start by analysing the classic public state-owned corporations in a way that takes into account the different economic sectors and the assessment at book or market values. Afterwards, we analyse in a specific manner some particular cases of special enterprises.

The major milestone in the development of state-owned enterprises occurred in 1940, when Franco's government created the National Institute of Industry [*Instituto Nacional de Industria*] as a special company that grouped all public holdings into industrial corporations. The detailed study of Martín Aceña et al. (1991) presents the basic accounts of the Institute, including a consolidated profit and loss statement and the balance sheet. Given that the Institute was hardly profitable throughout its history, it seems reasonable to compute public equity holdings as the sum of the paid-up capital and reserves. In 1941 another major change occurred, when the government nationalized the railroad companies and unified their business by creating a new public enterprise (*RENFE*) (Comín, 1998). The annual reports of this corporation also show that it was never profitable, so it is indeed preferable to record the equity (capital and reserves) as stated in its balance sheet.

Besides these two gigantic companies, the Ministry of Finance also kept an independent control over important shareholdings in service sector corporations. The most important, with their respective dates of creation or nationalization, were *CAMPSA* (1927), *Ferrocarriles del Oeste de España* (1928), *Tabacalera* (1945), *Telefónica* (1945), *Petroliber* (1961) and *Trasmediterránea* (1977). Virtually all were only partly state-owned, and their shares continued to be quoted in the stock market. To compute public holdings, we start by making an approximation to the stake held by the state in each enterprise according to

different sources[21]. Afterwards, we adjust to market prices using the stock prices of the Madrid Stock Exchange at the end of each year.

Public-owned corporations that operated in the mining and financial sectors need to be analysed in a specific manner. With respect to the first, in Spain, a few mining sites (Almadén, Arrayanes and Torrevieja) have been under public-ownership during the late modern era. In the twentieth century these mines were usually exploited directly by the state, although they normally lacked the legal status of a modern corporation and therefore did not publish regular accounts. Also, in some particular years, the government opted to make a lease with a private agent in exchange for royalties. To estimate their value, we start by taking the annual dividends and royalties, as reported in the state budget [*Cuentas generales del Estado*] (Instituto de Estudios Fiscales 1979; 1982; 1989; 1990), and multiply its decennial averages by the return on equity of the private mining companies (Tafunell 2000). This figure represents the "core value" or "capital" of this publicly owned-business, to which we add the corresponding annual profit to estimate the government's equity. Overall, results show that these mining firms were an important asset of the public sector in some periods.

The Spanish state has also played an important role in the development of the financial sector. Since the nineteenth century the government granted a privileged status to some banking firms, such as the monopoly of issue acquired by the Bank of Spain or the right to issue covered bonds of the Spanish Mortgage Bank. Originally, these enterprises were fully owned by private investors and the government only imposed a special tax on profits. However, in 1962 these set of companies were nationalized. The Bank of Spain retained its special status as a separate corporation, but the others were grouped into a new entity called *Crédito Oficial.* The analysis of this latter group is not particularly difficult, as their equity (capital plus reserves) is stated in the annual reports (Instituto de Crédito a Medio y Larzo Plazo 1963-1979).

[21] Information on government ownership has been obtained in the following way: Campsa according to Tortella et al. (2003); Oeste de España in Colegio de Agentes de Cambio y Bolsa (1919-1942), Tabacalera in Torres Villanueva (2000), Telefónica, Petroliber and Trasmediterránea in *AFSAE* and Dirección General del Patrimonio del Estado (1977)

However, the valuation of the public stake in the Bank of Spain is a more difficult task. As Piketty and Zucman (2014, p. 14) point in their appendix, the ways in which central banks value their assets changes significantly between countries, as some opt to record them at book value, while others reflect variations in market prices. Also, earnings based on seigniorage income can change notably throughout time. In Spain, the modern Financial Accounts compute as part of the Bank of Spain's equity not only the paid-up capital and ordinary reserves, but also the accounting provisions for valuation adjustments. This makes that presently the equity holding in the Bank of Spain is one of the most important shareholdings of the public sector[22].

For the period of 1962 to 1979, it seems very difficult to apply these same criteria. As an alternative, we have opted to take the annual profits (which were fully paid as dividends to the state) (Ministerio de Hacienda 1962-1979) and capitalize them at the return of equity of the private banking sector, as stated by Tafunell (2000). Although this method makes the series a bit volatile, the results provide similar valuation figures to the ones used in present day accounting standards.

Liabilities

The last step for estimating the net wealth of the general government is to deduct its liabilities. For the period of 1905 to 1969, we have already stated in the section dedicated to household fixed income securities the sources used to calculate the debt of the general government. We have also explained the necessary adjustments to convert nominal values into market prices.

However, to follow the SNA and ESA methodology, we have also made one final adjustment to deduct the debt that is not issued by the general government, but has an explicit (or implicit) state guaranteed. The rules of the European Union are very clear in this sense. Although state-guaranteed debt can be included when

[22] For example, in 2014 state-owned equity holdings amounted to 148 billion euros, of which 21% (31 billion euros) corresponded to the value of the Bank of Spain.

calculating the public debt stock following the Maastricht criteria, "guaranteed debt is recorded solely as the borrowing of the borrower" but "for the government, it is contingent liability which is not recorded in ESA balance-sheet (but may be shown as memorandum item or a footnote)" (European Union, 2016, p. 392).

Fortunately, the original source (Fernández Acha, 1976) is sufficiently detailed to make the necessary changes. As a rule, we compute all debt issued by the government and the Treasury, but we exclude the securities of the Mortgage Bank [*Banco Hipotecario de España*], railway companies [*RENFE* and *Ferrocarril de Tánger a Fez*], the National Institute of Industry [*Instituto Nacional de Industria*] and other minor entities [*Administración del Norte de Marruecos* and *Asociación de la Prensa de Madrid*]. Also, regarding foreign loans guaranteed by the government, we have excluded those in which borrowers were companies [*Empresas y organismos con garantías del Estado*] or individuals [*particulares*].

From 1970 onwards we include all general government liabilities as stated in the Financial Accounts of the Bank of Spain.

These particularities of the SNA rules ought to be considered when comparing these new series with other estimates. For the period of 1905 to 1969 our results are slightly inferior than the public debt stock estimated by Comín et al. (2005) and Comín (2012), due to the reasons above mentioned. Thereafter, government liabilities tend to follow the same trend than public debt, as computed by other sources. However, it should be noted that differences between both magnitudes get bigger throughout time[23].

[23] As a point of reference, at the end of 2015, total government liabilities amounted to 139% of GDP, but public debt according to the EU criteria stood at c. 100 per cent.

CORPORATE WEALTH

In this paper, we approximate corporate wealth from two perspectives. First, for the period 1900 – 2014, we find corporate wealth indirectly by detracting the "market-value" measure of national wealth from the "book-value" definition. Second, for the 1996 – 2014 years, we compute it directly from market-value records of the balance sheet of corporations. In this section, we explain how we dealt with the direct measurement of corporate wealth from balance-sheet data, including a brief discussion of the Tobin's Q concept.

Non-financial assets of non-financial corporations

Since 1982, the Central Balance Sheet Data Office of the Bank of Spain has built a comprehensive sample on the accounting information provided by Spanish non-financial corporations. Measured in terms of gross value added, the sample originally covered around 20-25% of the Spanish corporate sector, but since the mid-1990s it has gradually risen to 45%. From this dataset, the Bank of Spain publishes two different set of results. From 1982 until the present, the Bank summarizes the main balance sheet variables of its sample of corporations. Alternatively, since 1995 onwards the Bank also extrapolates the previous series to reflect the complete universe of Spanish non-financial companies.

Both datasets have been reclassified by changing the traditional accounting classification to SNA/ESA standards. This process implies not only changes in nomenclature, but also revaluating some specific assets (i.e. real estate) from book to market values. Furthermore, from the late 1990s onwards, the Bank of Spain also decomposes non-financial assets between non-produced and produced assets. However, the resulting series is highly questionable as the values for non-produced assets are very low, probably because the division between buildings and the land underlying has not been properly calculated. For this reason, only the basic series on corporate non-financial assets has been used in this paper.

One last observation must be done regarding the data provided by the Bank of Spain. Since the dataset of the Central Balance Sheet Data Office is revised in various time intervals, as a rule we took the latest version (normally published up to 6 years later from year *t*) as the reference value. This means that the series for the most recent years (2009-2014) can be subject to small revisions in the future. Also, it should be noted that the values for financial assets and liabilities are slightly different to the ones published in the Financial Accounts of the Bank of Spain. To keep all series consistent, the Financial Accounts figures have been taken as the definitive ones.

Non-financial assets of financial institutions

Spain does not have a complete set of statistical set on the non-financial assets of financial institutions. The Central Balance Sheet Data Office does not include this sector in their surveys and the Financial Accounts of the Bank of Spain does not cover these assets in their definitions. Alternatively, their magnitude can be calculated by drawing on the statistics of monetary institutions (i.e. the Bank of Spain, deposit-taking corporations and money markets funds), insurance companies and pension funds. Implicitly, it has been assumed that other non-monetary financial institutions (such as financial intermediaries, asset managers, etc.) do not own non-financial assets.

Information on these three institutional groups is provided by the Bank of Spain. The aggregated balance sheet of monetary institutions includes as a separate item the value of non-financial assets (buildings, office equipment, etc.) since 1962. The statistics for insurance companies and pensions funds is slightly different, as it presents in one single item all other assets different from financial investments, loans and cash. By taking this classification, non-financial asset might be slightly overstated, although its overall magnitude relative to other institutional sectors is relatively small. Another problem of the insurance and pensions funds statistics is that they only cover up to 2009, so alternatively it has been assumed that non-

financial assets from then onwards follow the trends reported by private insurance companies.

Financial assets and liabilities

Financial assets and liabilities of both non-financial and financial institutions are reported in the Financial Accounts of the Bank of Spain. No further adjustment has been made in this paper.

Tobin Q

As a final step, the Tobin's Q of the Spanish corporate sector (including both non-financial and financial institutions) has been calculated in the following way:

$$Q = \frac{Market\ value\ of\ equity}{Corporate\ net\ worth}$$

The market value of equity is directly stated in the Financial Accounts of the Bank of Spain, and is available from 1981 onwards. The corporate net worth is a broader concept that sums corporate assets minus non-equity liabilities, both measured at market prices following ESA guidelines. Hence, for the period 1995 – 2014, we can compute corporations' Tobin's Q based on the aggregate balance sheet of the corporate sector. Alternatively, we also compute the Tobin's Q using the indirect measure of corporate wealth obtained from detracting the market-value definition of national wealth from the book-value approach. In this case, we define 'corporate net worth' as the sum of corporations' wealth plus their market-value of equity, and we compute Tobin's Q for a longer period: 1981 – 2014. For the period in which both measures overlap results show a similar value.

FOREIGN WEALTH

Net Foreign Assets are the assets held by Spanish residents in foreign countries minus the value of assets held by non-residents in Spain. Our estimate covers the full 1850 – 2014 period and is expressed at market value. To calculate the Net Foreign Assets of Spain we rely on a variety of sources and methods.

For the period 1850 – 1913 we take the data on Spain's international indebtedness from Prados de la Escosura (2010)[24]. His approach is easy to understand. He assumes that Spain's international indebtedness in 1850 amounted to the foreign liabilities of the public sector, and then accumulates the current account plus the variation in foreign exchange reserves. This method is based on the accounting identity according to which the aggregate of the current account, the financial account plus the variation in reserves equals to zero. The main drawback of this method, however, is that it does not capture changes in the relative price of assets in different countries that could be happening over time. However, as we do not count with specific information on the assets held abroad by country and by type of asset, this seems the best possible method to apply.

Later, for the years 1932 to 1934 the Bank of Spain estimated the level of international indebtedness of Spain and we use estimates without further correction (Banco de España 1932-1935). However, we discard a previous estimate made by the Bank of Spain for the year 1931, as this calculation has a lower quality than those of the period 1932 - 1934. To match the 1932 - 1934 estimates from the Bank of Spain with the series of Prados de la Escosura ending in 1913, we extend Prados de la Escosura's data following the same methodology: we start by accumulating the current account since 1914 correcting for the variation in reserves up to 1931[25]. This procedure leads to an estimate of the net foreign asset position of Spain in 1931 that is -18% the value of the national

[24] International indebtedness is an equivalent to Net Foreign Assets, just expressed with an opposite sign.

[25] Data on the current account balance has been kindly provided by Prados de la Escosura (2016). Information on gold reserves is stated in Martín Aceña (1986)

income of Spain in the same year, versus an estimate of the Bank of Spain for the year 1932 of -4% the national income of Spain in 1932.

This difference could be the result of different factors. First, it could be because of lack of information in the Bank of Spain's estimate for the years 1932 - 1934 or it could be due to a wrong approximation to Spain's foreign assets in 1850. Most likely, this could be largely the consequence of not being able to account for the variation in the relative price of assets held abroad by Spanish residents and those assets owned by foreigners in Spain. Given that the quality of current account information is slightly better for the period 1850 – 1913 than for the period 1914 – 1931, we decided to correct our extension of Prados de la Escosura's series of international indebtedness with a constant capital gain to match the 1913 estimate with that of 1932. The annual capital gain needed to match the 1913 estimate with that of 1932 is an annual revaluation of the net foreign asset position of 0.75% as a proportion of annual national income.

The next period in which net foreign assets have been estimated go from 1935 to 1970. Thereafter, the Financial Accounts of the Bank of Spain enable to calculate directly the net foreign assets of the country. Thus, to match the 1934 estimate with that of 1970, we follow the same procedure of accumulating the current account and correcting by the variation of foreign exchange reserves. Data on the current account balance is provided by Prados de la Escosura (2016). Information on the foreign exchange reserves from 1935 to 1948 is presented by Martínez Ruiz (2003) and for the later period from the annual reports of the Bank of Spain and the Anuario Estadístico de España (Dirección General del Instituto Geográfico y Estadístico, n.d.). The resulting series is corrected in the period 1958 – 1970, assuming some given capital gains of 1.9% per annum.

Finally, for the period of 1970 to 2014, Spain's net foreign assets are derived by netting the gross foreign assets and gross foreign liabilities from the Financial Accounts.

INCOME AND SAVINGS

In this paper, we reconstruct both the stock of wealth and the income flows of the Spanish economy. On the flows side, we are mostly interested in three measures: net national income, net national savings and the current account.

Net national income (or simply national income) seems the best measure to measure the resources produced at disposition of a country's population for either consumption or saving. From this metric, we derive net national savings (or just national savings) to evaluate whether the evolution of wealth is driven by a volume effect (through savings) or by a capital-gains effect (through prices). Finally, we reconstruct the current account to estimate the evolution of the Foreign Assets Position in certain periods.

To obtain these estimates we use the Spanish historical national accounts of Leandro Prados de la Escosura, who reconstructs the GDP and national income of Spain for the period 1850 to 2015 (Prados de la Escosura 2003; 2016a), and the international position from 1850 to 1913 (Prados de la Escosura, 2010).

National income

National income is equivalent to GDP, plus the net primary income with the rest of the world, and minus the consumption of fixed capital. We are interested in this measure as it reflects the income of a country after discounting the income dedicated to "repair" the depreciation of the existing capital stock, and after accounting for the rents sent abroad and received from abroad.

For the period of 1850 - 2014 we use the data on GDP at market value from Prados de la Escosura's (2016) most recent update of the Spanish historical accounts, in which he extends his previous work on the Spanish GDP for the period 1850 – 2000 (Prados de la Escosura, 2003). In addition, these new estimates revise the splicing procedure of the different GDP series produced by the Spanish statistical office since 1958 Consequently, the new series for the 1958

– 2000 period show some differences relative to the figures for the same period published in his 2003 book[26].

In addition to GDP, we need data on the net primary income from the rest of the world, which can be decomposed between net foreign labor and capital income, plus the net foreign production taxes (net of subsidies). We use the series on net primary income with the rest of the world from Prados de la Escosura (2016a) for the period 1850 – 2014 and we only correct these data for the Civil War period (1936 – 1939) when Prados de la Escosura's estimates (which are still work in progress) seem implausibly low. We correct these data using the estimates from Martínez Ruiz (2006), which analyzes the foreign sector of Spain during the Civil War. In particular, Martínez-Ruiz's work collects two important flows of income from Spain to foreign countries over this period: the maintenance cost of foreign troops fighting in Spain (around 277.3 million of current dollars) and the payments made by the Spanish authorities to pay down acquired loans (around 78.5 million dollars)[27]. Given that her estimates cover a period of four years, we provide a simple annual average and apply the exchange rate with the US dollar prevailing in each of these four different years. Following this procedure, our annual estimate of net foreign primary income is about -2.9% of Spain's national income, which is of a much larger magnitude than Prados de la Escosura's provisional estimate of about -0.2%.

For the Consumption of Fixed Capital (CFC), we decide not to use the values of Prados de la Escosura (2016a), for three reasons. First, to keep consistency between our estimates of produced assets and the decomposition of national wealth accumulation between savings and capital gains. Importantly, this decomposition relies on using net investment rates by asset type, hence discounting CFC from gross investment. Second, Prados de la Escosura's (2016a) values for CFC are negative during the Civil War period (1936-1939), something

[26] For a detailed methodological discussion of this splicing revision, see Prados de la Escosura (2016b).

[27] The maintenance cost of foreign troops is taken from table 4.3 in Martínez-Ruiz (2006). The amount of debt payments is taken form table 4.10 (payments to Italy), table 4.11 (payments to Germany) and from the text in the case of payments to Portugal (which amounted to 5.84 million of dollars).

of difficult economic interpretation[28]. Finally, Prados de la Escosura (2016a) adopts the official data on CFC from INE (Spanish National Statistics Institute) since 1999 onwards, coinciding with the latest official national accounts series. Although this approach seems reasonable to assure convergence between the historical accounts and the most recent official data, it also implies discarding the pattern of depreciation adopted for the period 1850-1998. For these reasons, we prefer to use our series of CFC throughout all sections of this study. As we show in the robustness checks section, our benchmark values of CFC are consistent both with the existing national accounts and with the historical series of Prados de la Escosura (2016a). Therefore, this choice does not affect significantly our results in this study.

National savings and the current account balance

Net national saving is equal to net domestic saving (gross capital formation minus the consumption of fixed capital) plus net foreign investment. Foreign investment is equivalent to the current external balance (i.e. the net balance with the rest of the world of exports, primary income, current transfers and capital transfers). The current external balance diverges from the most extended definition of the current account balance in that the former includes net capital transfers from the rest of the world. As briefly introduced at the beginning of this section, the main goal for calculating net national saving is to decompose wealth growth between a savings effect and changes in asset prices. From this perspective, it is more accurate to include in the definition of net savings the current external balance instead of the current account balance because net capital transfers directly affect the property of assets across countries, something we would like to capture[29].

[28] A negative depreciation of capital would imply that National income is higher than GDP (assuming net primary income to be 0).

[29] Capital transfers (ESA 2010, 4.145, 4.146) are defined as transfers of ownership of an asset (other than inventories and cash), or the cancellation of a liability by a creditor, without any counterpart being received in return (European Union, 2013, p. 119)

To compute gross capital formation (domestic investment) and net exports (exports minus imports) we need to decompose GDP into its demand side components (private consumption, investment, government spending and net exports). All metrics are derived for the 1850 – 2014 period from Prados de la Escosura (2016a).

Net current transfers with the rest of the world are also taken directly from Prados de la Escosura (2016a) for the 1850 – 2014 period. Net capital transfers with the rest of the world, on the contrary, are only available for the period 1972 – 2014 from OECD National Accounts Statistics. Although it would be good to count with data covering a longer period, we do not think this should have a relevant effect on the current external balance as capital transfers only became significant after Spain entered the European Union in 1986. Given that the GDP levels in Prados de la Escosura (2016) and OECD show some discrepancies for the reasons discussed above, we rescale the net capital transfers in OECD to match the GDP values of Prados de la Escosura. For example, in 1989 the GDP level per OECD statistics stood at 102.7% the level of Prados de la Escosura (2016a). Consequently, we simply make that net capital transfers (as per OECD data) are matched at the same percentage (for example, 0.3% in 1989), but using Prados de la Escosura's GDP series.

Decomposition of wealth accumulation

In addition to building sectoral balance sheets, we also present a decomposition of the accumulation of wealth between a volume effect (through saving) and a relative price effect (through capital gain/losses). To do this, we follow both the "multiplicative" and the "additive" decomposition of wealth accumulation as proposed by Piketty and Zucman (2014) in the appendix to their paper. These methods relate the accumulation of national saving to the evolution of national wealth, and finds the capital gain component as a residual.

The multiplicative approach argues that the wealth stock in year $t + 1$ depends on three factors: the volume of wealth in t, new accumulated wealth from t to $t + 1$

(net of depreciation) and the evolution of the relative price of wealth with respect to income. This can be thought as a two goods model were the price of wealth varies with regard to the price of consumption goods. Leaving aside the capital gains component, the accumulation of wealth can be expressed through the following equation:

$$W_{t+1} = W_t + s_t Y_t \quad (1)$$

Where W_{t+1} represents the value of wealth in year $t + 1$, W_t represents de value of wealth in year t, and $s_t Y_t$ represents the net-of-depreciation saving flow between years t and $t + 1$, that results from the net-of-depreciation saving rate in year t from Y_t, the net national income in year t. Then, to track the evolution of the wealth-to-income ratio (β) we divide the previous equation by Y_{t+1} and we obtain:

$$\beta_{t+1} = \beta_t (1 + g_{wt})/(1 + g_t) \quad (2)$$

where $1 + g_{wt} = 1 + \frac{s_t}{\beta_t}$ and $1 + g_t = \frac{Y_{t+1}}{Y_t}$. Hence, in this model movements in the wealth-to-income ratio are positively determined by the volume of saving and negatively determined by the growth rate of income.

Using the result in equation (2), we introduce the relative price effect component $(1 + q_t)$ as follows:

$$\beta_{t+1} = \beta_t (1 + q_t)(1 + g_{wt})/(1 + g_t) \quad (3)$$

Next, we cumulate this equation over n years to get the following multiplicative decomposition of wealth accumulation:

$$\beta_{t+n} = \beta_t (1 + q)^n (1 + g_{ws})^n/(1 + g)^n \quad (4)$$

where $(1 + g_{ws})^n = (1 + g_{wt}) \text{ x } \dots \text{ x } (1 + g_{wt+n-1})$ equals the cumulated saving-induced wealth growth rate;

$(1 + q)^n = (1 + q_t) \text{x } \dots \text{ x } (1 + q_{t+n-1})$ is the cumulated capital-gains-induced wealth growth rate, and

$(1 + g)^n = (1 + g_t) \text{x } \dots \text{ x } (1 + g_{t+n-1})$ is the cumulated growth rate of national income.

From equation (4), we can decompose the evolution of the wealth-to-income ratios into the previous three components or, alternatively, we could just decompose the accumulation of wealth into a volume effect and a capital gains effect. Given that we count with all the data in equation (3) except the "cumulated capital-gains-induced" component, we solve for this component as a residual of this equation.

In addition, we carry this decomposition of wealth accumulation for two subcomponents of national wealth: Housing and non-housing wealth. To do this, we start from the definition of national wealth as the sum of domestic non-financial assets plus net foreign wealth: $W_N = A^{NF} + NFW$, which we further decompose into housing and non-housing wealth: $W_N = W^H + W^{NH}$. Housing wealth is the market value of dwellings, while non-housing wealth is the sum of non-housing non-financial assets and net foreign wealth. Similarly, we decompose national saving into domestic investment (net of depreciation) and foreign saving: $S_N = I + S_F$, which then we decompose into housing investment and non-housing national saving: $S_N = I^H + S^{NH}$. As a result, each component of national saving is mapped to its corresponding component in national wealth. We run equation (4) separately for each of these two components of national wealth:

$$\beta_{i,t+1} = \beta_{i,t} (1 + q_{i,t})(1 + g_{wi,t})/(1 + g_{i,t}) \quad (5)$$

, where i stands for housing or non-housing national wealth. Ideally, we would have liked to further decompose non-housing wealth into non-housing non-financial assets and net foreign wealth. However, the multiplicative

decomposition of wealth accumulation is based on geometric averages of growth rates, which are only meaningful when wealth stocks take positive values. This is not the case for net foreign wealth in Spain.

On the other hand, the additive decomposition between two given years (t and t+1) can be specified as follows:

$$W_{t+1} = W_t + S_{t,t+1} + KG_{t,t+1} \quad (6)$$

where Wt and Wt+1 are national wealth at time t and t + 1, $S_{t,t+1}$ is the total saving flow between year t and t + 1, and $KG_{t,t+1}$ are the total capital gains or losses between year t and t + 1. To track the evolution of the wealth-to-income ratio (β) we then divide the previous equation by Yt+1 and obtain:

$$\beta_{t+1} = \beta_{ini} + \beta_{sav} + \beta_{kg} \quad (7)$$

where $\beta_{ini} = \frac{W_t}{Y_{t+1}}$ is the component coming from initial wealth and $\beta_{sav} = \frac{S_{t,t+1}}{Y_{t+1}}$ and $\beta_{kg} = \frac{KG_{t,t+1}}{Y_{t+1}}$ the components coming from saving flows and capital gains or losses, respectively.

Furthermore, in line with the multiplicative form, we go one step beyond and carry this decomposition for housing, other types of capital and foreign wealth[30]. We run equation (7) separately for each of these three components of national wealth:

$$\beta_{i,t+1} = \beta_{i,ini} + \beta_{i,sav} + \beta_{i,kg} \quad (8)$$

where i stands for housing, other types of capital or foreign wealth.

The additive decomposition has the advantage of allowing us to disentangle the fraction of savings and capital gains that each component represents in the total,

[30] Note that in this case we do not have the limitations mentioned for the multiplicative decomposition and we are able to split non-housing wealth between other types of capital and foreign.

which is very relevant for explaining the accumulation of national wealth in Spain over time.

The decomposition of wealth accumulation (in both the multiplicative and the additive forms) can be calculated directly with the available series on national wealth, income and savings, except for the Civil War period (1936-1939) and the two subsequent years (1940 and 1941), when we lack complete information to compute the wealth stock. To provide an estimate of national wealth in these years, we follow the approach of Piketty and Zucman (2014) when they estimate the value of wealth in periods with missing data by running equation (2). In addition, they add a fixed capital gain (1+q) over the whole period, as in equation (3), which serves to match the initial estimate of the wealth-to-income ratio with the ratio at the end of the given period. From 1935 to 1942 we follow this same approach with two corrections. First, we correct for the destruction of wealth during the Civil war period (1936-1939) based on Prados de la Escosura et al. (2010), using the same proportions of assets destroyed that we use for the PIM estimates of produced assets. Second, we adjust equation (5) with a fixed annual capital gain, which serves to match the 1935 estimate of wealth-to-income ratios for each subcomponent of national wealth with that of 1942. Specifically, we run accumulation equations separately for housing and non-housing wealth (we do count with foreign wealth data for the period 1935-1942). We then assume a fixed capital gain for each of this two subcomponents. Finally, we obtain the evolution of national wealth for the period 1935-1942 by aggregating the three subcomponents (housing, non-housing and foreign wealth).

A second aspect where our data show some limitations has to do with the estimate of housing and non-housing investment. By definition, gross national saving equals gross investment plus net foreign saving (current external balance), where gross investment is the sum of gross fixed capital formation and changes in inventories. While we count with data for gross fixed capital formation for housing and non-housing assets, changes in inventories is not decomposed into different assets. Hence, we assume that the proportion of housing and non-housing assets in changes in inventories is proportional to the one observed in gross fixed capital formation. Although we would like to count with more precise

estimates of inventories, we do not believe that this assumption has a practical effect on our accumulation equations, as changes in inventories are a small proportion of total gross investment.

ROBUSTNESS CHECKS

In this paper we compare the long-run evolution of national wealth at market-value and at book-value and, in addition, we decompose the accumulation of national wealth between capital gains and savings using the market-value definition of national wealth. In this section, we check the robustness of our results to different specifications. First, we estimate an alternative measure of book-value national wealth using three different patterns of depreciation for produced assets. Second, we test the validity of each estimate of produced assets be comparing the implied values for the Consumption of Fixed Capital. Finally, we compare the decomposition of national wealth accumulation using the market-value approach, as presented in the paper, with the same decomposition using the book-value definition. Overall, our results are very robust to these different specifications.

Alternative measurement of book-value national wealth

The book-value approach to national wealth sums the stock of non-financial assets (produced and non-produced) and the net foreign wealth. Ideally, the measurement of all types of assets should be based on a census-like approach where prices and quantities are observed at a given point in time, for which a value of assets is reconstructed. While we measure the two most important non-financial assets in Spain –agricultural land and housing- through the census approach, our book-value definition of wealth calculates produced assets with the PIM[31]. This method is sensitive to three aspects: the initial stock of produced assets from which investment flows are added, the depreciation pattern of assets and the quality of the underlying data on flows of investment.

[31] We also measure subsoil assets using a capitalization approach, which is different to the census-like method. However, given the historically low weight of subsoil industries in total GDP in Spain, any mismeasurement of the stock of subsoil assets should have an almost negligible impact on the total value of national wealth (for more details, see "mineral and energy reserves" section in this appendix).

The last of these three elements is difficult to test. However, we rely on Prados de la Escosura's reconstruction of Spain's historical national accounts (2016a), which is regarded as one of the most serious and consistent historical reconstructions in advanced economies. As for the initial value of the stock of produced assets, we calculate our series of produced assets since 1850, but we only present results since 1900 onwards. This way, we avoid any mismeasurement coming from the choice of an initial value. This is shown by Prados de la Escosura and Rosés (2010), where they compare different choices for the initial stock of produced assets in Spain for the year 1850 and the posterior evolution of PIM estimates. The authors demonstrate that after a period of 40 years (i.e. by 1890), differences in the value of produced assets basically vanish[32].

The choice of a depreciation pattern is a more delicate aspect. At this respect, the release of the OECD's (2009) manual supposed an improvement for the practical implementation of the PIM, as it recommends the use of geometric patterns of depreciation, which we use in this study. This type of pattern is characterized by fast rates of depreciation in the initial years of an asset life, which reduces the accumulation of investment and the resulting stock of produced assets when compared to other patterns. Therefore, we decide to compare our results with those using a more conservative approach. For this purpose, we take the depreciation rates used in Prados de la Escosura and Rosés (2010), which correspond to a "modified" geometric pattern, and which are especially conservative regarding the speed at which assets depreciate. As expected, using the "modified" geometric depreciation raises the annual stock of produced asset.

As "Figure appendix 1" shows, our benchmark value for produced assets is around 70-80 per cent of the alternative stock of produced assets over the period 1900 – 2014. In both cases, we have smoothed the evolution of service lives across the three different periods (1850-1919, 1920-1959 and 1960-200) for which Prados and Rosés (2010) calculate different service lives (see discussion in "produced assets" section). We do this to avoid sharp breaks in the years in which

[32] In our benchmark series we use a faster pattern of depreciation than the one used by Prados de la Escosura and Rosés (2010). Hence, for our case, the period of time necessary to avoid differences coming from choosing an initial value would be even smaller.

there exist a change of 'service-lives' period (i.e. between 1959 and 1960), which would imply a sudden and artificial increase in the depreciation of produced assets in these years. "Figure appendix 2", on the contrary, compares our benchmark estimate of produced assets with that of a "modified" geometric depreciation with non-smoothed service lives while "Figure appendix 3" presents the comparison of our benchmark series with those using the same depreciation pattern (geometric) but with non-smoothed service lives. Overall, results for the value of produced assets are very similar when comparing the same depreciation pattern with smoothed and non-smoothed service live. However, there exists a significant difference in the level of produced assets when computed with a geometric depreciation pattern or a "modified" geometric depreciation approach (i.e. geometric pattern is around 70-80 percent of the "modified" pattern, confirming the results of "Figure appendix 1").

To shed light on which series of produced assets are better to use, we compare the Consumption of Fixed Capital (CFC) obtained with each of the previous approaches. "Figure appendix 4" compares our benchmark series of CFC with those obtained using the "modified" geometric pattern, as a percentage of GDP. In both specifications, the service lives of assets are smoothed. As expected, our benchmark series using the "double-declining" geometric approach shows higher levels of depreciation. "Figure appendix 5" compares our benchmark series with those using a "modified" geometric pattern with non-smoothed services lives while "Figure appendix 6" compares our benchmark series with those using the same depreciation approach but with non-smoothed service lives. Results from "Figure appendix 5" present very similar values to those in "Figure appendix 4", confirming that the main difference when estimating produced assets stems from the depreciation patterns, and not from the smoothing of service lives. However, as shown in "Figure appendix 6", when using non-smoothed series, a spike in CFC appears in 1960, coinciding with the year in which there is a change in the profile of service lives. From this perspective, using smoothed lives seems preferable.

In "Figure appendix 7" we compare the geometric and the "modified" geometric results for CFC with those from the Spanish national accounts, since 1970, when

the OECD splices the official series form the Spanish National Statistics Institute. In this comparison, the denominator (GDP) is different: the geometric and "modified" geometric series uses the GDP from Prados de la Escosura (2016a) while the OECD series uses their own GDP obtained when splicing official accounts. This way, all results for CFC are comparable. This figure shows that our benchmark estimates of CFC are very close to those of national accounts, while those obtained using the "modified" approach are significantly below (between 3 and 4 points of GDP). From this perspective, our benchmark series of produced assets are closer and more compatible with official national accounts than those using the significantly more conservative pattern of depreciation, as it is the case for the "modified" depreciation one.

As explained in the "produced assets" section, in this study we prefer not to use the data on CFC in Prados de la Escosura (2016a), as it shows negative values during the Civil War period (1936-1939) and, also, because since 1999 Prados de la Escosura uses directly the data from the last official Spanish national accounts, which start in 1999. While doing this allows Prados de la Escosura full convergence of CFC between his series and those in the official national accounts for the period 1999-2014, it also implies a break with the depreciation pattern followed during the historical period. In "Figure appendix 8" we compare our benchmark values for CFC with those of Prados de la Escosura (2016a). Overall, the evolution is similar, with some notable exceptions in the Civil War period and during the 1950s, when our series are higher. At this stage we cannot address the reason of the discrepancy, as both series should be based on the same investment data. Nevertheless, we prefer to use our own series as it guarantees consistency throughout our study. In addition, by using our series we avoid obtaining negative values during the Civil War years. Interestingly, this comparison confirms that Prados de la Escosura does not apply the "modified" geometric depreciation pattern to compute his estimates of CFC, probably because this pattern brings too low values for depreciation.

Finally, "Figure appendix 9" compares our benchmark series of depreciation with those of Prados de la Escosura (2016a) and those from official national accounts, since 1970. Our benchmark series are closer to the official accounts from 1970

until the mid-1990s, when the series of Prados de la Escosura (2016) converge with the official accounts and our benchmark remains slightly above the official data. It is worth noting that official data during this period is based on a linear pattern of depreciation, as opposed to the geometric pattern used in this study and advised by OECD (2009).

Overall, this analysis of the different levels of depreciation obtained under different specifications make us favor our approach, especially with regards to using a significantly more conservative patter of depreciation as the "modified" depreciation pattern, as we obtain more reasonable values of depreciation which are close to both the value in Prados de la Escosura's (2016) Histroical National Accounts and the official Spanish accounts.

In what follows we compute the book-value national wealth, the stock of non-financial assets and the Tobin's Q under the different patterns of depreciation used to estimate produced assets.

Figure 10, 11 and 12 in the appendix compare our benchmark series of book-value national wealth with the same three alternative scenarios to calculate produced assets: "modified" geometric depreciation with smoothed service lives, "modified" geometric depreciation with non-smoothed service lives and geometric depreciation with non-smoothed services lives. In all three cases, the results are very similar to our benchmark series. This seemingly paradox is the result of land underlying buildings, which is obtained as a residual from detracting the replacement cost of dwellings from the total value of housing. Thereafter, the share of land underlying non-residential buildings is imputed from the relation found in the housing sector. Thus, when using the most conservative depreciation pattern, we obtain a higher value of produced assets, which is compensated by lower land underlying buildings (both residential and non-residential)[33]. This is shown in figures 13, 14 and 15 in the appendix, which

[33] When using the "modified" geometric depreciation, we find slightly negative values for land underlying dwellings in the years 1930s and 1940s. This could be the result of dwellings being overestimated by the PIM when using the "modified" geometric depreciation but also some degree of underestimation in our series of housing wealth over these years. Historically, rent control can

present the decomposition of non-financial assets obtained under these different specifications as compared to our benchmark series. Although the share of produced assets and land underlying buildings varies between the two figures, the dynamics are broadly similar.

Finally, in figures 16, 17 and 18 in the appendix we present the Tobin's Q obtained using these different approaches to the book-value national wealth and compare them with the Tobin's Q calculated from corporations' balance sheet. As the alternative measures of national wealth based on the PIM show similar levels over the long run, the Tobin's Q estimates under the different specifications offer similar results too.

Overall, this sensitivity analysis confirms the robustness of our book-value measure of national wealth. In addition, these results highlight the importance of computing dwellings at market value (i.e. including land underlying), as this asset not only determines the long-run dynamics of national wealth but also the role played by land underlying buildings in our calculations. Nevertheless, these results also confirm the need to count with better assessments of both produced assets and land underlying buildings. This element has not been sufficiently explored by statistical institutes and researchers, both in the past and in the present.

The decomposition of national wealth accumulation with the book-value approach

A second aspect which deserves attention has to do with the decomposition of national wealth accumulation shown in the paper. This decomposition is carried with market-value national wealth series and not with the book-value ones. Therefore, we compute the same decomposition using our benchmark series of book-value national wealth. Results are presented in tables 1 and 2 of this appendix, which present the same results than tables 1 and 2 of the paper. Not

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also explain the low values of the market-value of housing as compared to the replacement cost of dwellings during this period.

surprisingly, given the close resemblance between the two measures of national wealth, results obtained with the two measures are almost identical.

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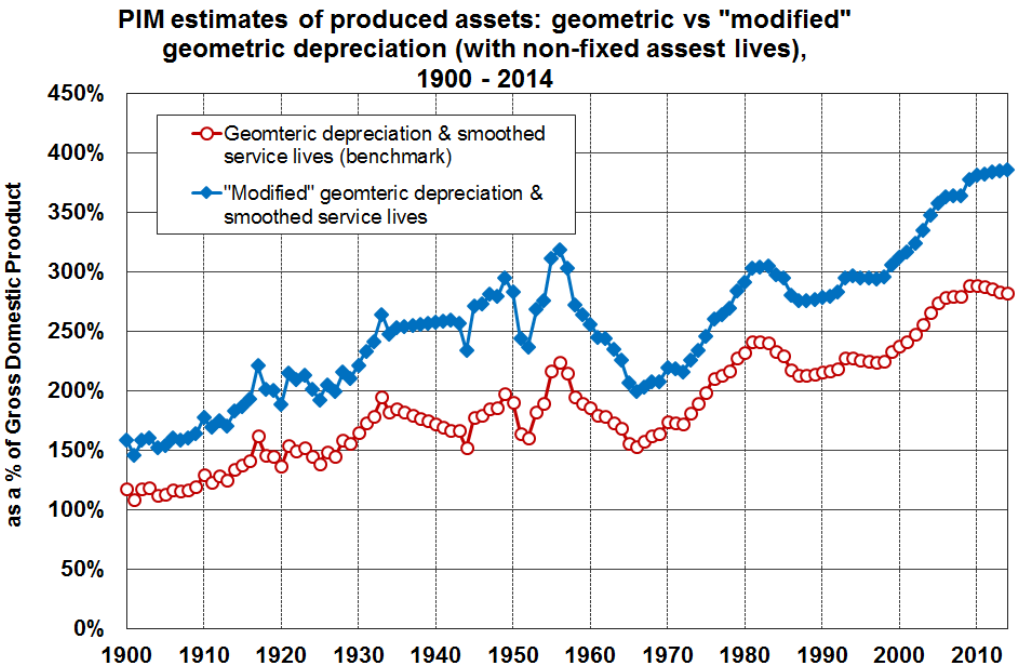
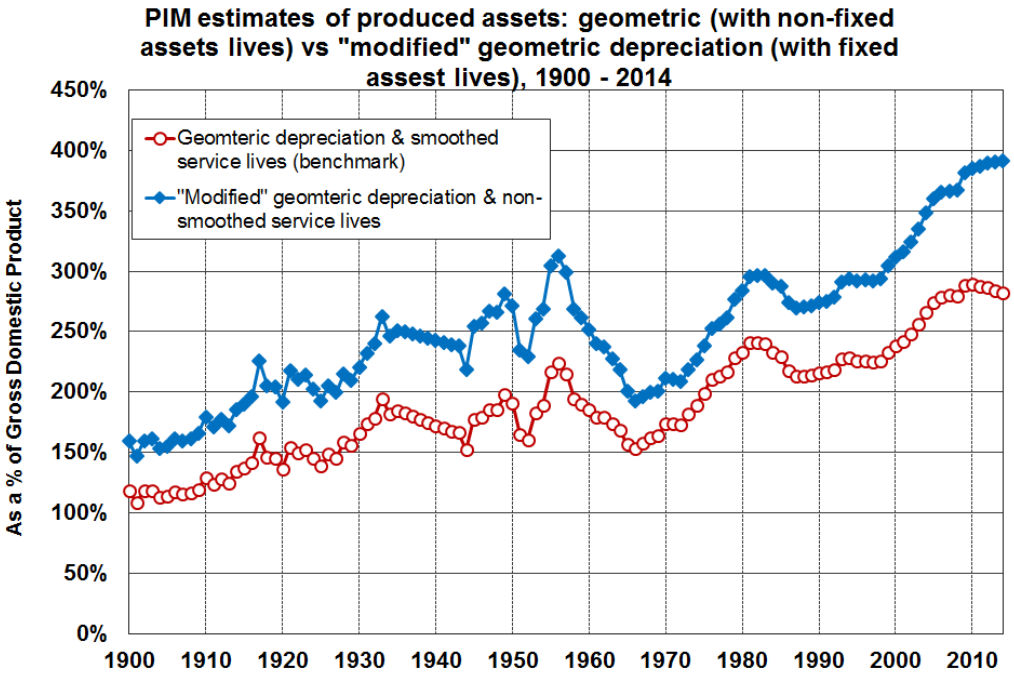
FIGURES APPENDIX

Figure appendix 1



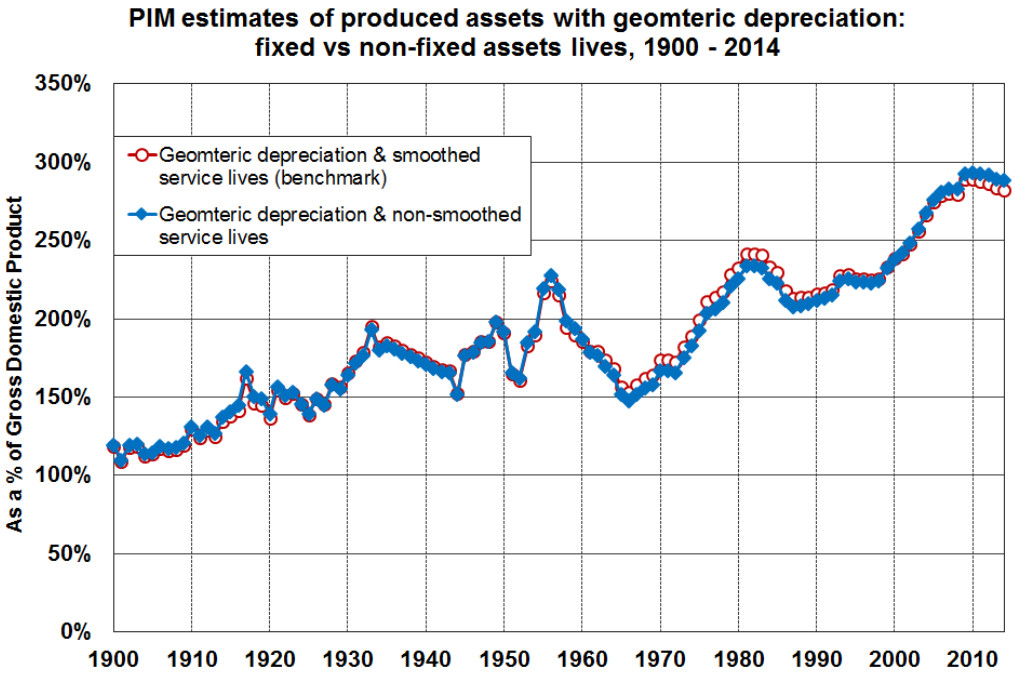
Notes: This figure compares the stock of produced assets obtained using the Perpetual Inventory Method with smoothed service lives of assets under two different patterns of depreciation: a) Using a geometric pattern of depreciation (benchmark series in the paper), and b) Using a "modified" geometric pattern of depreciation. Data are expressed as a percentage of Gross Domestic Product.

Figure appendix 2



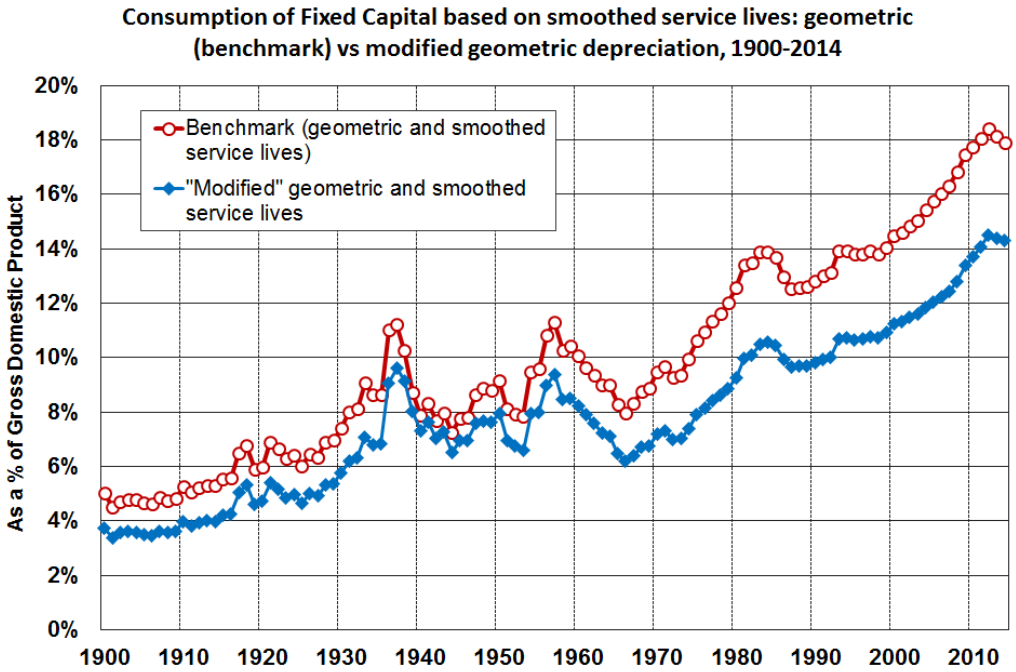
Notes: This figure compares the stock of produced assets obtained using the Perpetual Inventory Method under two different scenarios: a) Using a geometric pattern of depreciation together with smooth service lives of assets (benchmark series in the paper), and b) Using a "modified" geometric pattern of depreciation with non-smoothed service lives of assets. Data are expressed as a percentage of Gross Domestic Product.

Figure appendix 3



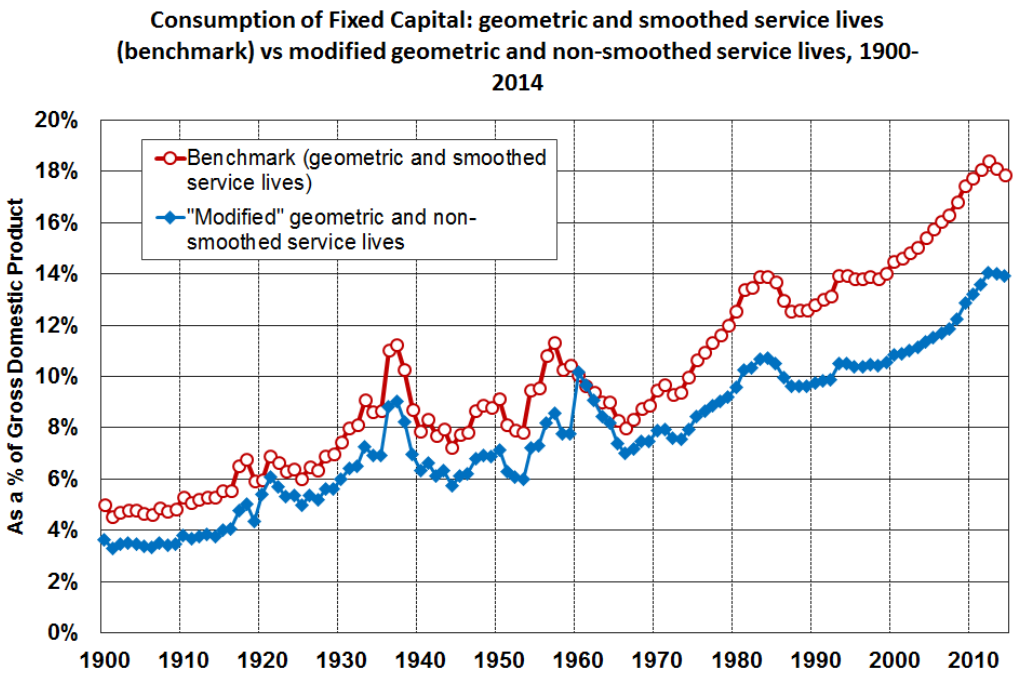
Notes: This figure compares the stock of produced assets obtained using the Perpetual Inventory Method with a geometric pattern of depreciation under two different specifications for the service lives of assets: a) Using smoothed service lives (benchmark series in the paper), and b) Using non-smoothed service lives. Data are expressed as a percentage of Gross Domestic Product.

Figure appendix 4



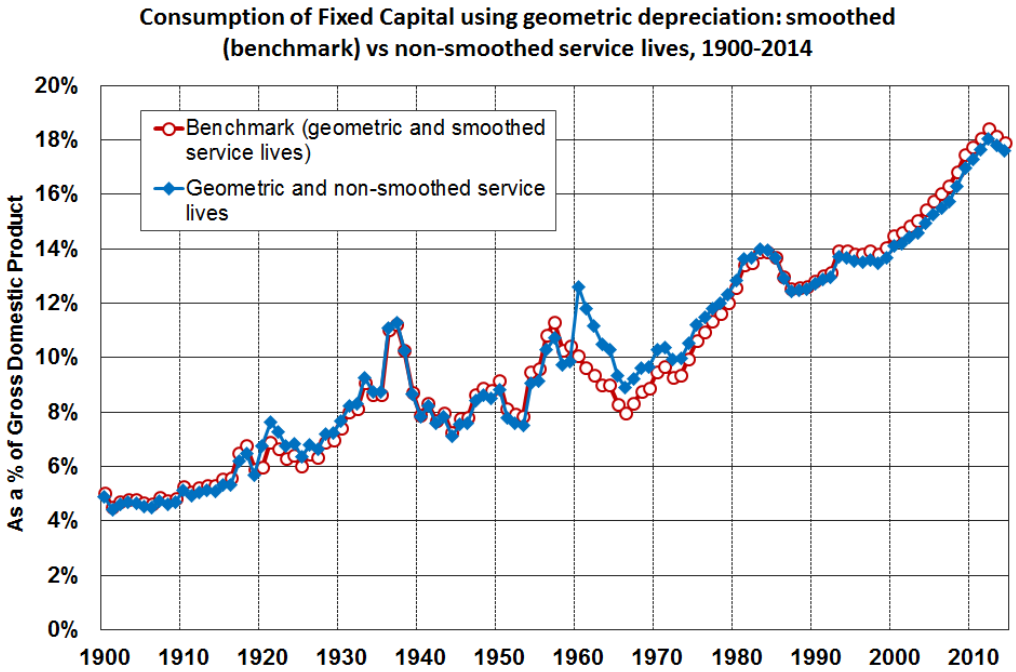
Notes: This figure compares capital depreciation obtained from estimating the stock of produced assets using the Perpetual Inventory Method with smoothed service lives of assets but under two different patterns of depreciation: a) Using a geometric pattern of depreciation (benchmark series in the paper), and b) Using a "modified" geometric pattern of depreciation. Data are expressed as a percentage of Gross Domestic Product.

Figure appendix 5



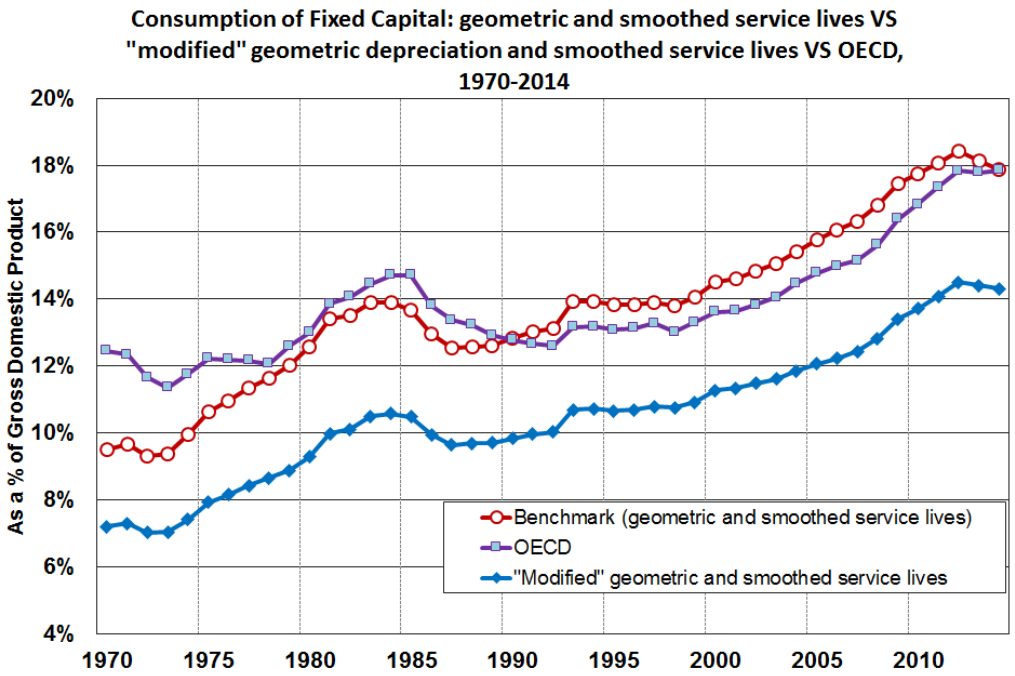
Notes: This figure compares capital depreciation obtained from estimating the stock of produced assets using the Perpetual Inventory Method under two different scenarios: a) Using a geometric pattern of depreciation with smoothed service lives of assets (benchmark series in the paper), and b) Using a "modified" geometric pattern of depreciation with non-smoothed service lives of assets. Data are expressed as a percentage of Gross Domestic Product.

Figure appendix 6



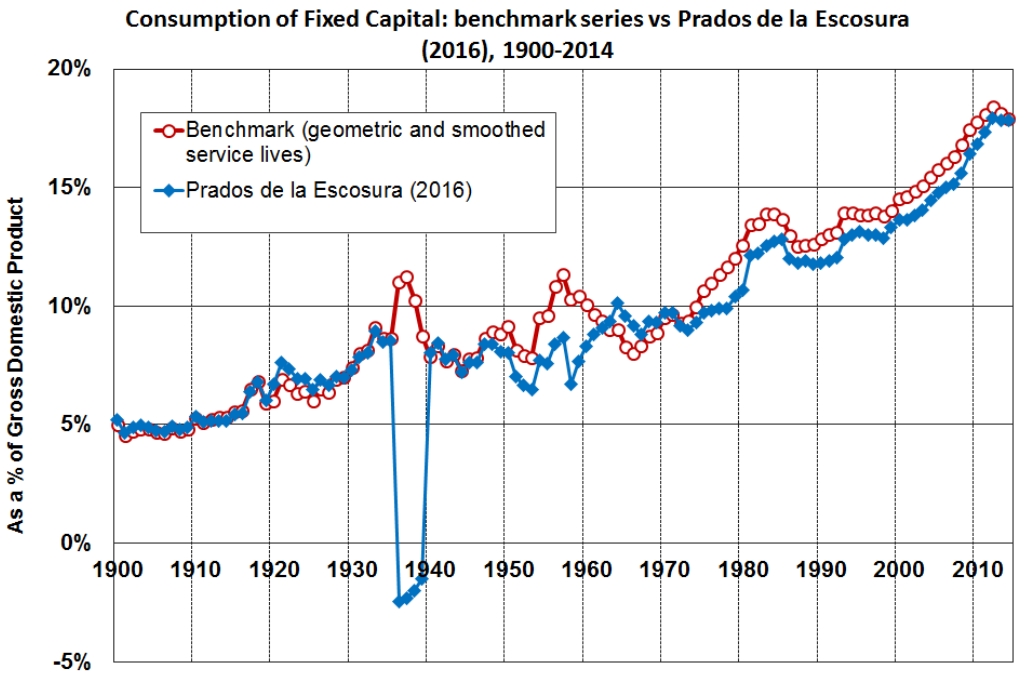
Notes: This figure compares capital depreciation obtained from estimating the stock of produced assets using the Perpetual Inventory Method with a geometric pattern of depreciation under two different specifications for the service lives of assets: a) Using smoothed service lives (benchmark series in the paper), and b) Using non-smoothed service lives. Data are expressed as a percentage of Gross Domestic Product.

Figure appendix 7



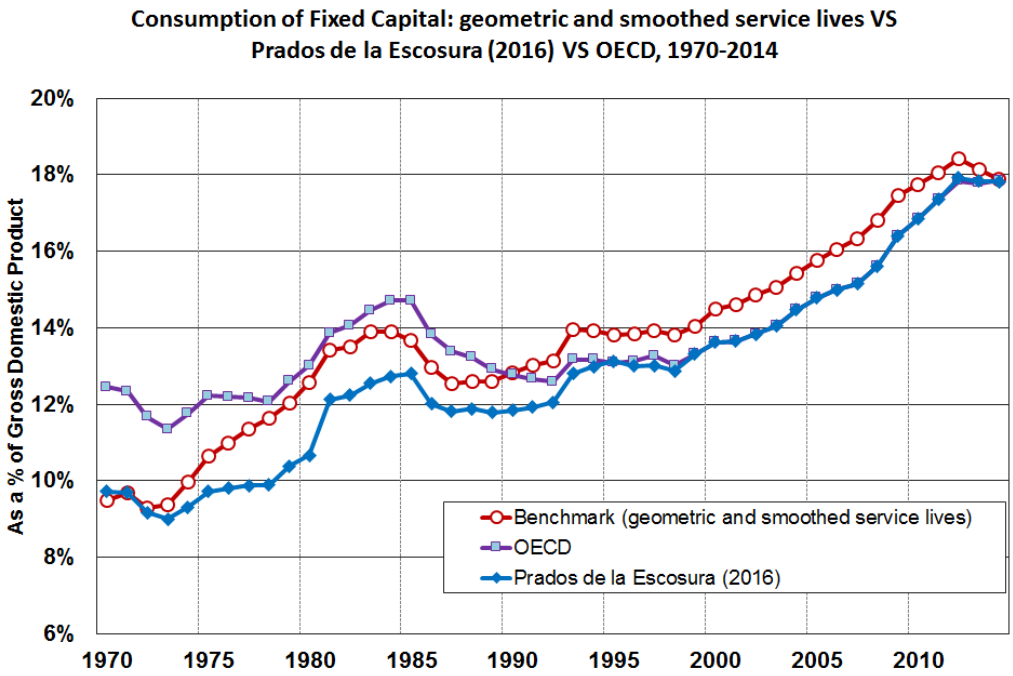
Notes: This figure compares our benchmark series of capital depreciation (geometric pattern of depreciation with smoothed service lives) with those obtained with a "modified" geometric pattern of depreciation and those calculated by the OECD National Accounts Statistics. Data are expressed as a percentage of Gross Domestic Product. To be consistent, OECD's capital depreciation is expressed as a percentage of OECD's GDP (our benchmark series of GDP slightly differ from those at OECD).

Figure appendix 8



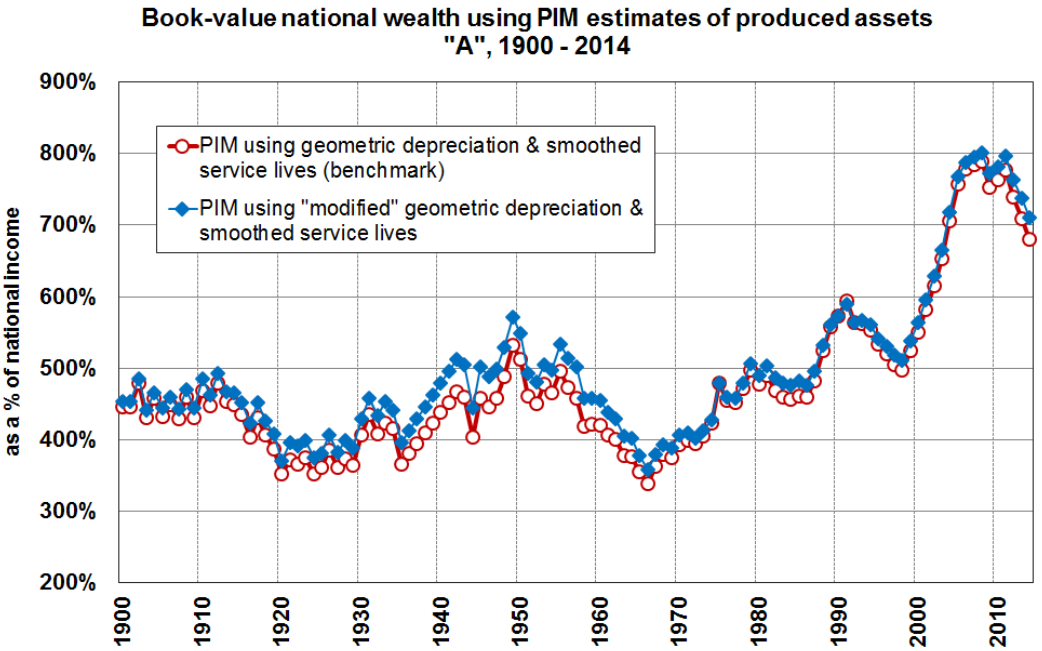
Notes: This figure compares our benchmark series of capital depreciation with those in Prados de la Escosura (2016a). Data are expressed as a percentage of Gross Domestic Product.

Figure appendix 9



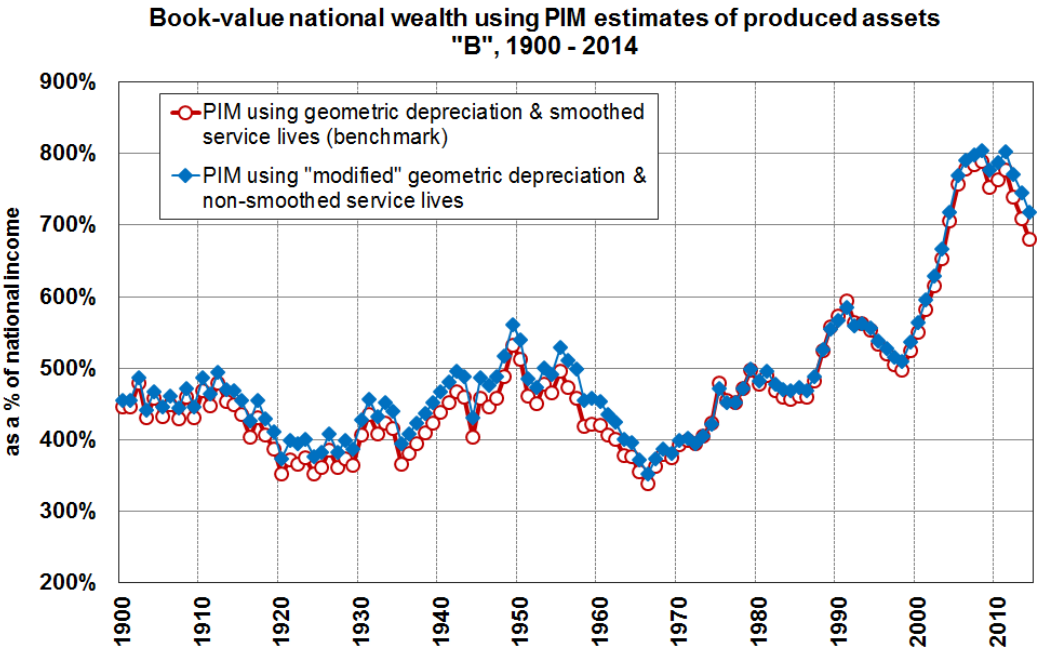
Notes: This figure compares our benchmark series of capital depreciation with those in Prados de la Escosura (2016a) and those in OECD National Accounts Statistics. Data are expressed as a percentage of Gross Domestic Product. To be consistent, OECD's capital depreciation is expressed as a percentage of OECD's GDP (our benchmark series of GDP slightly differ from those at OECD).

Figure appendix 10



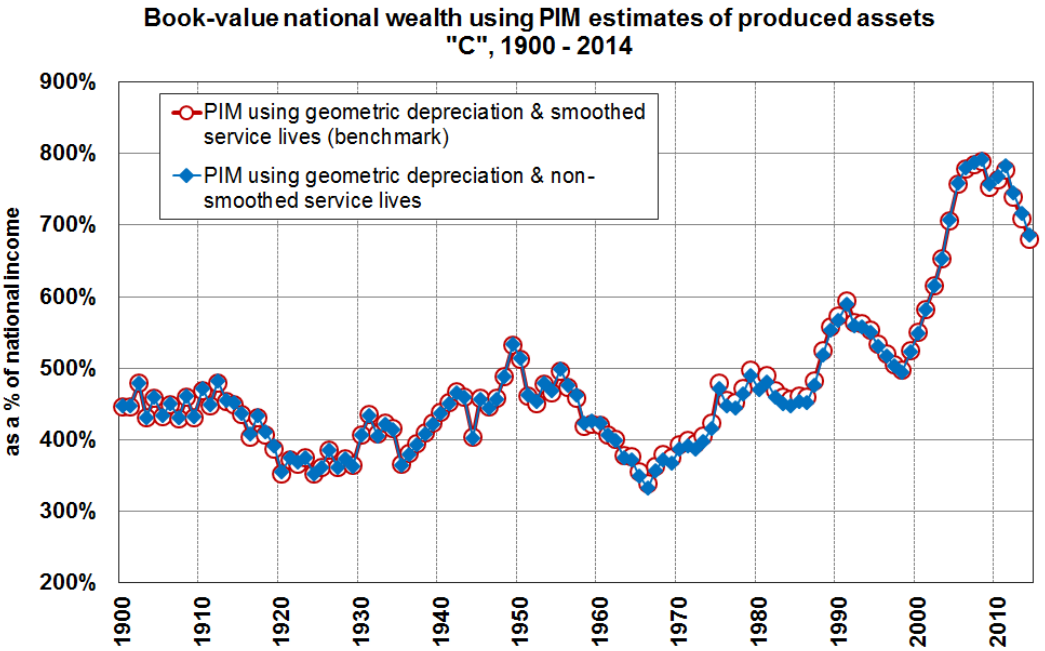
Notes: This figure compares our benchmark series of book-value national wealth with those obtained estimating produced assets under an alternative pattern of depreciation. Our benchmark series uses a geometric pattern while the alternative series uses a "modified" geometric pattern. Data are expressed as a percentage of Gross Domestic Product.

Figure appendix 11



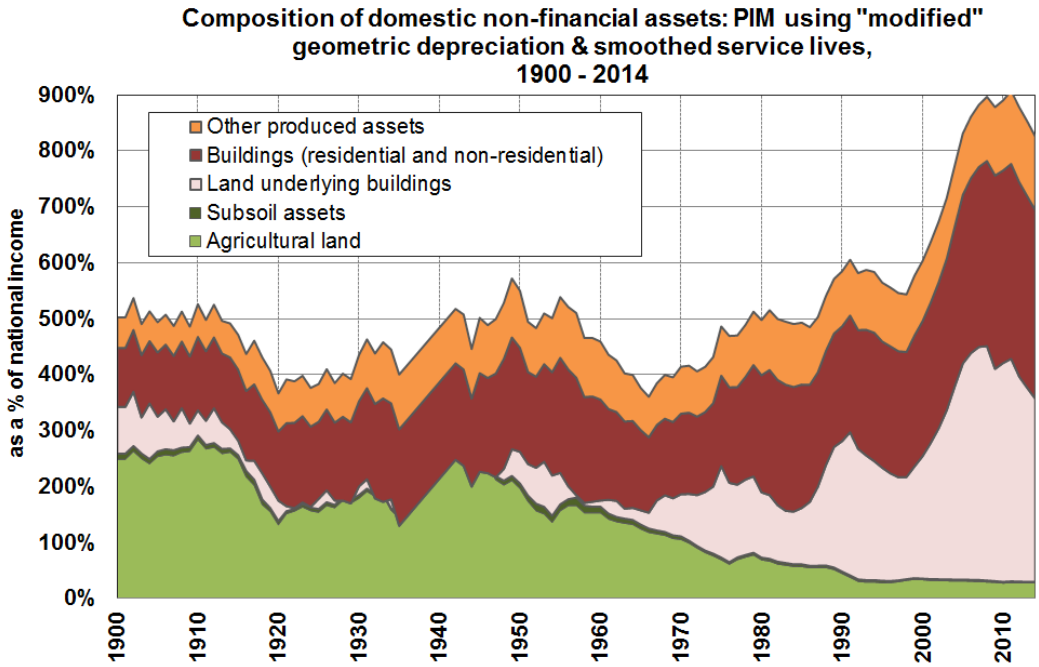
Notes: This figure compares our benchmark series of book-value national wealth with those obtained estimating produced assets under an alternative pattern of depreciation and a different specification for the service lives of assets. Our benchmark series uses a geometric pattern together with smoothed service lives of assets while the alternative series uses a "modified" geometric pattern with non-smoothed service lives of assets. Data are expressed as a percentage of Gross Domestic Product.

Figure appendix 12



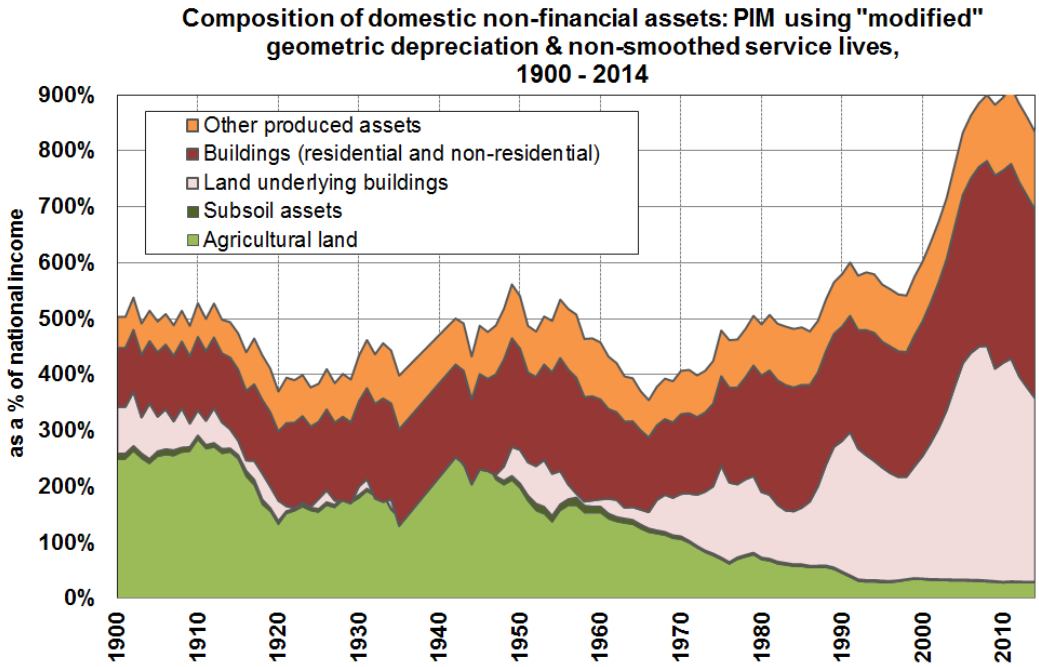
Notes: This figure compares our benchmark series of book-value national wealth with those obtained estimating produced assets with a different specification for the service lives of assets. Our benchmark series uses smoothed service lives of assets while the alternative series uses non-smoothed service lives of assets. Data are expressed as a percentage of Gross Domestic Product.

Figure appendix 13



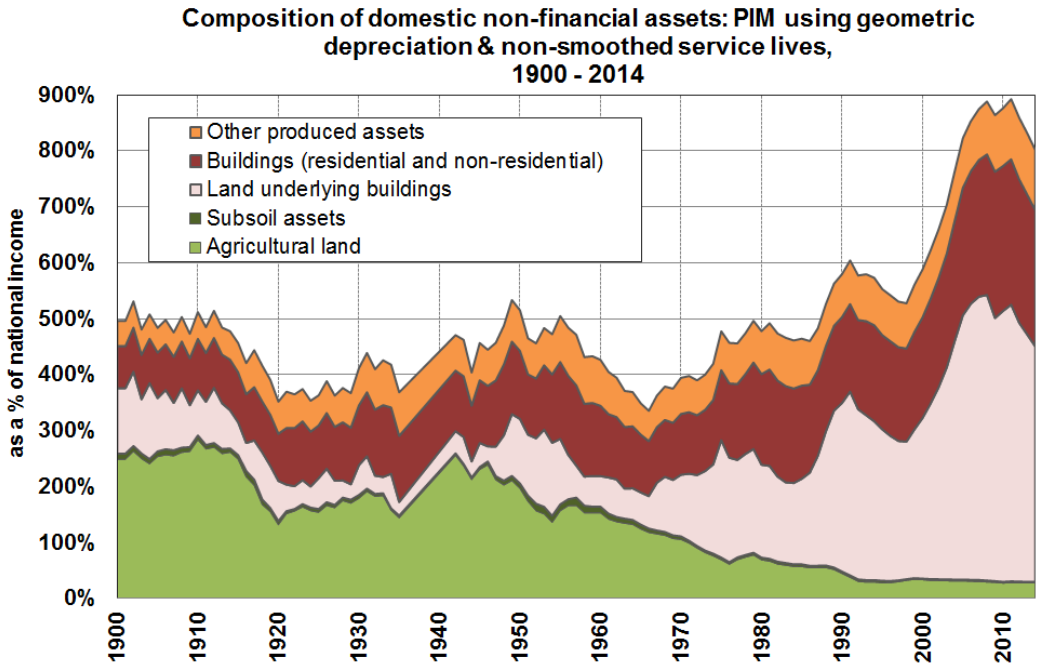
Notes: This figure shows the composition of domestic non-financial assets which results from estimating produced assets with an alternative specification to the one used in the paper. In this alternative case, produced assets are obtained using a "modified" pattern of depreciation while the benchmark series in the paper (Figure A.8.) uses a geometric pattern. Data are expressed as a percentage of National income.

Figure appendix 14



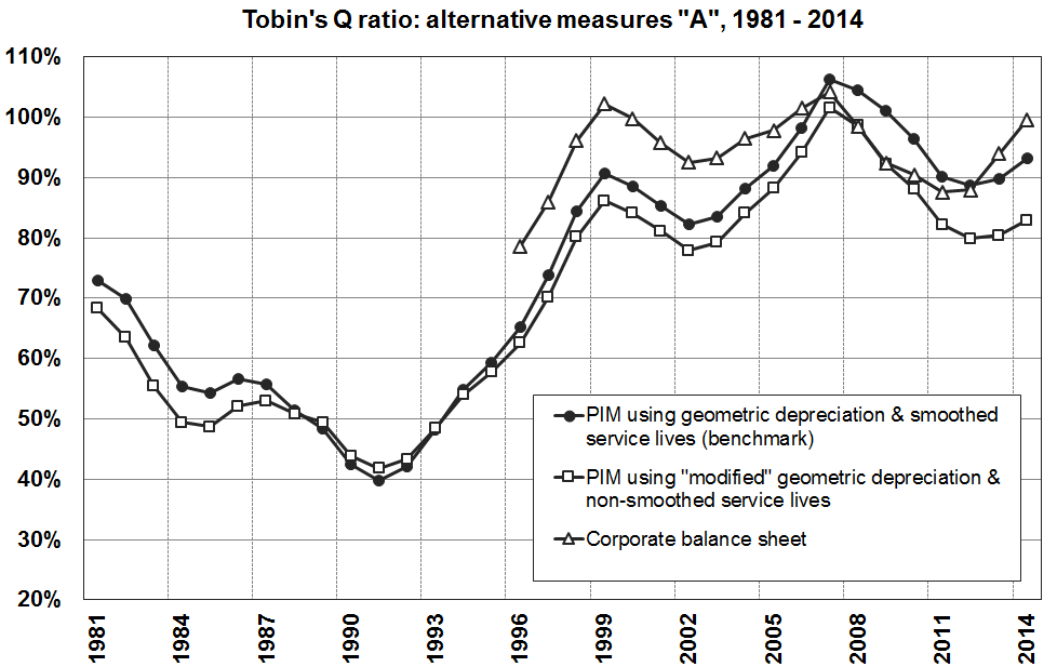
Notes: This figure shows the composition of domestic non-financial assets which result from estimating produced assets with an alternative specification to the one used in the paper. In this alternative case, produced assets are obtained using a "modified" pattern of depreciation and non-smoothed service lives of assets. The benchmark series in the paper (Figure A.8.) uses a geometric pattern with smoothed service lives of assets. Data are expressed as a percentage of National income.

Figure appendix 15



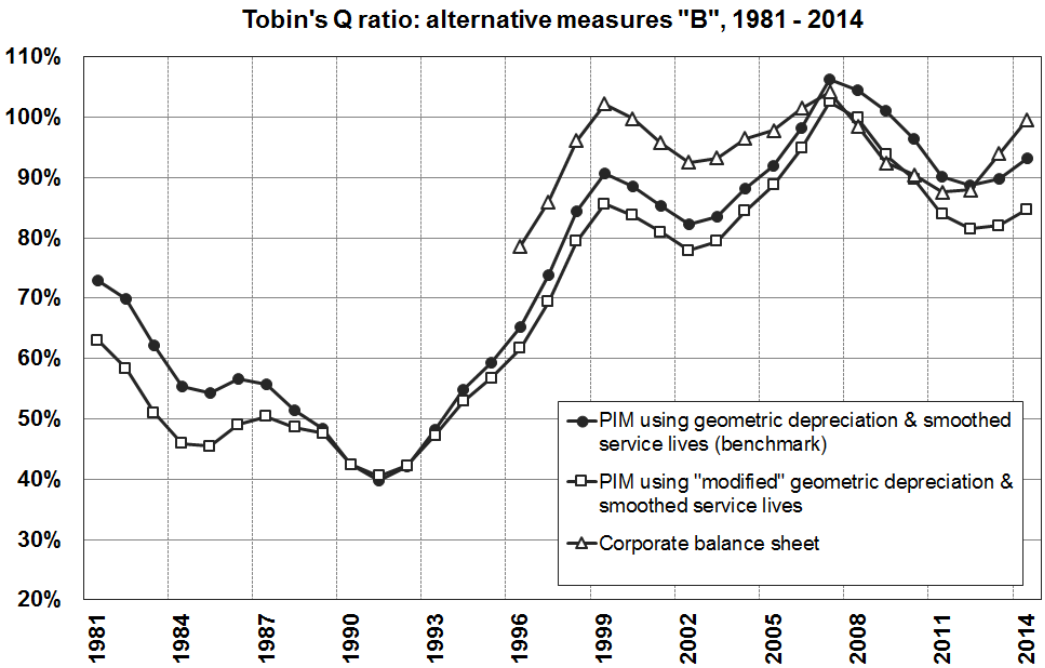
Notes: This figure shows the composition of domestic non-financial assets which results from estimating produced assets with an alternative specification to the one used in the paper. In this alternative case, produced assets are obtained using non-smoothed service lives of assets. The benchmark series in the paper (Figure A.8.) uses smoothed service lives of assets. Data are expressed as a percentage of National income.

Figure appendix 16



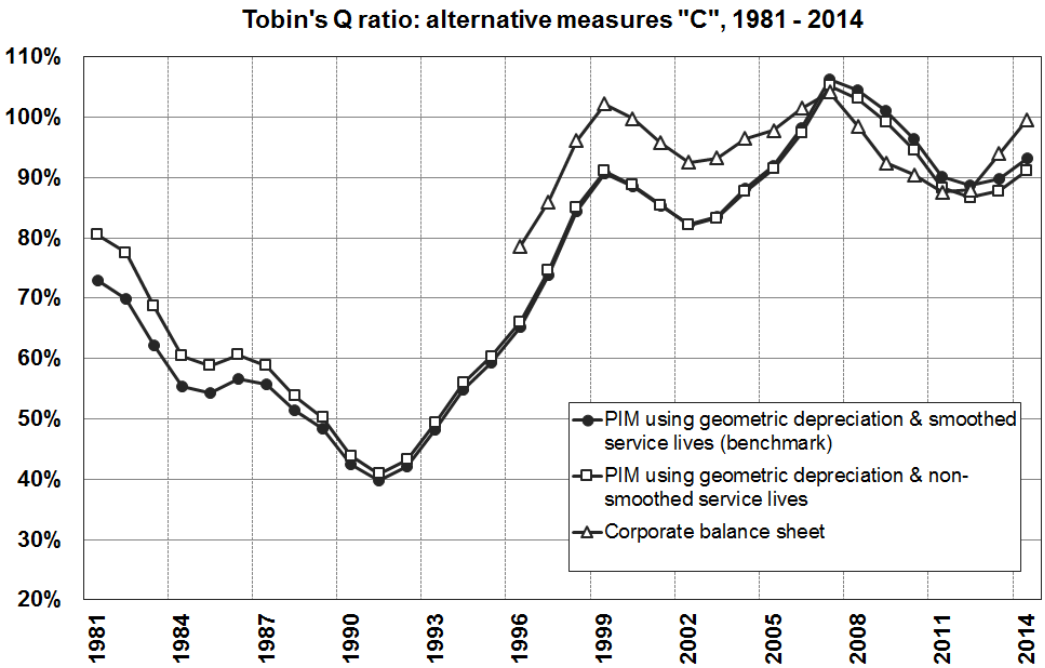
Notes: This figure compares our benchmark series of Tobin's Q and the census-like estimate from the Bank of Spain (both series shown in Figure A.10. in the paper) with an alternative series of Tobin's Q obtained estimating produced assets using a "modified" pattern of depreciation and non-smoothed service lives of assets.

Figure appendix 17



Notes: This figure compares our benchmark series of Tobin's Q and the census-like estimate from the Bank of Spain (both series shown in Figure A.10. in the paper) with an alternative series of Tobin's Q obtained estimating produced assets using a "modified" pattern of depreciation.

Figure appendix 18



Notes: This figure compares our benchmark series of Tobin's Q and the census-like estimate from the Bank of Spain (both series shown in Figure A.10. in the paper) with an alternative series of Tobin's Q obtained estimating produced assets using non-smoothed service lives of assets.

TABLES APPENDIX

Table appendix 1

Accumulation of book-value national wealth in Spain, 1900-2010 (Multiplicative decomposition)

	Book-value national wealth-income ratios (%)		Decomposition of national wealth growth rate (%)			Decomposition of housing wealth growth rate (%)			Decomposition of non-housing wealth growth rate (%)		
			Real growth rate of national wealth	Savings-induced wealth growth rate	Capital gains-induced wealth growth rate	Real growth rate of housing wealth	Savings-induced wealth growth rate	Capital gains-induced wealth growth rate	Real growth rate of non-housing wealth	Savings-induced wealth growth rate	Capital gains-induced wealth growth rate
	βt	βt+n	gw	gws=s/β	q	gw	gws=s/β	q	gw	gws=s/β	q
1900-2010	446%	763%	3,3%	1,6%	1,5%	4,1%	1,9%	2,2%	2,5%	1,5%	1,0%
				51	49		46	54		61	39
1900-1950	446%	513%	1,2%	0,9%	0,2%	1,2%	1,0%	0,2%	1,2%	0,8%	0,4%
				83	17		82	18		70	30
1950-2010	513%	763%	4,9%	2,1%	2,7%	6,3%	2,4%	3,8%	3,4%	1,9%	1,4%
				44	56		39	61		58	42
1950-1980	513%	478%	5,4%	2,7%	2,6%	6,9%	3,3%	3,5%	4,4%	2,5%	1,9%
				50	50		48	52		56	44
1980-2010	478%	763%	4,3%	1,6%	2,7%	5,7%	1,5%	4,1%	2,4%	1,4%	0,9%
				37	63		27	73		62	38

Notes: This table presents the accumulation of book-value national wealth in Spain for 1900-2010 using the multiplicative decomposition. Results for the market-value definition of national wealth are presented in Table B.1. in the paper. This table reads as follows: The annual real growth rate of national wealth in Spain was 3.3% over 1900-2010. This can be decomposed into 1.6% and 1.5% savings-induced and capital gains-induced wealth growth rates, respectively. The table also presents the accumulation of housing and non-housing national wealth (other types of capital and foreign wealth) separately. The small numbers below the savings and capital gains growth rates are the fraction of each in the total growth rate.

Table appendix 2

Accumulation of book-value national wealth in Spain, 1900-2010 (Additive decomposition)

	Savings (% of total cumulated net savings)			Capital gains (% of total capital gains)		
	Housing	Other types of capital	Foreign	Housing	Other types of capital	Foreign
1900-1950	32%	66%	2%	28%	26%	46%
1950-2010	59%	83%	-42%	81%	18%	1%
1950-1980	42%	93%	-35%	61%	12%	27%
1980-2010	67%	79%	-46%	86%	20%	-5%

Notes: This table presents the accumulation of book-value national wealth in Spain for 1900-2010 using the additive decomposition. Results for the market-value definition of national wealth are presented in Table B.2. in the paper. National wealth is decomposed into housing, other types of capital, and foreign wealth. The Table reads as follows: Housing accounts for 32% of total cumulated net savings over 1900-1950.