

WEALTH-INCOME RATIOS IN A SMALL, OPEN ECONOMY: THE NETHERLANDS, 1854–2019*

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Abstract

We construct and analyze household wealth and its composition for the Netherlands since 1854. The household wealth-income ratio followed the familiar U-shaped pattern over the 20th century. The wealth-income ratio increased in the 19th century, driven by industrialization and booming private foreign investments, to a peak of 700% around 1880. In contrast to other countries, the wealth-income ratio remained high up until 1929. We construct the first series on colonial wealth in the literature and show that colonial and other foreign investment account for most of the gap with other countries in the pre-WWII period. The initial post-war decline of the ratio is driven by rapid income growth. The increase in the ratio since the 1970s has been mainly driven by the large capital-funded pension system. Housing plays only a secondary role in net wealth accumulation due to significant mortgage debt.

JEL Classification: D3; E2; G5

Keywords: Wealth inequality; wealth distribution; household wealth.

*We are grateful for the support of Bas van Bavel and Coen Teulings. We extend our special thanks to Nico Wilterdink and Rob Potharst. This paper, in many respects, builds upon the seminal contributions of Nico Wilterdink to the study of wealth inequality in the Netherlands. Sadly, Professor Wilterdink passed away during the preparation of this paper. We hope that our contribution may serve, in some small measure, as a tribute to his scholarly legacy and enduring influence. We are indebted to the editors and the anonymous referees for their insightful and constructive feedback. We have also benefited greatly from valuable comments and suggestions from Charlotte Bartels, Luis Bauluz, Bas van Bavel, Pierre Brassac, Matthias Doepke, Ewout Frankema, Abe de Jong, Herman de Jong, Joost Jonker, Matthijs Korevaar, Peter Koudijs, Wouter Leenders, Clara Martínez-Toledano, Salvatore Morelli, Thomas Piketty, Rob Potharst, Ricardo Reis, Wiemer Salverda, Coen Teulings, Daniel Waldenström, Nico Wilterdink, Jan Luiten van Zanden, and Pim de Zwart. We are grateful to our discussants, Ingber Roymans and René Schulenberg, as well as to participants at the Bonn Macrohistory & Macrofinance Lab, Centraal Planbureau, Dutch Economists Day, Erasmus School of Economics, the 2022 European Historical Economics Conference, the 2022 IARIW General Conference, Oxford University, Utrecht School of Economics, the Utrecht Economic & Social History Group, the 2024 VALURED Conference, and the 2021 World Inequality Conference for their helpful insights and observations. The views expressed in this paper do not necessarily reflect those of the Dutch Ministry of Finance. All remaining errors are our own.

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1 Introduction

Wealth growth is intrinsically tied to broader economic development and improvements in societal well-being (Waldenström 2017). Consequently, economists focus on understanding the relationship between wealth and income, how it evolves over time, and the driving factors behind these changes (Baselgia and Martinez 2024). The wealth-to-income ratio is a key metric in such analyses, offering cross-country comparability by remaining independent of price levels and providing insights into long-term structural trends.

Piketty and Zucman’s seminal study (Piketty and Zucman 2014) analyzed national and private wealth-income ratios across four major Western economies – France, Germany, the United Kingdom, and the United States – revealing significant fluctuations over time. They found that aggregate wealth rose sharply before World War I, declined through much of the 20th century, and rebounded in the 1970s. Their work highlights broader implications for inequality, suggesting that as wealth gains prominence relative to income, disparities stemming from wealth concentration may intensify. It may even constrain economic growth.

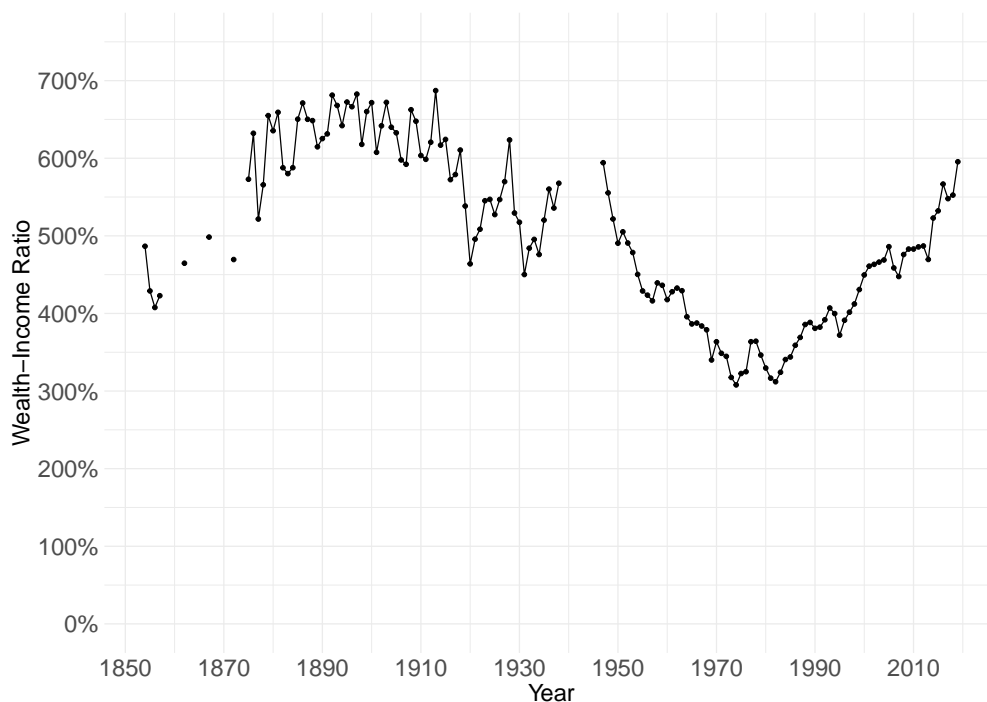
Building on their contributions, and those of subsequent scholars in their wake, it is crucial to examine other countries with distinct historical and economic trajectories (Waldenström 2017; Artola Blanco, Bauluz, and Martínez-Toledano 2020; Baselgia and Martinez 2024). The Netherlands provides a compelling case, as it has long been one of the wealthiest nations, shaped by its colonial riches and its pioneering role in modern capitalism (’t Hart, Jonker, and Van Zanden 1997). Amsterdam, once a global financial hub for trading stocks, bonds, and other instruments, lost prominence in the 19th and early 20th centuries as London rose to dominance. Nevertheless, it remained a leading center for international and colonial enterprises, bolstered by a sophisticated financial sector. Unlike most of its neighboring countries, the Netherlands was slow to industrialize, leading the Dutch elite to favor international and colonial investments due to limited domestic opportunities. This reliance on foreign investments contributed to differences in the wealth-income ratio compared to other countries in the pre-World War II period. Similarly, post-1970s variations in the Dutch wealth-income ratio reflect its large capital-funded pension system. Despite its distinctive trajectory, the Netherlands has been neglected in studies of long-term household wealth (Piketty and Zucman 2014) which tended to look at larger, more closed economies.

Our paper fills this void by presenting the first historical household balance sheets for the Netherlands (1854–2019), fully aligned with existing System of National Accounts data. Starting from 1880, we decompose these balance sheets into wealth components – real estate, equity, bonds, liabilities, and pension and life insurance claims – and provide multiple interpretations of our findings, contrasting them with existing international evidence.

Our main contributions are threefold. First, we provide an estimate of private wealth in the Netherlands from 1850 to 2019. Second, we break down aggregate wealth into its principal components, highlighting their respective importance from 1880 to 2019. Finally, we situate these trends in the broader context of the Netherlands early development of security markets and capitalism, its colonial past, and the pivotal role of its capital-funded pension system. By offering evidence on a small and highly open economy, our study broadens the literature on long-term wealth dynamics—which often focuses on larger, more closed economies—and supports the hypothesis by Piketty and Zucman (2014) that highly financialized economies are associated with higher wealth-income ratios. In that sense, the Netherlands experience, especially before World War II, corroborates more recent findings for Switzerland and may likewise shed light on how wealth and income could continue to evolve in the 21st century, particularly as policymaking continues to favor free market policies (Baselgia and Martinez 2024).

Our main results are summarized by Figure 1, which shows the household wealth-income ratio in the Netherlands since 1854.

Figure 1: The Wealth-Income Ratio, 1854–2019



Notes: Figure depicts the ratio of aggregate household wealth to net national income (1854–2019).

Our results suggest that the wealth-income ratio in the Netherlands followed the familiar U-shaped pattern observed in earlier studies, with a peak in the early 20th century, a subsequent decline until the 1970s, and an increase in recent decades. However, we find that the magnitude of this peak is among the largest observed in the international literature (Waldenström 2024). Specifically, the wealth-income ratio peaked close to 700 percent at the end of the 19th century;

notably, it remained high during and after World War I, only declining after the Great Depression of 1929. After World War II, the wealth-income ratio declined precipitously until the 1970s, and since the 1980s it has risen again, reaching 600 percent in 2019.

Second, we provide a detailed account of the composition of household wealth since 1880. We find that financial assets dominated wealth composition prior to World War II. After World War II, financial assets decreased in importance, while pension wealth rapidly became a dominant asset class for households, comprising 40 percent of the household portfolio by 2019.

To explain the peak in the wealth-income ratio in the 1880s, as well as the persistently high ratios post-World War I, we are the first to construct a series on colonial wealth. Our findings demonstrate that colonial and other foreign wealth played a particularly significant role in the Netherlands compared to most other countries. More generally, our results underscore the importance of careful accounting for foreign investment, colonial wealth, and other major trends in the late 19th century to explain global patterns in wealth inequality. Moreover, the sharp decline in the wealth-income ratio that occurred in the 1950s – rather than during the 1940s – can plausibly be related to the forced nationalization of Dutch enterprises by the newly independent Indonesian government, along with the general upheaval associated with decolonization, rather than to the expansion of the welfare state. Finally, we show that pension savings and capital gains have been the most important drivers of wealth concentration since the 1980s.

Our findings on the wealth-income ratio differ significantly from earlier historical estimates of Dutch household wealth, stemming from methodological differences. The earliest historical estimations, traceable to the late 19th century (Boissevain 1891), relied on the estate multiplier approach using tabulated inheritance tax records (Kopczuk and Saez 2004). More recent findings were provided by Wilterdink (1984, 2015), who built estimates upon available wealth tax data and assumed that the wealth of those below the wealth tax threshold could be approximated by a lognormal distribution. His estimates have served as a benchmark in the (international) literature (e.g., it is used in Roine and Waldenström 2015). We compare our estimates – which employ a consistent treatment of household wealth aligned with national accounts – with these earlier methods as a robustness check. We find that the estate multiplier method produces similar estimates to the benchmark historical national accounts pre-World War II, but that the two methods diverge after the war. As noted by Van Bavel and Frankema (2017) and Coenen (2017), the lognormal extrapolation method used by Wilterdink resulted in unrealistically low private wealth estimates for the 1970s, placing the wealth-income ratio at approximately 85 percent of net national income. By contrast, our estimates yield a more realistic wealth-income ratio of roughly 300 percent for the same period.

The remainder of the paper is organized as follows: Section 2 reviews existing literature on the dynamics of wealth, both in the Netherlands and in other countries. In Section 3, we define household wealth and examine the distinct role of pension wealth in greater detail. Section 4 outlines the three methods employed to reconstruct aggregate household wealth in the Netherlands. Section 5 provides an overview of the results, including aggregates and wealth

composition, as well as a brief international comparison. In Section 6, we analyze the dynamics of the wealth-income ratio. We first examine the role of international and colonial investments (Section 6.1) and then explore socio-economic developments in the Netherlands after World War II (Section 6.2), highlighting the large accumulation of capital-funded pensions as a key driver of rising wealth growth since the 1980s. Finally, Section 7 concludes.

2 Literature Review

Research on long-term wealth dynamics is a relatively recent development. This is largely because such studies depend on national stock accounts, which statistical institutes only began compiling systematically in the early 1990s. In recent years, however, there has been a growing interest in the historical trends of wealths size, composition, and distribution, particularly in Western countries and some less economical developed countries. Foundational works, including those by Davies, Sandström, and Wolff (2011), Piketty (2014), and Piketty and Zucman (2014), have motivated additional studies to investigate whether the U-shaped trajectory of wealth-income ratios documented by Piketty and Zucman (2014) can also be observed in countries with varying institutional frameworks. Examples include studies on Sweden (Waldenström 2017), South Africa (Orthofer, Du Plessis, and Reid 2019), China (Piketty, Yang, and Zucman 2019), India (Kumar 2019), Spain (Artola Blanco, Bauluz, and Martínez-Toledano 2020), and Switzerland (Baselgia and Martinez 2024).

To contextualize our findings, we compare the trajectory of wealth-income ratios in the Netherlands to those in several developed economies. Our comparative analysis places particular emphasis on France and the United Kingdom, given the significant role that foreign and colonial investments played in shaping wealth trends in these countries. In addition, we will also investigate similarities with other small, open economies, especially Switzerland (Baselgia and Martinez 2024). To ensure international comparability, we closely follow the methodologies proposed by Piketty and Zucman (2014) and Bauluz (2019).

It is important to note that while our study is the first to provide a consistent wealth-income ratio for the Netherlands over an extended period, there exist historical estimations of private wealth. Early efforts date back to the mid-19th century, with Pareau (1864) comparing private wealth to population size. Later, Boissevain (1883, 1891) and Stuart (1888) produced estimates of aggregate wealth for the 1880s and 1890s using the estate multiplier method. During the interwar period, Bongers (1923) criticized this method and adopted an approach closer to national accounts, which was subsequently refined by Smeets (1932) and Van der Wijk (1939).

The post-World War II period saw a decline in studies on Dutch wealth dynamics until Wilterdink (1984) revitalized the field by analyzing wealth tax records from the 1890s to the 1970s and examining top wealth shares. Building on this foundation, subsequent studies explored earlier periods (Verstegen (1996), Bos (1990)) and extended coverage to more recent decades (Wilterdink (2015), Salverda (2019)). Despite these contributions, gaps remain in

long-term, comprehensive data. Our work seeks to fill these gaps by providing the first integrated dataset on Dutch wealth spanning from the 1850s, fully aligned with contemporary international standards.

3 Definitions of Wealth Components

Our aim is to reconstruct household wealth, W_t , following the definition spelled out in the System of National Accounts, which is the total market value of assets minus liabilities. Assets include all financial and non-financial assets over which ownership rights can be enforced and which provide economic benefits to their owners. This definition includes most major wealth components, including housing, real estate, savings accounts, stocks and bonds, which can be accessed and transacted by their owners. As is standard in the literature, we normalize wealth by national income Y_t to obtain the *wealth-income ratio*, commonly denoted as $\beta_t := W_t/Y_t$.

It is useful at this point to clearly spell out the concepts which we will estimate and pursue throughout the paper. Denote national wealth by W_t^n , and government (public) wealth by W_t^g . Then, we have the accounting identity

$$W_t^n = W_t + W_t^g. \quad (1)$$

In modern National Accounts, W_t can be split into wealth accruing to households and wealth accruing to non-profit institutions serving households (NPISH); in our historical series, no such distinction can be made. Hence, our measure of household wealth is inclusive of NPISH throughout. For simplicity, we continue to refer to this total as household wealth.¹

A final important decomposition we will use in this paper is the decomposition of private wealth into the private capital stock K_t – broadly defined to include land – and the net foreign asset position:

$$W_t = K_t + \text{NFA}_t. \quad (2)$$

We emphasize that equation (2) decomposes *household* wealth into a domestic capital and a foreign wealth part. Piketty and Zucman (2014) use this decomposition for national wealth (i.e., $W_t^n = K_t^n + \text{NFA}_t^n$), where all variables also include the relevant government-owned counterparts. We use the private wealth decomposition to reconstruct total wealth, as we will detail below. When doing so, we take care to remove government capital and foreign assets from our data, to make the accounting identity hold for household wealth.

Modern balance sheets decompose household wealth into financial assets A_t^f , non-financial assets A_t^{nf} , and liabilities L_t , each of which can be decomposed into more granular components. Our aim in this paper is to provide a series

1. Piketty and Zucman (2014) and the following Distributional National Accounts literature refers to household + NPISH wealth as *private* wealth, and sole household wealth as *personal* wealth. We stick to household wealth for simplicity. In addition, referring to pension wealth as “private” is unfortunate, since pension claims are not under private control of households. We return to this issue below.

of household wealth that is as consistent as possible over time. To this end, we use the following broad categories:

$$W_t = \underbrace{D_t + S_t + P_t}_{=:A_t^f} + \underbrace{H_t + B_t}_{=:A_t^{nf}} - L_t. \quad (3)$$

In equation (3), D_t refers to deposits, including cash holdings. S_t refers to securities, which include listed stocks, bonds, and other financial products, both domestic and foreign. L_t measures liabilities, which for households primarily take the form of mortgage debt. H_t refers to housing assets, defined following National Accounting conventions as the sum of residential dwellings and land under dwellings. The final two components are P_t (pensions and life insurance) and B_t (business assets), both of which merit particular attention for this paper.

The Dutch pension system consists of three ‘pillars’: (i.) universal retirement payouts, funded as a PAYGO scheme (*Algemene Ouderdomswet* or *AOW*); (ii.) occupational capital-funded pension funds, which every employee is legally required to contribute to; and (iii.) private capital-funded pension schemes. In standard National Accounting guidelines, components (ii.) and (iii.) are included in household wealth. We note, however, that in Dutch wealth inequality statistics this component is consistently excluded. The reason is that, unlike in other institutional contexts (such as the U.S. 401(k)), it is effectively impossible for Dutch households to withdraw their contributions from pension funds for consumption or transfers to others prior to retirement; in this sense, they do not have property rights over their pension claims. Although some limited exceptions exist (e.g., early retirement or disability), access to accrued pension capital before the statutory retirement age is generally heavily restricted. Once pension benefits are drawn, they are taxed under the EET (Exempt Exempt Taxed) model, which exempts contributions and returns from taxation, but taxes benefits upon withdrawal – often at a lower effective rate for retirees (*Pensioenwet* 2007). We refer the reader to Martínez-Toledano, Sodano, and Toussaint (2023) for more discussion of this point and its implications for Dutch wealth shares. In this paper, we follow existing guidelines and include all capital-funded pension claims in household wealth, as well as pension-like products such as life insurance.

The final component is business assets B_t . In modern National Accounts, we can clearly delineate between non-financial assets belonging to the household sector (such as agricultural land and fixed capital owned by self-employed entrepreneurs), and equity shares in non-listed corporations, which are claims on the capital stock of the corporate sector and hence financial assets of households. This delineation is not possible in the early periods of our data series. In order to make our series as consistent as possible, we will not distinguish between non-listed shares and capital directly owned by the household sector, and refer to its total value as business assets. For modern National Accounts, this labeling solely affects the composition of household wealth, not its levels or trends. In earlier periods, we effectively estimate this component residually, by first estimating all other variables in equation (3), and subtracting all these variables from our estimates of total household wealth to arrive at business assets. We elaborate on this procedure in the next section.

4 Data and Methodology

4.1 Total Household Wealth

For our empirical analysis of the wealth-income ratio for the Netherlands, we aim to align as closely as possible with the current System of National Accounts (SNA-2008). Our approach results in five distinct methodological periods: (i) 1854–1879; (ii) 1880–1938, (iii) 1947–1969, (iv) 1970–1994, and (v) 1995–2019.² We will first discuss how we estimate total household wealth before 1995; in the next subsection we will then briefly discuss the different data sources used to estimate the various components mentioned in equation 3.

Table 1: Overview of Methods and Data Sources

Method	Years	Sources & Data steps
Main Series (Death Duties + HNA)	1854–1879	Death duties methods (available until 1981)
	1880–1938	Reconstruct manually, using $W_t = K_t + NFA_t$
	1947–1969	Interpolate totals using savings flows
	1970–1994	Augment CPB estimates
	1995–2019	System of National Accounts
Wealth Tax Methods	1894–1993	Extrapolate from wealth tax returns

We discuss each subperiod in turn.

- **1854–1879:** Prior to 1880, we use the estate multiplier method, which relies on succession tax data. Dutch statistical agencies have published this data in aggregate form since the mid-1850s, reporting wealth information for the decedent population based on market prices (Gelderblom, Jonker, Peeters, and de Vicq 2022). The level of detail in these reports varies by period (see Section B in the Appendix). In the literature, a common concern with such data is that high thresholds for inclusion might restrict coverage to the wealthiest estates. However, this is not the case for the Netherlands, where the threshold approximated the annual earnings of an unskilled worker. As a result, the data reflects a broader range of the wealth distribution rather than just the upper tail (Gelderblom, Jonker, Peeters, and de Vicq 2022).

This method estimates total population wealth by scaling the wealth recorded in inheritance tax returns with the ratio of deceased individuals covered by the tax to the total living population in that year. Since larger estates are more common among older individuals, age-specific mortality rate adjustments are required to account for differences between the sample and the general population.

To estimate mortality rates specific to those in the inheritance tax records, additional data is needed. Possible solutions include using life insurance company records (Lampman 1962), social class-based mortality multipli-

2. Details for each wealth component are provided in Appendix A.

ers (Alvaredo, Atkinson, and Morelli (2018) and Atkinson and Harrison (1978)), or wealth-mortality gradients derived from housing wealth data (Acciari, Alvaredo, and Morelli 2021). In our analysis, we use detailed individual-level mortality data, made available by Gelderblom, Jonker, Peeters, and de Vicq (2022).

For our final series of household wealth, we take the historical national accounts as given, and index the level of the death duties series to match the 1880 national accounts estimate. This procedure preserves growth rates of the death duties series, but slightly increases levels. Figure 1 is based on this indexed estimate pre-1880, and the historical national accounts after 1880. In Section 5, we will compare the two raw series without indexing.

- **1880–1938:** From 1880 onward, we reconstruct historical national accounts manually. To estimate total household wealth before 1947, we use equation 2, which tells us that private wealth W_t can be found as the sum of the capital stock K_t and the net foreign asset position NFA_t . We have high-quality estimates of the total private capital stock K_t for the entire period, which has been estimated by Smits, Horlings, and van Zanden (2000) for 1800–1913 and Groote, Albers, and De Jong (1996) for most of the 20th century. Moreover, we have detailed balance sheets compiled by Statistics Netherlands for the year 1938 (and several post-war years), which include the (private and total) NFA. For years before 1938, we have to estimate the NFA ourselves. We observe consistent series of net primary income from abroad y_t^f , which mainly consists of dividends (from Smits, Horlings, and van Zanden 2000 until 1913 and den Bakker 2019 thereafter). We convert flows to stocks by capitalizing this series, using

$$y_t^f := r_t^f \cdot NFA_t,$$

where r_t^f is the return on foreign assets. Hence, we can arrive at an estimate of the NFA by dividing foreign dividends by an estimated discount factor r_t^f .³

For each year, we take the average of the dividend yields of Berlin, Brussels, London, New York, and Paris; the stock exchanges which were by far the most important for Dutch non-colonial foreign investment in terms of cross-listed equities and bonds (Moore 2012). Data on dividend yields for those exchanges are taken from Jordà et al. (2019). The five series are generally quite close to each other, with an average standard deviation over the 1880–1938 period of slightly more than 1%. During crisis years, such as 1917, the standard deviation increases; nevertheless, the average dividend yield gives a reasonable capitalization factor even in volatile years, particularly when considering that the resulting series is quite smooth; sticking with only one series would likely result in much more artificial volatility in the equity series.

We benchmark the resulting NFA series to the official 1938 balance sheet. The result is a consistent series of

3. Note that for our purposes, the dividend yield is the correct variable by which to capitalize the dividend streams and not the total return, i.e., dividends plus capital gains. This is because we are interested in the nominal value of equity at time t , and not in its real value, corrected for price revaluations.

the Dutch household net foreign asset position. In the Appendix, we discuss our methodology in more detail, and compare it to historical estimates of Dutch foreign investment, which are in general remarkably close to our estimates.

- **1947–1969:** After 1938, the next year we can recover is 1947. For 1947–1952, we again have official balance sheets listing total wealth. After 1952 and before 1970, we have some additional total wealth statistics for 1958 and 1960; however, many years are missing. Fortunately, we do observe total net savings flows for each year. Hence, we can interpolate total wealth for the missing years, using the wealth accumulation identity, which describes how wealth W evolves from period t to $t + 1$ based on savings s and capital gains q :

$$W_{t+1} = (1 + q_{t+1})(1 + s_t)W_t. \quad (4)$$

Our method is based on Piketty and Zucman (2014, Online Appendix K), and uses equation 4 to find an average capital gains rate that makes the identity hold. Consider the gap between 1952 and 1958. Our method is to (i.) fix a value $q_t = \bar{q}$ for all years, (ii.) plug this value together with annual savings rates s_t into the equation, (iii.) calculate final wealth as $W_{1958} = \prod_{t=1952}^{1958} (1 + \bar{q})(1 + s_t)W_t$, and (iv.) compare this estimate with actual wealth in 1958. If there is a gap between our estimated wealth for 1958 and actual wealth, we adjust \bar{q} and restart the algorithm, stopping once the difference is negligible. This procedure, applied to all missing years, results in a consistent series of nominal household wealth.

- **1970–1994:** For 1970–1994, we use household balance sheets from CPB Netherlands Bureau of Economic Policy Analysis, comparing components with external sources in Appendix A.5 to ensure consistency. We augment these estimates with additional data on life insurance, and replace their estimates of equity wealth with data from Statistics Netherlands.
- **1995–2019:** From 1995 onward, we utilize the System of National Accounts (2015 revision), maintained by Statistics Netherlands, ensuring consistency by reporting end-of-year values throughout the series. This comprehensive approach allows us to produce a robust and continuous reconstruction of Dutch household wealth from 1880 to 2019.

4.2 Alternative Approach to Calculate Total Wealth

The exceptional richness of Dutch historical data enables us to perform an analysis that is often not feasible for other countries due to the scarcity of reliable sources. In addition to constructing our benchmark series based on historical national accounts post-1880 and death duties pre-1880, we also construct a series using lognormal extrapolation on

wealth tax data, to support and validate the robustness of our benchmark series. We briefly outline this method, describe the data sources employed, and provide further technical details in the appendix.

The wealth tax, introduced in 1893, was first implemented in the fiscal year 1894 and remained in effect until 1993. Initially, it applied to fortunes exceeding 13,000 guilders,⁴ covering approximately 5–7% of households. In 2001, the wealth tax was replaced by a system ostensibly taxing capital income rather than net wealth.⁵ Unlike the current tax system, the historical wealth tax targeted natural persons rather than households, although married couples were treated as a single entity for tax purposes.

The tax base included financial assets (e.g., listed and unlisted stocks, business wealth), deposits and cash, real estate, transport items (e.g., horse-carts and cars), life insurance claims, and, after 1918, jewelry and precious metals. Exclusions included pension claims, artworks, and consumer durables. Valuations were theoretically based on market value, though establishing accurate valuations was often challenging (Wilterdink 1984).

We compiled wealth tax data from 1894–1993, with interruptions, particularly during the Second World War. To estimate total wealth, we adopt the method developed by Potharst (2022), which estimates the parameters μ and σ of a lognormal wealth distribution from censored tabulated data. This approach assumes that the wealth below the tax threshold matches a lognormal approximation of the distribution, where $W_t \sim \log \mathcal{N}(\mu_t, \sigma_t^2)$, with μ and σ derived from the wealth tax data. Combining this estimated component with wealth above the threshold yields an estimate of total wealth.

Estimating μ_t and σ_t^2 requires leveraging information from the wealth tax data’s top brackets. Each data point is structured as (k, n_k, μ_k) , where k is the lower threshold of the bracket, n_k is the number of individuals in that bracket, and μ_k is the average wealth within it. Using this information, μ and σ^2 are estimated by minimizing the discrepancy between a lognormal distribution and the observed bracket thresholds and frequencies (see Appendix C).

4.3 Wealth Composition

We briefly list the sources used to estimate each wealth component in equation (3), relegating details to the Appendix.

- **Deposits:** Prior to 1970, we use balance sheet data from the Dutch central bank (De Nederlandsche Bank (2000)) and publications by Statistics Netherlands (van der Bie (2001)) to estimate deposits and currency. From 1970, deposits are observable in the CPB balance sheets; from 1995, we use the National Accounts.
- **Securities:** Dutch government bonds are directly observed in annual statistics. Domestic stocks are calculated by taking total stock market capitalization from van der Bie (2001). Foreign assets are derived by the NFA

4. The threshold was later adjusted to 15,000 in 1915, reduced to 10,000 in 1947, and subsequently increased to 50,000 in 1957, 100,000 in 1970, and 200,000 guilders in 1983.

5. Ostensibly, because financial assets directly held by households are assumed to generate a fixed “presumptive” return (4% for most of our data period), which is taxed at a flat rate (30%, which was made progressive in 2017). This is a *de facto* wealth tax (Jacobs 2015).

capitalization discussed above. The foreign dividends series, from Smits, Horlings, and van Zanden (2000) and den Bakker (2019), can be split into colonial and non-colonial dividends; this will allow us to construct the first estimates of colonial wealth in the literature.

- **Pensions:** Pension entitlements and private insurance savings are derived from technical reserves recorded by the Dutch central bank.
- **Housing:** We directly observe the value of residential dwellings in the capital stock estimates of Smits, Horlings, and van Zanden (2000) and Groote, Albers, and De Jong (1996). Land under dwellings is not directly observable before 1995, except in the official balance sheets for 1938 and 1947–1952. We estimate land under dwellings for all other years by indexing these years to the official balance sheets. As we detail in the Appendix, the fit with the official estimates from 1995 is remarkably good.
- **Business Assets:** As discussed above, this component is obtained residually before 1995. We do observe various subcomponents, such as agricultural land since 1880, and non-listed shares after 1970. These subcomponents, together with equation (2), enable us to discipline the size of this residual component. After 1995, this component equals the non-housing part of the non-financial balance sheets, plus non-listed shares for time-series consistency.
- **Liabilities:** Data on mortgages and other private credits are directly observed in annual statistics, and taken from the CPB balance sheets after 1970 and official balance sheets after 1995.

4.4 Population, Income, Prices, and Savings

We briefly note our sources for supporting data series.

- **Population:** We use population figures from van der Bie (2001). Note that for the wealth tax extrapolations, where we integrate over the population to obtain total wealth, we have to consider *tax units* as a reference, i.e., all adults above 20, where married couples are treated as a single unit (Wilterdink 1984). We follow Wilterdink (1984) and simply subtract the total number of married women from the population total above 20.
- **Prices:** Throughout, we use the Statistics Netherlands Consumer Price Index, as it appears in van der Bie (2001), which is based on the work of Smits, Horlings, and van Zanden (2000) before 1913 and Statistics Netherlands and den Bakker (2019) thereafter. We normalize the index such that 2015 equals 100.
- **Income:** Throughout, we use net national income at market prices as the denominator for the wealth-income ratio. Data are from van der Bie (2001), which are based on Smits, Horlings, and van Zanden (2000) for the period up to 1913, den Bakker (2019) for the Interbellum, and Statistics Netherlands thereafter. Both Smits, Horlings,

and van Zanden (2000) and den Bakker (2019) are extremely thorough studies who reconstruct national income in as consistent a manner as possible with modern national accounts. The internal consistency ensures that there are no breaks in the data or definition changes.

- **Savings:** We use net household savings, as reported by Statistics Netherlands in various editions of *Jaarcijfers voor Nederland*. From 1969, we use the official National Accounts.

5 Results

In this Section, we present our main results. We begin by comparing the different methods to construct total wealth, finding strong overlap between the historical national accounts and the death duties method pre-World War II. Then, we analyze the composition of wealth from 1880. We end with an international comparison.

5.1 Aggregate Wealth Estimates

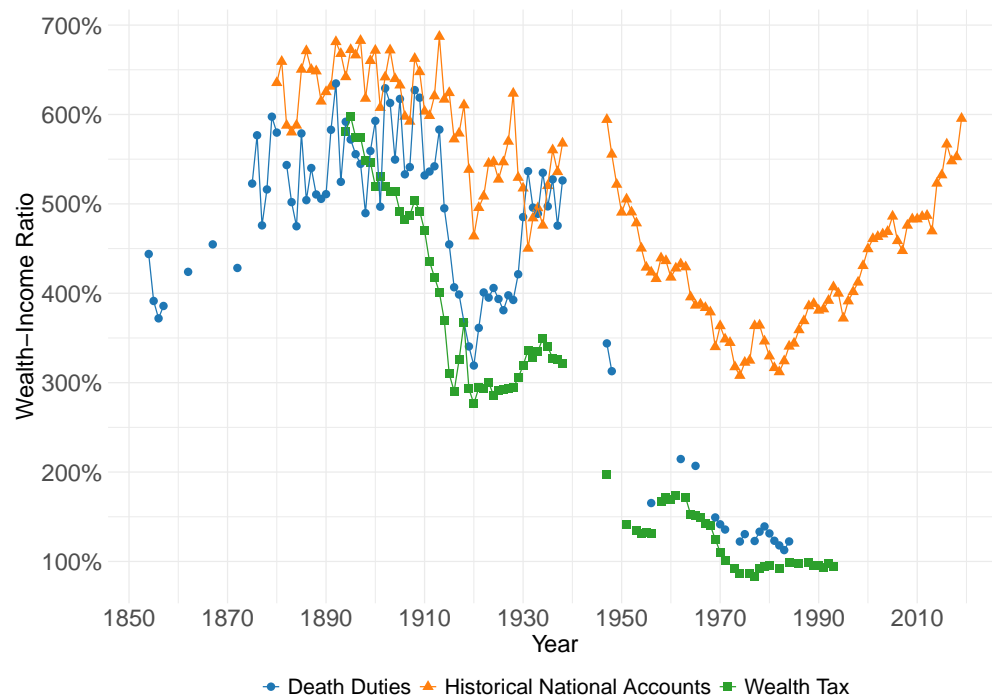
Figure 2 presents the ratio of household wealth to national income for the period 1854–2019, for all methods (historical national accounts, death duties, and wealth tax methods). In this Figure, death duties data are not indexed to the post-1880 historical national accounts to provide a fair comparison.

From the 1880s to the 1920s, the historical national accounts and death duties methods produce remarkably similar estimates of the wealth-income ratio. However, after the 1920s, the historical national accounts diverge significantly, reflecting a period of rapid capital gains on colonial wealth holdings. It is likely that death duties, the basis for the estate multiplier method, failed to fully capture these gains, as they did not adequately account for asset revaluation effects. This divergence underscores the limitations of the estate multiplier method in accurately capturing dynamics during periods of substantial capital accumulation. During this same early period, the wealth tax method consistently produces lower ratios, as previously noted by Van Bavel and Frankema (2017).

After the 1950s, the death duties and wealth tax methods converge but remain consistently below the estimates derived from the historical national accounts. This discrepancy can be attributed to the declining reliability of wealth and estate tax records over time, as highlighted by earlier studies such as Wilterdink (1984) and Van Bavel and Frankema (2017), which may have biased these estimates downward.

Despite variations in magnitude, all three methods reveal broadly similar trends in the wealth-income ratio over time. A striking feature in the data is the sharp increase in the wealth-income ratio between 1930 and 1950, which is visible across all three methods. This trend is most pronounced in the historical national accounts and is unlikely to be due to measurement error, as corroborated by official balance sheets for 1938 and 1947. These records indicate that household wealth more than doubled over the decade, rising from 28 billion guilders in 1938 to over 70 billion

Figure 2: Wealth-Income Ratios per Method



Notes: Figure shows the ratio of household wealth to net national income, using our three main methods: (i) Historical National Accounts (the benchmark), (ii) Estate Multiplier methods using death duties, and (iii) Wealth Tax methods.

in 1947. Although this increase is nominal, the evidence suggests that, in real terms, private wealth remained stable or even grew slightly during this period. This stability reflects the relatively minor destruction of private wealth in the Netherlands during the war, particularly in comparison to other countries, as discussed in Piketty and Zucman (2014). Considering that national income in the Netherlands fell sharply during this period due to the lingering effects of the Great Depression and especially World War II, the dramatic rise in the wealth-to-income ratio becomes understandable.

In the post-war period, aggregate wealth grew more slowly than national income, resulting in a decline in the wealth-income ratio, a pattern also observed in many other countries. By the 1970s, the ratio reached its lowest point, around 300 percent of national income. However, from the 1980s onward, private wealth grew rapidly relative to national income, accelerating further in the 1990s. By 2019, the wealth-income ratio had reached a post-war peak of 600 percent.

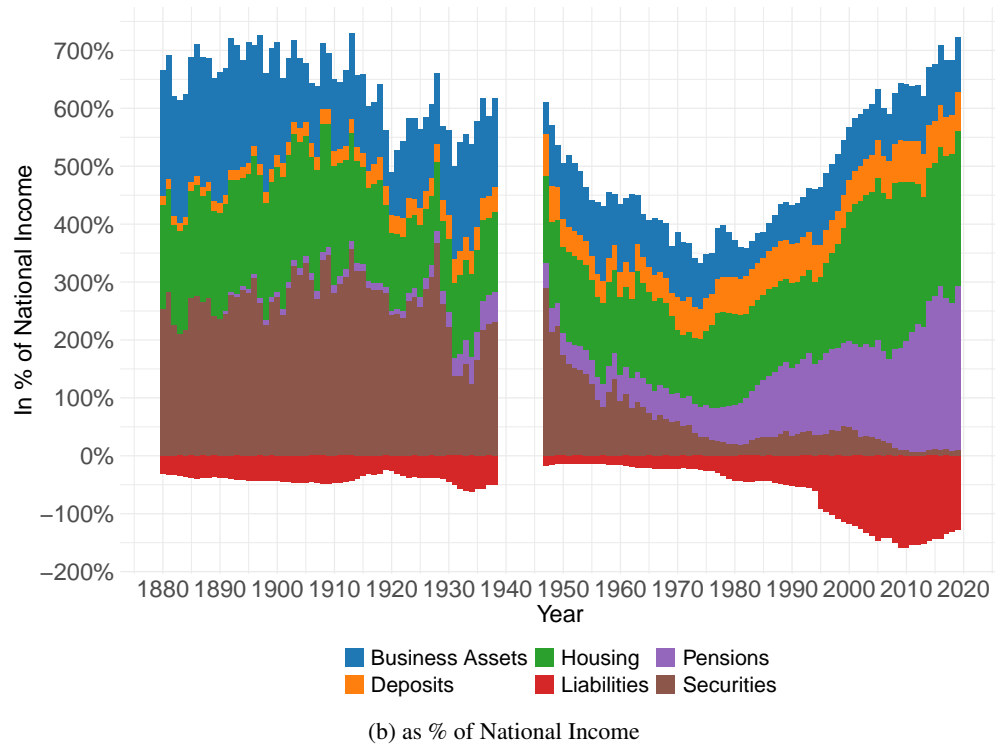
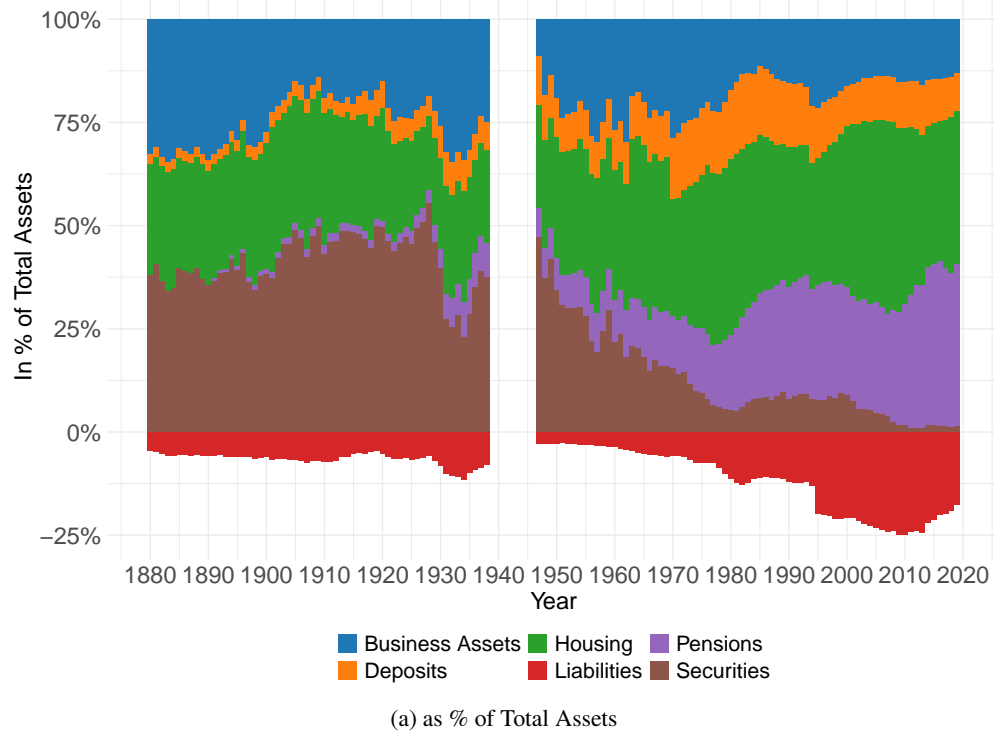
The fact that all three methods – despite differences in their assumptions, coverage, and sensitivity to measurement errors – point to similar long-term trends strengthens the robustness of our empirical analysis and claims. This alignment across methods may also offer valuable guidance for studying countries or time periods where historical national accounts are unavailable, enabling a more comprehensive understanding of wealth-income dynamics in such contexts. In the following section (5.2), we analyze the composition of household wealth to better understand the forces driving these dynamics.

5.2 Wealth Composition

Figure 3 illustrates the decomposition of household wealth from 1880 until today. We focus on the broad categories included in Equation 3: Securities, housing, pension wealth, deposits, business assets, and liabilities. In panel 3a, all asset classes are expressed as a percentage of the value of total assets, and in panel 3b, we express the same series in percentage of the net national income, to give an idea of the magnitudes of each wealth component.

The period between 1880 and 1920 is first and foremost characterised by a sharp decline in the relative value of business assets; while this is a broad category, as discussed extensively above, the primary reason appears to be the reduction in value of agricultural land compared to net national income, declining from almost 200% in 1880 to 60% in 1938 (Knibbe 1993). This coincides with trends in several other countries (Piketty and Zucman 2014), and is driven to a large extent by falling agricultural prices as a result of global competition and technological improvement (Knibbe 2014). A second major finding is the strong importance of securities; this category dominates all others until the 1960s. As we will explore in Section 6.1, this is mostly driven by the long Dutch history of (mostly international) financial investment. The Netherlands developed a stock market in the 17th century, and this early financialization persisted over time. Furthermore, by the start of our series in 1880, the Industrial Revolution had taken off in the Netherlands, which led to a boom in industrial corporations seeking equity (van Zanden and van Riel 2000). Finally,

Figure 3: Wealth Composition, 1880–2019



Notes: Figure shows the composition of household wealth, with each asset expressed as a proportion of total assets (panel 3a), and as a proportion of national income (panel 3b). All wealth composition data are from the historical National Accounts method, with the sources described in the main text and Appendix A; data on net national income are described in Appendix 4.4.

and very significantly, foreign securities played an outsized role in the Dutch economy from the 1870s onward, with investments in American steel and railroad companies as well as Austrian and Russian bonds making up a major part of Dutch investors' portfolios. Notably, the Dutch colony of Indonesia also opened up for private investment in the late 1870s, and would become a major source of household wealth by the early 1900s.

The other wealth components we identify play smaller roles prior to World War II. Housing is relatively constant at around 150% of national income, or 25% of household assets. Liabilities build up quite significantly before World War II. This is mostly due to an increase in mortgage debt (de Vries 1976).

After World War II, we notice several similarities and other differences. Deposits and non-financial assets - housing and business assets - remain relatively constant, both as a share of total wealth and as a share of national income. By contrast, the major reason for the decline in the wealth-income ratio in this period is due to a relative decrease in the value of financial assets. The Bretton Woods system featured capital controls and other measures which limited capital mobility and the ability of securities to be traded freely. The Dutch stock market grows rather slowly from 1947 until 1980, only picking up afterward. Furthermore, foreign investment was much more limited in this period than before World War II. This is especially true for investments in Indonesia following Indonesian independence. We observe a sharp drop in the relative value of securities in the late 1950s, which corresponds precisely with the peak of nationalization of Dutch firms remaining in Indonesia at the time: a process also referred to as Indonesianization.⁶

Following the First and Second Oil Crises of the 1970s, both household shareholdings and overall wealth declined significantly. The growing welfare state further reduced the incentive for private saving by covering old age, illness, disability, and childrens education through collective arrangements (Slot 2004). Meanwhile, many institutional investors pursued higher returns through alternative channels – short-term loans, term deposits, commodity futures, venture capital, or direct company investments. By the early 1990s, however, a stock market boom began to reverse this downward trend, driving up share prices and prompting renewed private investment in equities (Slot 2004). Around the same time, new financial products such as investment-linked insurance policies and share leasing broadened market access for retail investors. Nonetheless, this resurgence was relatively short-lived, as the dot-com bubble and the subsequent financial crisis of 2007 led to another decline in securities holdings (Van der Valk, de Vicq, and Moatsos 2022). Despite the strong performance of stock markets since 2010, a segment of Dutch households appears to have permanently disengaged from active financial participation (van der Valk 2019).

A striking trend in the post-1970s period is the dynamic in the relative value of housing. Its market value experiences rapid swings up and down in the late 1970s and early 1980s; since housing in the National Accounts is the sum of both dwellings – which is estimated using perpetual inventory methods – and land under dwellings, these swings

6. Indonesianization (indonesianisasi) is defined as the process set in motion by the Indonesian government to realise an economic decolonization'. It consisted of various measures aiming at the transfer of property and economic functions held by foreigners or foreign businesses (primarily Dutch), or residents viewed as foreigners (primarily of Indonesians of Chinese descent), to what the government considered to be indigenous Indonesians (Thee 2012).

in market values are relatively muted, although still noticeable (especially in the value of land under dwellings, which experiences swings of 40% of national income in a few years in this period).⁷ The value of housing then continued to grow almost uninterrupted until the mid-2010s.⁸ An important underlying institutional dynamic is the gradual rise in the share of owner-occupied housing over time from 35% in 1971 to 56% in 2010. From the 1980s onwards, production of new housing mainly focussed on the owner-occupied sector and housing associations were encouraged to sell off (socially) rented dwellings (Haffner, Hoekstra, Oxley, and van der Heijden 2009). This increase in the value of private real estate was mirrored by a sharp increase in home mortgages; which, as a percentage of net national income, nearly quadrupled throughout this period. This reflects the growing financialization of the Dutch economy and the limited regulatory oversight over the mortgage sector (van der Valk 2019). A particular institution which contributed to the buildup in mortgage debt was the interest-only mortgage, which was enormously popular until the Great Financial Crisis of 2008 (Bernstein and Koudijs 2024).

Notable for the Netherlands is the sharp rise in pension wealth over the twentieth century, which saw near-exponential growth since the 1990s due to legislative reforms and the broader expansion of collective arrangements (Slot 2004). While its most notable growth occurred more recently, the roots of the Dutch pension system extend back to the pre-war period, with crucial developments including the 1922 Pension Act establishing the *Algemeen Burgerlijk Pensioenfonds* (ABP) and a universal, capital-based pension plan for civil servants and the 1937 legislation that enabled sectoral pension agreements to be declared generally binding (Nijhof 2009). Over subsequent decades, as an ever-larger proportion of the workforce was incorporated into collective pension funds, and as those funds themselves matured, overall pension assets grew markedly. Sectoral pension schemes also benefited from more participants paying contributions throughout their entire careers.

By the 1990s, liberalized capital flows and expanded international investment opportunities further accelerated the growth of these funds, as pension funds pursued higher returns in global markets. In the early 2000s, second-pillar pensions already covered over 90% of employees, underscoring the shift away from purely individual savings mechanisms toward collective arrangements (Van der Valk, de Vicq, and Moatsos 2022).

This gradual shift, which originated with the expansion of welfare states, does not imply that Dutch households have withdrawn from the equity markets altogether; rather, a substantial portion of their equity exposure has been redirected through these large pension funds, instead of through direct stock holdings (Alessie, Angelini, and van Santen 2013). Although several countries have large occupational pension schemes that channel household investments in equities via institutional investors, the Dutch case is distinguished by nearly universal coverage, strong sector-wide pension arrangements, and comparatively high contribution rates (OECD 2019). This scale, coupled with favorable tax treatment, explains why the share of household wealth funneled into institutional vehicles is so high by interna-

7. In the working paper version of this paper (Toussaint, de Vicq, Moatsos, and van der Valk 2022), we used a market-value series of housing wealth based on the CPB balance sheet; the price swings were even more pronounced in that series.

8. There is a break in the housing and mortgage data between 1994 and 1995. See Appendix A.2.1.

tional standards (European Commission 2021).⁹ Falling discount rates further contributed to the growth of pension wealth in more recent years by inflating the net present value of these household claims on pension funds. Whereas it was once all but a minor component of private wealth, it now slightly exceeds housing as the most important asset of households. We will return to the pension system in Section 6.2.

5.3 International Comparison

Figure 4 looks at private wealth-income ratios for several western countries for which such long-run evidence exists: the United Kingdom, France, Germany, Sweden, Spain, Switzerland, and the United States. We use the series for Spain by Artola Blanco, Bauluz, and Martínez-Toledano (2020), as well as the estimates by Albers, Bartels, and Schularick (2020) for Germany, Baselgia and Martinez (2024) for Switzerland, Madsen (2019) for the UK, and the series by Waldenström (2017) for Sweden; all other estimates are from Piketty and Zucman (2014). The Spanish, German, and Swedish series are all quite substantially lower before World War I than the series reported by Piketty and Zucman (2014). This fact has led Waldenström (2024) to state that wealth-income ratios were much lower pre-World War I than argued by Piketty and Zucman (2014).

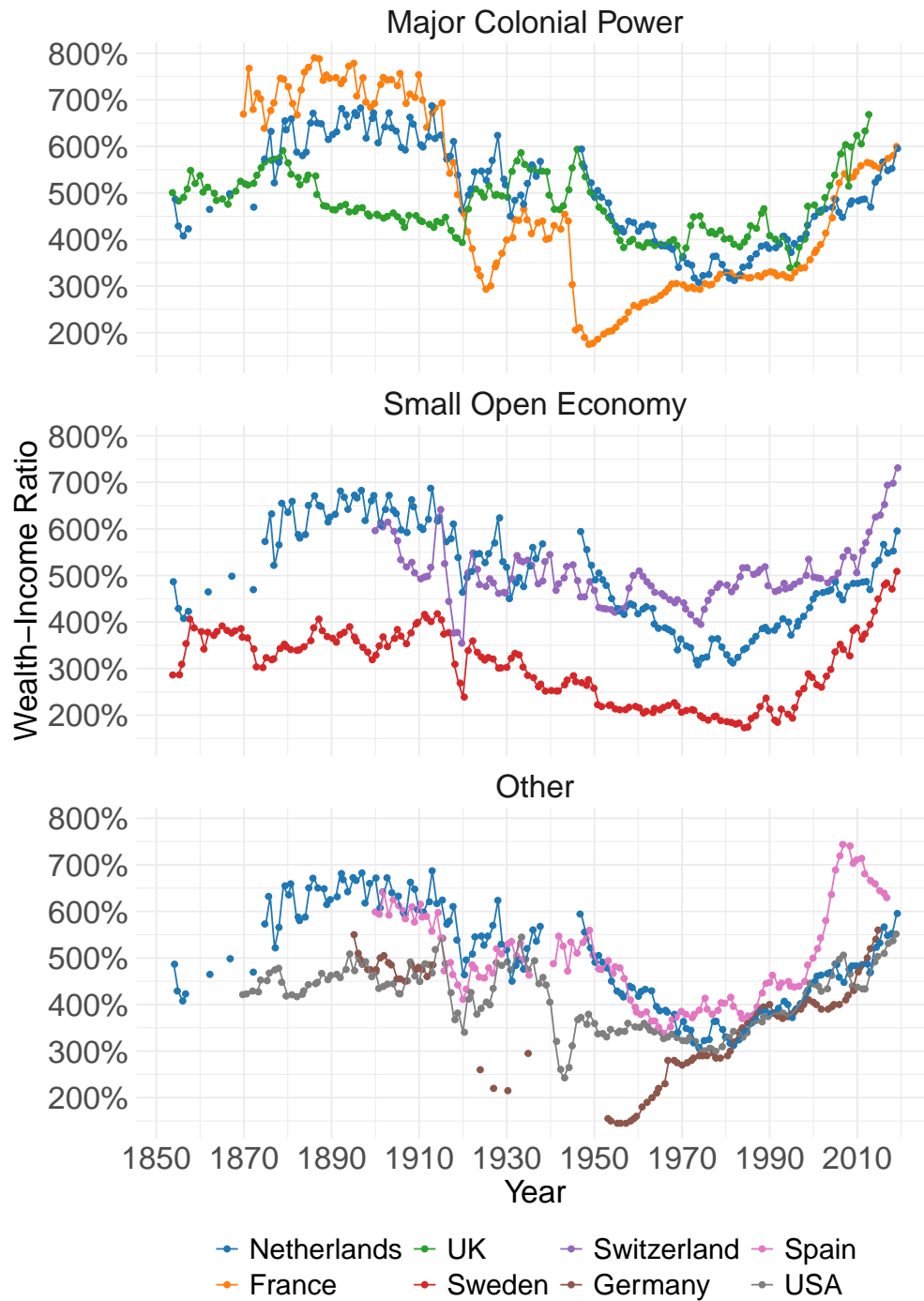
In order to visually distinguish between the eight different series, we have split the Figure into three panels, with the Netherlands in each. The top panel lists the major colonial powers of the 19th and 20th century (France, the UK, and the Netherlands). The middle panel lists small, open economies (Sweden, Switzerland, and the Netherlands). The bottom panel contains all other countries, again with the Netherlands included for comparability.

Our evidence indicates that the Dutch wealth-income ratio was among the highest observed prior to World War I, reaching approximately 500% in the 1850s. Throughout this period, it exceeded the United Kingdom's ratio and was significantly higher than Swedens, the only two other countries with comparable data (Madsen 2019; Waldenström 2017). The Dutch ratio peaked near 700% in the early 1880s, second only to France, and by the 1920s remained one of the highest at approximately 600%. However, following the 1929 crash, it converged with other countries. In Section 6.1, we will explore the dynamics of this increase, attributing it primarily to the Netherlands' substantial net foreign asset position, a consequence of early financialization and expanding colonial investments in Indonesia.

Post-WWII, wealth-income ratios declined globally until the 1980s, when they began to rise sharply. In Europe, France and the UK followed similar trajectories, with ratios increasing from around 300% in 1970 to over 600% today. Germany and Sweden saw more moderate increases, with ratios remaining below 400% until the early 2000s. In recent years, Sweden has experienced significant growth, now exceeding 500% (Piketty and Zucman 2014; Waldenström 2017). Spain and Switzerland witnessed dramatic increases since the 1990s, primarily driven by housing booms

9. Under the Dutch EET model (Exempt Exempt Taxed), no tax is levied on pension contributions or returns, but benefits are taxed upon withdrawal. Because many retirees fall into lower income brackets, the effective tax burden tends to be lower in present-value terms than if contributions were taxed from the outset. Additionally, the accrued pension wealth in these collective schemes is not subject to annual wealth taxes (e.g., Box 3 taxation).

Figure 4: Wealth-Income Ratio, International Comparison



Notes: Figure shows the evolution of the ratio of private wealth to net national income for the Netherlands, Germany (from Albers, Bartels, and Schularick (2020)), Spain (Artola Blanco, Bauluz, and Martínez-Toledano 2020), Sweden (Waldenström 2017), Switzerland (Baselgia and Martinez 2024), and the United Kingdom (Madsen 2019); as well as the series for France and the US from Piketty and Zucman (2014). The top panel shows France and the UK, the middle panel Switzerland and Sweden, and the bottom panel Spain, Germany, and the US. The Netherlands is in each panel for comparability.

(Artola Blanco, Bauluz, and Martínez-Toledano 2020; Baselgia and Martinez 2024). As we will discuss in Section 6.2, the Dutch case differs subtly: while housing has played a role, most net wealth accumulation since the 1990s has been driven by pension claims.

In summary, the Netherlands wealth-income ratio trends exhibit broad similarities with other countries, but three key aspects stand out. First, the Netherlands maintained exceptionally high ratios before WWII, peaking in the 1880s at nearly 700% and remaining elevated until the 1929 crash. Second, from the mid-1960s to mid-1980s, its ratios were notably low, consistently hovering around 300%, before sharply rising in recent decades. Third, the Netherlands trajectory aligns most closely with Switzerland, which is unsurprising. Both nations historically pursued neutrality, low taxation, open capital markets, and strong financial sectors, leveraging these strategies to establish themselves as global financial hubs. The experiences of the Netherlands thus corroborate those of Switzerland, further illustrating how deliberate open-market policies can drive substantial wealth accumulation. However, while the Netherlands before WWI relied more heavily on its colonial trade networks and foreign capital investments, Switzerland established itself as a center of international finance in the 20th century by introducing low corporate tax rates, emphasizing banking secrecy, and institutionalizing policies specifically designed to attract and prioritize foreign capital ('t Hart, Jonker, and Van Zanden 1997; Baselgia and Martinez 2024). Thus, the Dutch experience can be seen as a hybrid of colonial power dynamics (the first panel) and the characteristics of small, open economies (the middle panel).

6 Explaining the Wealth Dynamics

The previous sections have given an overview of the Dutch wealth-income ratio since 1850, and have placed them in an international and historical context. In this section, we delve deeper into underlying historical patterns. We focus on two episodes: the volatile dynamics of household wealth pre-World War II, and the U-shaped pattern of the wealth-income ratio after World War II. We argue that the Netherlands' unique context as a small, open economy with a large colonial empire is the main reason for the first episode. Second, we show that the enormous expansion of the capital-funded pension system, together with swings in housing prices, contributes most to the increase in the wealth-income ratio since the 1980s.

6.1 The Role of Foreign Investments

In this section, we delve into the dynamics of the Dutch wealth-income ratio before World War II, focusing on two key questions: Why was the wealth-income ratio so high in the Netherlands? And why was it considerably lower in non-colonial powers? We argue that the historical context provides compelling explanations for both.

The late eighteenth century marked the beginning of a prolonged period of economic stagnation in the Netherlands, triggered by political upheaval and the French occupation. This stagnation lasted for approximately fifty years, disrupting the economic foundations of the Dutch Republic. Even after the restoration of independence in 1813, economic recovery was sluggish and did not gain momentum until the mid-1820s. During this time, the lack of significant economic growth meant that most businesses had little need to raise substantial amounts of capital (Jonker 1996). Similarly, private colonial investments were minimal. Indonesia, by far the largest and most important Dutch colony,¹⁰ had been administered by the Dutch East India Company (VOC) until its dissolution around 1800. The subsequent Napoleonic era saw the colony contested by France and Britain.

By 1830, the Dutch had reasserted control over the Indonesian archipelago and implemented a new colonial policy to address mounting sovereign debt: the *Cultuurstelsel* (Cultivation System). Under this system, farmers – primarily on the island of Java – were forced to grow cash crops such as coffee and sugar, which were then sold far below market prices to the *Nederlandsche Handel-Maatschappij* (NHM), a state-supported trade corporation with a government-granted monopoly. This monopoly effectively excluded private investment in Indonesia during this period (Van Zanden and Marks 2013; Dell and Olken 2020). Only after the Cultivation System was phased out in the 1870s did private colonial investments begin to flourish.

The period from 1880 to World War II, often referred to as the "liberal period" in Indonesian colonial history, is the

10. During the period studied in this paper, the Netherlands also held other colonies, including Suriname and the Dutch Caribbean. These territories, most of which gained independence in the 1970s, are not included in our estimates due to data limitations. Following the abolition of slavery in the 1860s, these colonies likely contributed little to household wealth. For further analysis of Western colonies economic value pre- and post-abolition, see Koudijs, de Jong, and Kooijmans (2022).

focus of our analysis. During this time, Dutch private investors increasingly participated in the Indonesian economy, generating substantial returns from industries such as agriculture, mining, and trade. However, this era came to a definitive end with Indonesias declaration of independence in 1945, which was recognized by the Netherlands in 1949 following a violent colonial war. In the late 1950s, President Sukarno nationalized the remaining Dutch enterprises in Indonesia, expropriating them without compensating shareholders (Thee 2012). This marked the final chapter of Dutch private households colonial asset holdings.

Our main period of study in this section, the liberal period of 1880–1942, coincides with burgeoning industrialization in the Netherlands. It is also at the same time that investment in other foreign countries accelerates (van Zanden and van Riel 2000). Chief among these other foreign investments were industrial corporations in the United States, particularly steel and railroad companies. Bosch (1948) estimates the total value of Dutch investments in the United States in 1908 at 1.5 billion guilders, or close to 100% of national income.

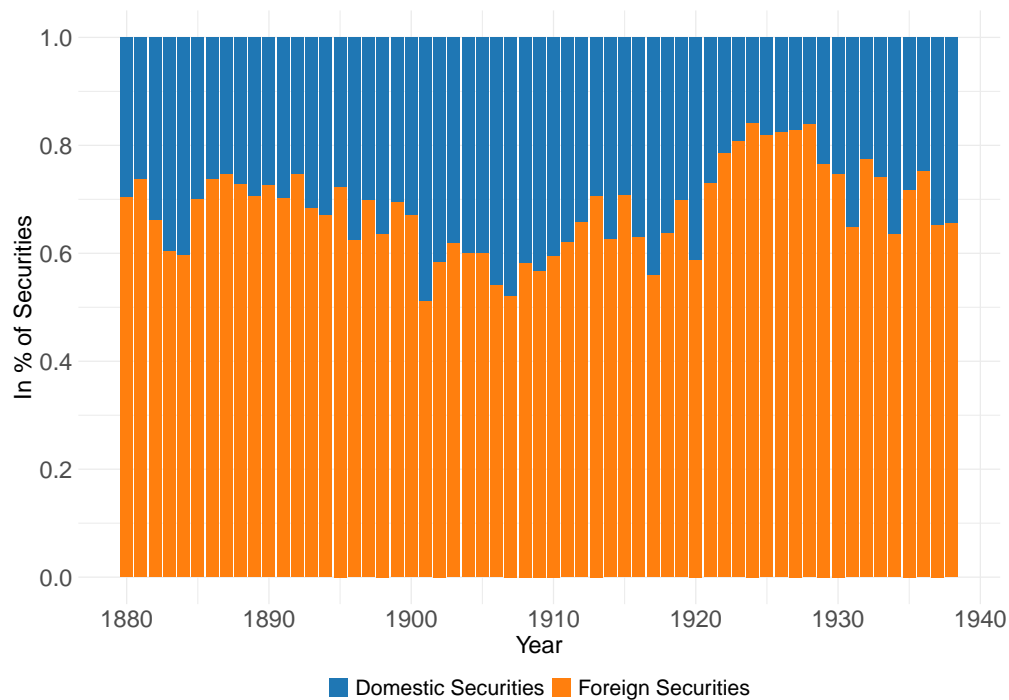
The aforementioned trends are made visible by Figure 5, which breaks down securities into domestic and foreign securities from 1880 until 1938, and Figure 6, which splits foreign securities into colonial and non-colonial wealth, as a percentage of national income. Both series are based on observed dividends, which were carefully noted on an annual basis by the Statistics Netherlands throughout various publications (Smits, Horlings, and van Zanden 2000; den Bakker 2019). As discussed in Section 4, we capitalize these dividends using information on dividend yields from Jordà et al. (2019), to arrive at total wealth invested abroad. Note that, to the best of our knowledge, ours is the first series on private colonial wealth.

Figure 5 shows that foreign securities make up the bulk of total security wealth throughout the period. This is consistent with all existing studies on the financial history of the Netherlands, all of which emphasize its nature as a financialized small, open economy (e.g., 't Hart, Jonker, and Van Zanden 1997; van Zanden and van Riel 2000). The ratio of foreign to domestic securities is around 2:1 until 1895. This is corroborated by the evidence in Verstegen (1996), who examines the composition of inheritance tax records for selected benchmark years and finds almost exactly the same ratio. 1895 marks the end of a long economic depression and the beginning of sustained economic growth, which lasts until World War I. As a result of this expansion, the value of domestic securities increases after 1895, reaching almost parity with foreign securities in the 1900s. Both the timing and the equalization of domestic vs. foreign securities is again consistent with the estate-based evidence in Verstegen (1996). This lends confidence that our capitalization-based method is robust.

After the 1910s, foreign securities start again to increase in value, really taking off from the 1920s onward, before collapsing again after the 1929 crash. To shed further light on these trends, it is informative to study the makeup of foreign securities, depicted in Figure 6.

Prior to the 1900s, most of foreign wealth was non-colonial, likely invested in American corporations (Bosch 1948), as well as in Austrian and Russian bonds (de Vries 1976). Colonial dividends were small in this period, but

Figure 5: Composition of Securities, 1880–1938

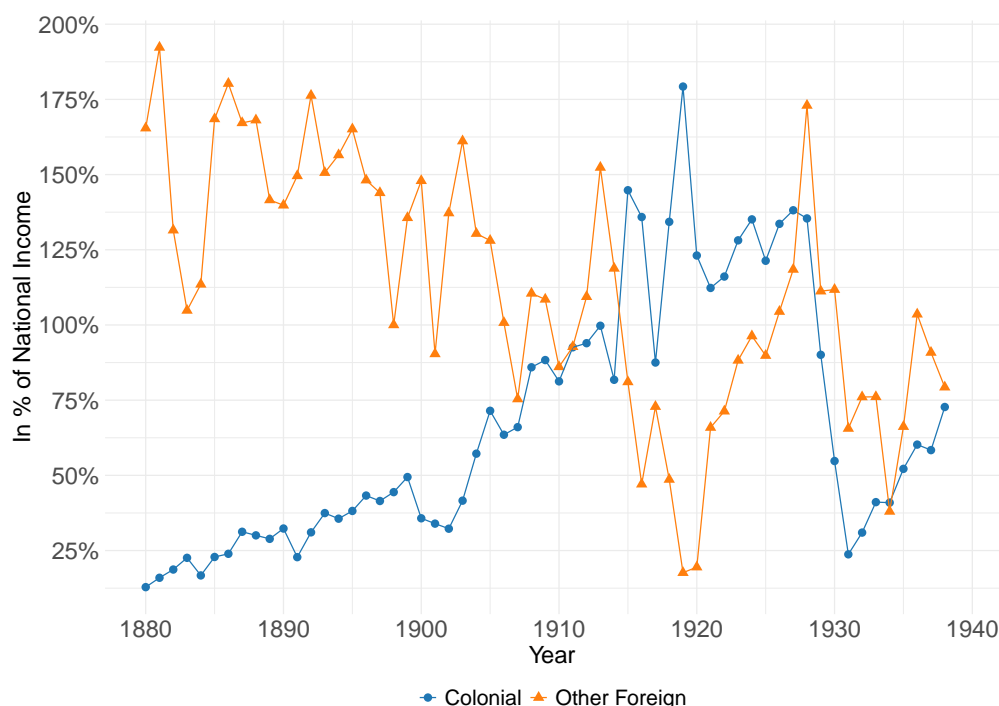


Notes: Figure shows the composition of directly held securities, from 1880 until 1938. All data are based on the Historical National Accounts method.

increased dramatically during the long era of economic expansion which started in 1895 and ended in 1914 (van Zanden and van Riel 2000). Although the Cultivation System had been abolished, cash crops still amounted for the majority of wealth generated in Indonesia. From the 1890s, oil reserves were also found on the islands of Sumatra and Borneo, fueling the rise of the corporation now known as Shell. The expansion of colonial investment is clearly visible in Figure 6.

What is also striking is the collapse of non-colonial foreign investment during the 1910s. The impacts of World War I, as well as the accompanying hyperinflation, likely played an important role here. What's interesting is that colonial investment only continued to expand during this period. After the end of World War I, non-colonial investment crashed, reaching a nadir of around 10% in 1920; whereas colonial investment peaked to reach a zenith of approximately 175%, although with substantial volatility. Disregarding this temporary peak, both colonial and non-colonial investment trended upward again after the early-1920s. This is mainly driven by a boom in colonial commodity prices. The British had tried to introduce import restrictions on many cash crops to boost the post-war economy. The Netherlands ignored this plan and continued to export large amounts of cash crops and petroleum during the 1920s. The reduced supply by other producers resulted in high demand for Indonesian commodities, boosting profits and prices to unprecedented levels (Buelens and Frankema 2016). At its late-1920s peak, colonial investment was worth approximately 140% of

Figure 6: Foreign and Colonial Investment, in % of National Income



Notes: Figure shows the evolution of (net) foreign and colonial investment from 1880 until 1938. Both series are expressed as percent of net national income.

national income. A recovery in investment in the United States and other countries had also led to enormous growth in non-colonial foreign investment, resulting in a total foreign wealth peak of almost 300% of national income in 1928.

The Great Depression hit foreign investment hard; Indonesian corporations recorded losses of around 20% of their total value (van der Eng 1998), and investment in the United States also collapsed (Bosch 1948). By the late 1930s, some of these losses had been undone, with the final value of Dutch total private foreign investment in 1938 being close to 140% of national income.

Note that all these figures, which are based on colonial dividends and other returns to capital investment, are an estimate of the *direct* impact of Indonesia and foreign investment on household wealth. In several ways, this represents a lower bound on the overall importance, given that the value of many *domestic* firms also depended indirectly on the colonies. The textile industry in the rural region of Twente, for instance, would derive much of its value from the availability of a large sales market in Indonesia. We do not attempt to quantify such general-equilibrium effects of colonial investment here, but note that precisely such a calculation has been made back in 1945 by Derksen and Tinbergen (1945). Their estimate puts the total contribution of Indonesia to Dutch national income in 1938 at almost 14% (or about 765 million guilders at the time). In the same article, they estimate the total value of Dutch private investment in Indonesia at almost 4 billion guilders, which equals our estimate.

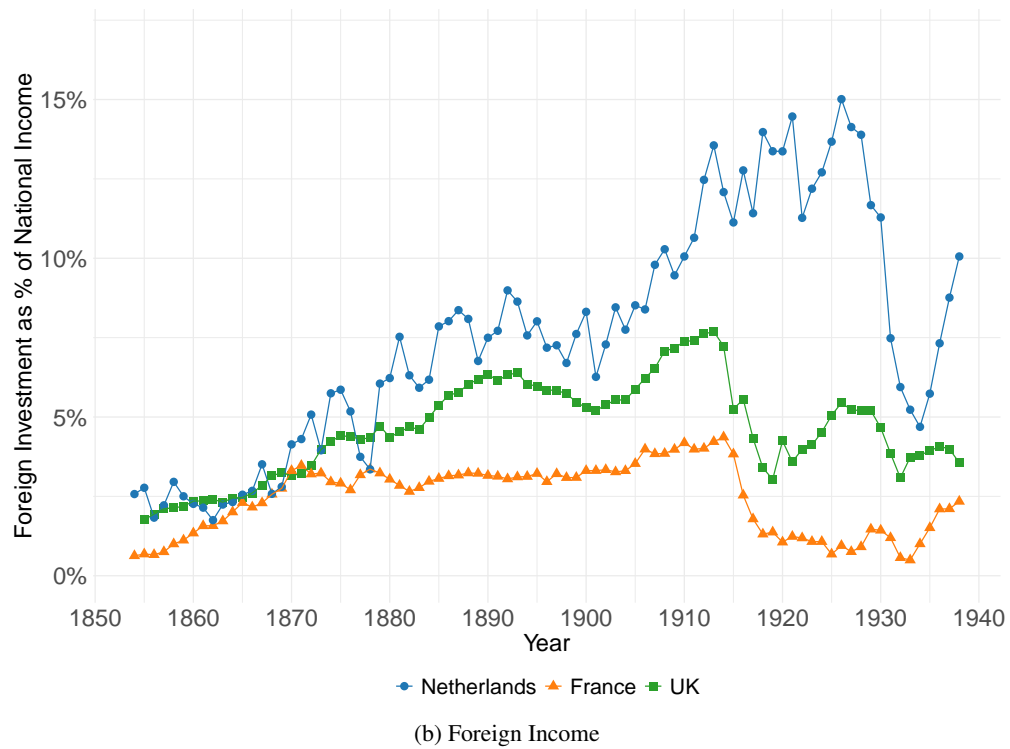
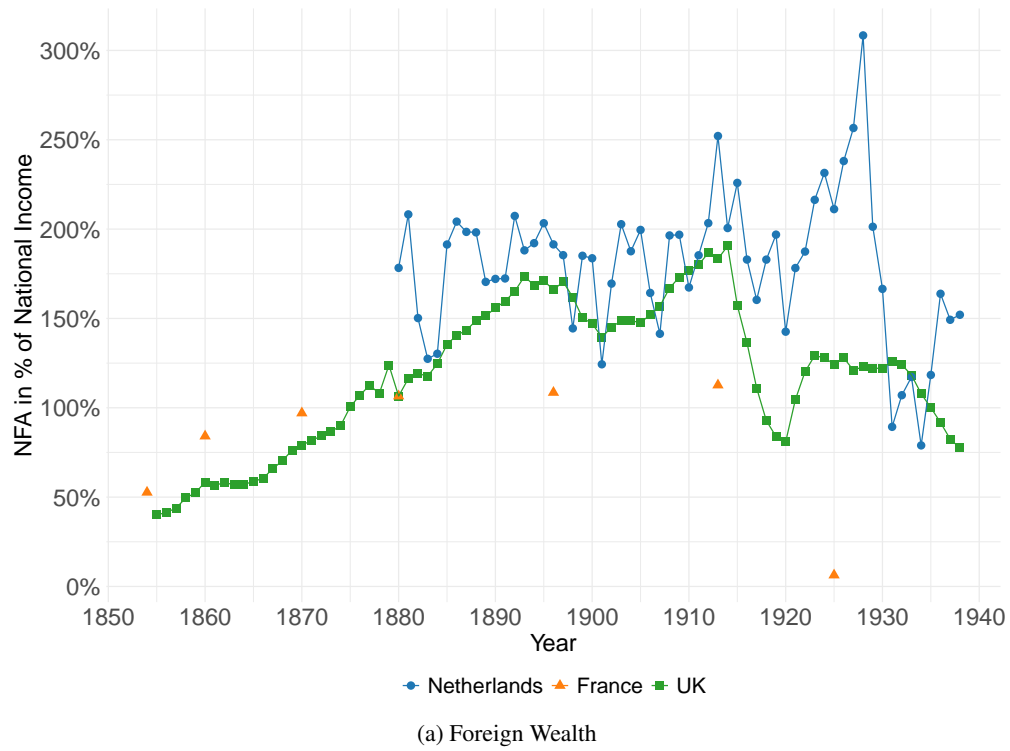
How do these statistics compare to other countries? To the best of our knowledge, no direct estimates of colonial investment in total wealth are available for other major colonial powers. Instead, we will compare net private foreign asset positions of three major colonial powers for which these are available: the Netherlands, France, and the UK. The result is given in Figure 7, which expands upon the analysis in Piketty (2020, pp. 276). In panel 7a, we compare the net private foreign asset positions of these three countries. Note that for France, only isolated benchmark years exist, whereas for the UK and the Netherlands, a continuous series is available.¹¹ We note that the Netherlands and the United Kingdom had comparable levels of foreign wealth until 1910, but started to diverge dramatically afterward, with the Netherlands increasing its foreign investment substantially, whereas the United Kingdom's foreign investment plummeted. France's foreign investment was much lower throughout this period.

The Dutch series seems more volatile than the other two series, which are estimated using different methods (see Piketty and Zucman (2014) for details). One might wonder how robust this feature is. Panel 7b shows that the volatility is mostly unrelated to the estimation method, since the flows of foreign income – which are directly taken from official statistics – are also much more volatile for the Netherlands than for the United Kingdom or France. It is an interesting open question why this should be the case; it is possible that the nature of colonial relations in the British and French empires resulted in more price stability, or that the Dutch investments were more tied to the world's financial markets and hence more volatile. Also note that for foreign income, we can go back further than our starting point of 1880 for wealth. As a result, we see clear evidence that foreign investment in the Netherlands increased substantially in the second half of the 19th century, with foreign income growing from 2% of national income to almost 15% in the 1920s.

Hence, we can conclude that foreign investment, and especially colonial investment, was to a large extent responsible for the different trajectory of the Netherlands compared to other countries. Given that the British and French empires were vastly larger in size, it is remarkable that the value of investment relative to national income of the Netherlands is comparable to those two empires and even exceeds their value from the 1910s onward.

11. Piketty (2020) interpolates the benchmark years for France, leading to a smooth series in his Figure 7.9.

Figure 7: Foreign Wealth and Income as % of National Income, International Comparison



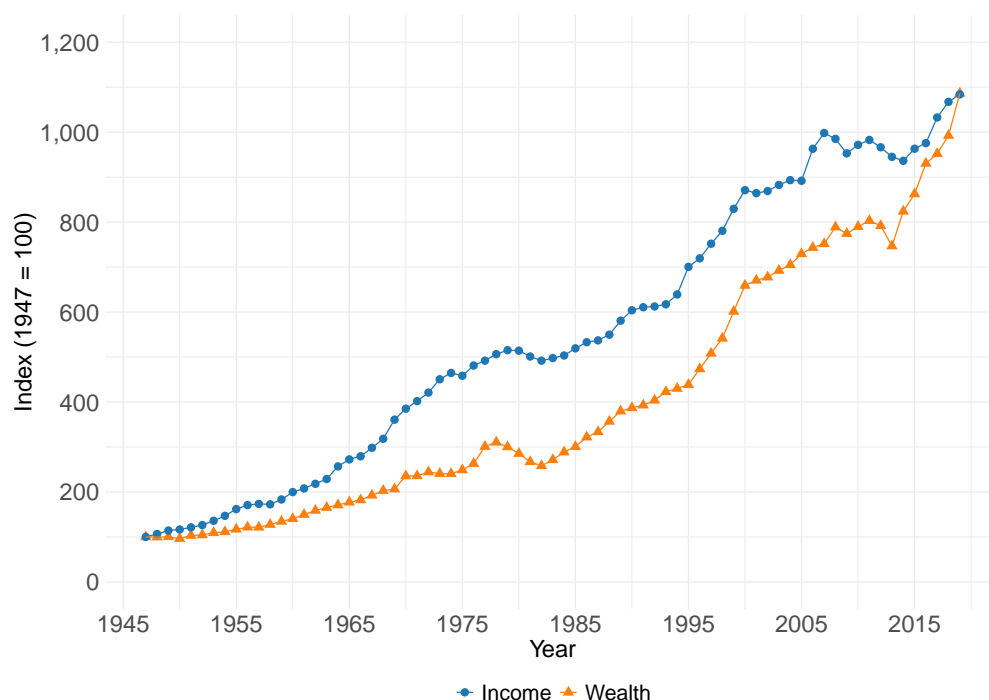
Notes: Figure shows the evolution of foreign wealth and foreign income for France, the Netherlands, and the United Kingdom. Data for France and the United Kingdom are from Piketty and Zucman (2014).

6.2 Pension Savings and Housing Capital Gains

In this Section, we explore the decline and subsequent increase in the wealth-income ratio after 1947. Specifically, we will focus on the role played by savings and capital gains in the observed real growth rates, and we will argue that the dominance of capital gains in the Netherlands reflects the institutional design of its pension system and its housing market.

After World War II, a large expansion of domestic investments contributed to the continuous growth of the Dutch economy, characterized by an annual increase of nearly 3 to 4 percent in national income in the 1950s and 1960s. This is seen in Figure 8, which shows real wealth and income growth from 1947 until 1980. Comparing the increase of national income across this period to the nominal growth in wealth, it becomes apparent that the growth of wealth has lagged considerably behind. Hence, the Netherlands experienced its equivalent of The Great Compression (Goldin and Margo 1992). Between the 1950s and the 1970s, the wealth-income ratio dropped to unprecedented levels, with an all-time low of approximately 300 percent in the early 1970s.

Figure 8: Real Wealth and Income Growth, 1947–2019



Notes: Figure shows the evolution of real household wealth and national income from 1947–2019. Both wealth and income are normalized such that the 1947 values equal 100.

Things started to change by the 1980s. We observe that real wealth skyrockets, in particular from the second half of the 1990s. This increase coincides with the Dot-Com Bubble in the stock market, as well as a large increase in the housing market. The early 2000s see a relative stabilization until the 2008 crisis, when real wealth briefly declines.

However, from the early 2010s wealth grows spectacularly, mostly driven by booming housing prices after 2015. In contrast, real income grows at much slower rates and even seems to stagnate since the beginning of the 21st century. In 2019, indexed real income and wealth overlap for the first time since 1947, completing the upward curve of the U-shape in Figure 1.

How can we make sense of these large upswings and downturns in the wealth-income ratio? A useful accounting decomposition is to split real wealth growth into a savings component and a capital gains component, using Equation 4. We observe real wealth growth $g_t := \Delta W_t/W_t - 1$, as well as savings rates out of wealth s_t ; hence, we can residually calculate real capital gains or losses as $q_t = (1 + g_t)/(1 + s_t) - 1$. Starting with Piketty and Zucman (2014), the subsequent literature has used this identity to identify an important role for capital gains in driving the recent boom in wealth-income ratios (e.g., Artola Blanco, Bauluz, and Martínez-Toledano 2020; Basalgia and Martínez 2020). We do a similar exercise in Table 2, which shows the decomposition of real wealth growth into its savings and capital gains components for the period 1947–2019.

Table 2: Decomposition of Real Wealth Growth, 1947–2019

Period	Real Wealth Growth	Savings	Capital Gains
1947–2019	3.4%	1.6%	1.8%
1947–1959	2.7%	0.6%	2.1%
1960–1969	4.9%	1.7%	3.2%
1970–1979	3.1%	3.2%	0.0%
1980–1989	2.7%	3.1%	-0.4%
1990–1999	6.4%	2.3%	4.0%
2000–2009	2.8%	0.6%	2.2%
2010–2019	3.8%	1.2%	2.6%

Notes: Table shows average real wealth growth rates for the respective periods in each row. This average growth rate is then decomposed into a savings and capital gains component using Equation 4.

Looking at the first row of Table 2, we observe that household wealth growth was sizable and positive, averaging 3.4% per year from 1947 until 2019. It is also clear that a sizable portion of this wealth growth is attributable to savings. This is true even when we use the narrowest savings concept, household savings; even with that conceptualization, savings accounted for $1.6/3.4 \approx 50\%$ of all household wealth growth.

The subsequent rows show decadal averages, and reveal substantial variation. Capital gains drove most of average wealth growth in the first two decades after World War II. By the 1970s, this pattern reverses, and the period from 1970 to 1990 is marked by growth driven exclusively by savings. After the 1990s, the pattern once again reverses, with capital gains contributing more on average than savings.

Inspection of the underlying annual data, while more volatile than decadal averages, reveals further insights. The

most important conclusion is that while savings are relatively steady, capital gains are highly volatile. Periods of positive capital gains (most of the 1950s and early 1960s) are followed by periods of negative capital gains (most of the 1970s and 1980s). However, occasional swings of large magnitude in capital gains result in a decadal average for the 1970s near zero. The early 1980s show severe negative capital gains. This is consistent with the decline in housing value observable in Figure 3. However, while the timing is consistent with our knowledge of the housing market, we do not have the data to disentangle savings and capital gains per wealth component for this period.

From 1995, we can get a grasp on the sources underlying these savings and capital gains components. From that year on, Statistics Netherlands publishes modern household balance sheets that include all wealth components, as well as volume and price mutations happening during each year to these components. Hence, we can decompose the household wealth growth rate into savings and capital gains components per major wealth component. We focus on four major categories: financial wealth (net of financial debt), pension wealth, housing wealth (net of mortgage debt), and non-financial wealth. This exercise bears some similarity to the work of Bauluz, Novokmet, and Schularick (2022) and Baselgia and Martínez (2020), and others. Important to note here is that we do not estimate synthetic savings and capital gains over the wealth distribution, as is done by Saez and Zucman (2016) and the literature following it. By contrast, we are only concerned with decomposing aggregate household wealth growth into the relative contributions of each component.¹² We do so in Table 3, which shows five-year averages, and Figure D.3, which shows annual growth rates.

By focusing on five-year intervals, we can shed further light on dynamics happening in the last 25 years. We notice that the positive real wealth growth since 1995 has been extremely heterogeneous over time, with the years following the Great Financial Crisis seeing little more than a percentage point of growth per year. By contrast, the late 1990s were characterized by growth rates of over 8% annually. By decomposing these growth trends across savings and capital gains and across wealth components, we observe various patterns. First, the major contributor to wealth growth since 1995 has been pension wealth. This component accounted for slightly more than half of all real wealth growth, with housing playing a secondary role. Other financial and non-financial assets matter far less for wealth growth in general, with the exception of the late 1990s, when financial assets were the most important contributor to wealth growth leading up to the Dot-Com bubble.

Pension wealth added to wealth growth both via savings and via capital gains, with those channels being roughly equal in magnitude across the whole period but showing significant fluctuations in between. By contrast, housing actually dominates pension wealth in most five-year intervals; however, housing experienced a stark slowdown in growth from 2005 onward, turning negative in the 2010-2014 interval. This period, associated with the collapse of housing prices following the Great Recession, clearly repressed real wealth growth of households. We note that even

12. While the distributional decomposition is interesting, it is not feasible with the data at our disposal, since the distribution of pension claims is not known and would require stringent assumptions to impute. Hence, we focus on the aggregate decomposition and leave distributional decompositions for future work.

Table 3: Decomposition of Household Wealth Growth by Wealth Component, 1995–2019

	1995–2019	1995–1999	2000–2004	2005–2009	2010–2014	2015–2019
Real Wealth Growth	3.8%	8.4%	4.0%	2.7%	1.2%	7.1%
- <i>Financial</i>	0.5%	2.5%	-0.3%	0.2%	0.0%	0.6%
- <i>Pension</i>	2.0%	2.3%	1.3%	1.6%	3.9%	3.0%
- <i>Housing</i>	1.2%	3.0%	3.0%	0.5%	-2.6%	3.3%
- <i>Non-Financial</i>	0.2%	0.5%	0.1%	0.4%	0.0%	0.2%
Due to Savings	1.3%	2.3%	1.4%	1.2%	1.4%	1.6%
- <i>Financial</i>	0.6%	1.7%	1.0%	0.6%	0.1%	0.4%
- <i>Pension</i>	1.1%	2.0%	1.5%	1.1%	1.0%	0.8%
- <i>Housing</i>	-0.5%	-1.5%	-1.2%	-0.7%	0.2%	0.3%
- <i>Non-Financial</i>	0.1%	0.1%	0.2%	0.2%	0.1%	0.1%
Due to Capital Gains	2.5%	5.9%	2.6%	1.5%	-0.2%	5.4%
- <i>Financial</i>	-0.1%	0.8%	-1.3%	-0.4%	-0.1%	0.2%
- <i>Pension</i>	0.9%	0.3%	-0.1%	0.5%	2.8%	2.2%
- <i>Housing</i>	1.7%	4.6%	4.3%	1.1%	-2.7%	3.0%
- <i>Non-Financial</i>	0.1%	0.4%	-0.1%	0.2%	-0.1%	0.1%

Notes: Table shows the decomposition of average real wealth growth per five-year period from 1995 until 2019, split into savings and capital gains components per major wealth component. All wealth components are measured net of debt.

in the other periods, housings contribution to wealth growth almost exclusively originates from capital gains, with housing savings being negative or very weakly positive throughout. This is due to the enormous accumulation of mortgage debt by households; the value of mortgages, in excess of 100% of national income in 2019, was stimulated by various government policies from the 1980s onward and relatively limited oversight over the mortgage sector (van der Valk 2019). We can conclude from this exercise that pension wealth is the dominant factor explaining the real wealth growth of Dutch households.

Appendix Figure D.3 further investigates the trends reported in Table 3, by decomposing the annual growth rate since 1995 into a savings- and capital gains-induced part, with each part further decomposed into the contributions by the broad wealth components. Focusing on annual rates yields additional insights. We observe that housing's contribution to savings growth is negative until 2010; this further illustrates the weight of mortgage debt, and reveals the impact of policy choices. After the 2008 crisis, mortgages became more heavily regulated; for instance, the maximum loan-to-value of the mortgage was reduced from its peak of 130% to 100% at the end of our series. These and other measures contributed to housing saving becoming a net positive contributor to wealth accumulation. A second conclusion from the Figure is that pension capital gains really take off from 2007 onward in contributing to wealth growth. Prior to 2007, most capital gains were in housing; while the housing boom from the mid-2010s again introduced positive housing capital gains, pension capital gains have remained quantitatively the most important for the last 15 years in our sample.

7 Conclusion

Following the seminal work by Piketty and Zucman (2014), this study analysed the historical development of aggregate wealth-income ratios for the Netherlands from 1854 until 2019; a country that has not been analysed so far in the literature. In addition, we decompose total private wealth into various components, tracking the relative value of financial and non-financial asset categories for 140 years (from 1880 until 2019). Finally, we discuss various interpretations of these trends, and contrast them to the available international evidence.

We find that while the private wealth-income ratio in the Netherlands followed the familiar U-shaped pattern observed in earlier studies, its unique history as both a major colonial power and a small, open economy significantly shaped its wealth-income dynamics. In comparison with other industrialised countries, the Netherlands, experienced periods with some of the highest as well as one of the lowest private wealth-income ratio: from a ratio in excess of 700% at the turn of the 20th century, to a ratio as low as 300% in the 1970s.

The main empirical contribution of this paper is to expand the existing evidence on long-term wealth dynamics for large, at times closed, economies with evidence on a small and very open economy throughout. A novelty of this paper is that it provides empirical evidence that the very high wealth-income ratio was at least in large part due to a significant proportion of private wealth invested in colonial and non-colonial foreign securities. This finding further highlights the significance of colonial empires in explaining (global) wealth dynamics and thus makes an important contribution to this ongoing debate (Chancel and Piketty 2021).

Methodologically, we exploit the rich availability of data sources for the Netherlands, and simultaneously use (i) historical national accounts; (ii) estate multiplier methods; (iii) wealth tax methods. We find that historical balance sheets and the estate multiplier produce remarkably similar results for the 19th century and early 20th century. Hence, the estate multiplier, if one is not too far from the benchmark year, is likely to be a reasonable method to employ in cases where the necessary data to reconstruct historical balance sheets are unavailable. The wealth tax extrapolation method performs less satisfactorily, and is more sensitive to the quality of the underlying wealth tax data.

Our findings can inform policymakers about household wealth dynamics, by placing recent figures in a historical perspective. Moreover, our decomposition of aggregate wealth highlights the important institutional determinants of household portfolio choice. Policy choices since the 1980s aimed at stimulating homeownership, like the mortgage interest deduction, are likely to have contributed to the rise in mortgage debt and housing prices. Likewise, the tax-exempt treatment of pension wealth will have contributed to its increase in relative importance in household portfolios. These results illustrate the impact of careful policy design to stimulate household private savings while also not encouraging overreliance on debt. Policy choices on the composition and distribution of household wealth also matter for macroeconomic stability, the level of the interest rate, and other key macroeconomic variables, and therefore the

findings presented here are relevant regardless of preferences for wealth redistribution.

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A Historical National Accounts

A.1 Concepts and Preliminaries

This section details the construction of our benchmark series on aggregate household wealth, using the historical national accounts method. As detailed in the main text, we work with standard accounting definitions of household wealth, W_t . In the following subsections, we focus on the (sub-)components of equation 3, repeated here for convenience:

$$W_t = H_t + B_t + D_t + P_t + S_t - L_t.$$

We start with non-financial assets (H_t and B_t), before moving to financial assets, and we conclude with liabilities. At the end of this section, we also discuss the comparisons of the CPB balance sheets since 1970 to alternative sources. Table A.1 provides a high-level summary of all steps per component per period.

Table A.1: Historical National Accounts, Sources and Methods per Component

Category	Sub-component	Years	Sources & Data Steps
Non-Financial Assets	Housing	$\left\{ \begin{array}{l} 1880 - 1994 \\ 1995 - 2019 \end{array} \right.$	Residential dwellings from capital stock + estimate of land under dwellings, benchmarked to official balance sheets National Accounts
	Business Assets: Agricultural Land	$\left\{ \begin{array}{l} 1880 - 1994 \\ 1995 - 2019 \end{array} \right.$	Agricultural area + price index for farmland National Accounts
	Business Assets: Livestock	$\left\{ \begin{array}{l} 1880 - 1938 \\ 1947 - 1994 \end{array} \right.$	Annual statistics (+ interpolations) for cattle + assumed value for horses from wealth tax Total number of livestock + agricultural land price index, benchmarked to 1958 total value
		$\left\{ \begin{array}{l} 1995 - 2019 \end{array} \right.$	National Accounts
		$\left\{ \begin{array}{l} 1880 - 1968 \\ 1995 - 2019 \end{array} \right.$	Residually estimated based on identity $W_t = K_t + NFA_t$ National Accounts (incl. non-listed shares)
	Business Assets: Remainder		
Financial Assets	Deposits	$\left\{ \begin{array}{l} 1880 - 1938 \\ 1947 - 1969 \\ 1970 - 1994 \\ 1995 - 2019 \end{array} \right.$	Total deposits at banks, benchmarked by 1938 balance sheet for split household/corporate Statistics Netherlands series, benchmarked by 1938 balance sheet CPB estimates National Accounts
		$\left\{ \begin{array}{l} 1880 - 2019 \end{array} \right.$	Same sources and procedure per subperiod as for deposits
	Pension and life insurance	$\left\{ \begin{array}{l} 1880 - 1969 \\ 1970 - 1994 \end{array} \right.$	Central bank statistics CPB estimates (pension); Central bank estimates, adjusted to match trends
		$\left\{ \begin{array}{l} 1995 - 2019 \end{array} \right.$	National Accounts
	Bonds	$\left\{ \begin{array}{l} 1880 - 1938 \\ 1947 - 1969 \end{array} \right.$	Value of privately held treasury bonds (benchmarkd to 1938 balance sheet) Total value of treasury bonds
		$\left\{ \begin{array}{l} 1970 - 1994 \\ 1995 - 2019 \end{array} \right.$	CPB estimates National Accounts
	Listed Stocks	$\left\{ \begin{array}{l} 1880 - 1938 \\ 1947 - 1969 \end{array} \right.$	Total value of stock market index, + capit. value of net foreign income As above
		$\left\{ \begin{array}{l} 1970 - 1994 \\ 1995 - 2019 \end{array} \right.$	CPB estimates National Accounts
	Nonlisted stocks & Other	$\left\{ \begin{array}{l} 1880 - 1969 \\ 1970 - 1994 \end{array} \right.$	See Business Assets, Residual CPB estimates (part of Business Assets)
		$\left\{ \begin{array}{l} 1995 - 2019 \end{array} \right.$	National Accounts (part of Business Assets)
Liabilities	Mortgages	$\left\{ \begin{array}{l} 1880 - 1969 \\ 1970 - 1994 \\ 1995 - 2019 \end{array} \right.$	Annual statistics, adj. for part of mortgages attributable to households CPB estimates National Accounts
		$\left\{ \begin{array}{l} 1880 - 1969 \\ 1970 - 1994 \end{array} \right.$	Annual statistics CPB estimates
		$\left\{ \begin{array}{l} 1995 - 2019 \end{array} \right.$	National Accounts
	Other Liabilities	$\left\{ \begin{array}{l} 1880 - 1969 \\ 1970 - 1994 \end{array} \right.$	Annual statistics CPB estimates
		$\left\{ \begin{array}{l} 1995 - 2019 \end{array} \right.$	National Accounts

Notes: See Appendix A for details; the order of the subsections follows the order in the table.

A.2 Non-Financial Assets

A.2.1 Housing

The value of housing is the sum of the value of dwellings and the land underlying dwellings. For the construction value of dwellings, we have perpetual inventory method (PIM) estimates from Smits, Horlings, and van Zanden (2000) for 1807–1913 and from Groote, Albers, and De Jong (1996) for 1900–1994. Although the assumptions differ a bit between these two sources, they are broadly comparable and yield almost identical estimates.

Unfortunately, no estimates exist of the value of land underlying dwellings. Hence, we opt to estimate this ourselves. We can derive the value of land under dwellings residually for the years for which Statistics Netherlands published official balance sheets (1938 and 1947–1952), since these also record the total value of land. Since we know the value of agricultural land (the next section), the remainder must be (to a first approximation) land under dwellings. For years before 1938 and after 1952, we index the evolution of land under dwellings to the evolution of agricultural land. We have experimented with other indexing schemes, such as to the housing price index of Korevaar, Francke, and Eichholtz (2021). Unfortunately, these indexing schemes, while more intuitive than to agricultural land, resulted in land values that were unrealistically high in the late 19th century, since the housing price index does not vary very extensively before 1938. Instead, the agricultural land index produces a remarkable fit to the 1995 balance sheets; moreover, it reproduces known swings in housing price values in the 1970s and early 1980s (van der Valk 2019).

From 1995, we use the value of dwellings and land underlying dwellings recorded in the National Accounts. The fit between our estimated series prior to 1995 and the post-1995 is remarkably good, with no discernible jump.

A.2.2 Business Assets: Agricultural Land

As discussed in the main text, we cannot consistently distinguish between capital and land directly owned by households and by the corporate sector. Hence, we have a residual category “Business Assets”, which includes any part of total wealth not “covered” by the other wealth components in equation 3. However, at various times we observe various subcomponents of this residual category, which allows us to verify the robustness of our residual estimate.

The first subcomponent is agricultural land. For non-residential land (which is predominantly farmland), we obtain a total value by multiplying estimated total area with estimated average prices. We use volume data on the area of agricultural land from van der Bie (2001), which is based on the work of Knibbe (1993). For land prices, we rely on work by Luijt and Voskuilen (2009). Their data series gives estimations of the price of farms and farmland from 1952. For the period before 1952, it only provides estimations of the value of farms. We calculate the ratio between farms and farmland throughout the 1950s and take the average for this period. This ratio (of 1.4) is then applied to estimate the value of farmland for the period 1880 and 1938. We interpolate some of the missing years. The resulting series

for the value of agricultural land is very comparable to that of Knibbe (2014), who basically uses the same data and methods as we do, but does not adjust the pre-1952 series as we do. As a result, his series show higher values of land pre-1952, but these values also capture implicitly the value of the farm buildings, capital stock and other attributes that would be reflected in the farm price. Since these aspects are better attributed to other wealth components, we feel our adjustment is closer to the likely value of land.

After 1995, we use the value recorded in the Non-Financial Accounts by Statistics Netherlands.

A.2.3 Business Assets: Livestock

The number and total value of cattle is readily available in the Annual Statistics for the Netherlands. We interpolated some of the missing years between 1880–1897; between 1908–1913; between 1922–1925; and between 1925–1930. Having the total value of cattle and the number of cattle at our disposal for most year, we were able to calculate the value of a single cattle. We took the average of this individual price (172 guilders) and assumed a horse would be approximately 5 times more expensive (862 guilders). Since we were able to retrieve the number of horses held by individuals based on their tax record, we were thus able to estimate the total value of all horses.

After World War 2, we rely on the total number of cattle presented in van der Bie (2001). The total value of livestock is put at 3 billion guilders in 1958; hence, we obtain an estimate of the average value of cattle for that year. For the remaining years, we assume that this value follows the development of agricultural land prices, so we index the average value in 1958 to our agricultural land price series. After 1995, we use the National Accounts, which do not explicitly include a post for livestock; hence, it appears in our series in the residual capital stock (i.e., the part of the non-financial accounts that isn't one of the main items mentioned in the rest of this section).

A.2.4 Business Assets: Remainder

This remainder item mainly includes parts of the capital stock directly owned by the household sector, which is mainly by self-employed nonincorporated enterprises. In addition, as discussed, this remainder part cannot be distinguished from nonlisted shares prior to 1970, and hence the two will be lumped together (together with agricultural land and livestock mentioned above), in business assets. We refer to the subsection on non-listed stocks on additional information.

A.3 Financial Assets

Following the System of National Accounts, financial assets include deposits and currency, shares and mutual funds, bonds, individual pension, and insurance savings.

A.3.1 Deposits

We begin by reconstructing the total amount of deposits from 1880 until 1970. The principal sources material used to estimate the value of these asset classes are (i.) the Statistical Publication by the Dutch Central Bank, which reported on the balance sheet information of commercial banking institutions as well as saving banks and cooperatives banks from 1900 onwards (DNB 1987, 2000); and (ii.) the previously mentioned Annual Statistics for the Netherlands. For **Saving Banks**, the data on the total value of deposits held by these institutions was readily available in the Annual Statistics for the Netherlands from 1885 onward. Thus, leaving a gap in the period between 1880–1885. For these years we however knew the amount of saving banks there were active; so we looked at the average deposits held by saving banks in 1880 and 1885 and interpolated this data based on the number of banks between 1881 and 1884. For **Farmers' Cooperatives**, we relied on Westrate (1948: 374-376). This memorial book, published to celebrate the 50-years jubilee of Cooperative Banks reported the value of deposits held by this type of banks from 1899 onward. For **Postal Savings Banks**, we relied on the Annual Statistics for the Netherlands. This data was readily available from 1885 onward. The data for **Commercial Banks**, was retrieved from the Statistical Publication by the Dutch Central Bank. This data was however only estimated for the entire commercial banking sector for the years 1903, 1908, 1913, 1918, 1923, 1928, 1933, and 1938. We therefore collected the deposits from the 3 largest banks from 1880 to 1900 and interpolated this data to calculate the deposits held by all commercial banks. We did the same to fill in the gaps between 1900 and 1908, but in this case, we relied on the data for the 5 largest banks as published in the Statistical Publication by the Dutch Central Bank. We then cross-referenced this estimation of all deposits held by commercial banks by comparing it to a newly collected dataset of approximately 140 individual commercial banks (De Vicq and Peeters 2022). This results in a series for aggregate deposits from 1880 until 1938. In 1938, we cross-check the amount in deposits with the official National Accounts balance sheets. The numbers align reasonably well; our stock of deposits is 3.3 billion guilders, whereas the official balance sheet gives a sum total of 4.4 billion. However, only 1.9 billion of these deposits should be ascribed to the household sector; the rest shows up on the balance sheet of corporations, the government, the insurance sector, and the foreign sector. Hence, for 1938, we take the official number for households as given, and for all years prior to 1938, we divide our series by the ratio of the series in 1938 to the official number ($3.3/1.9 \approx 1.7$).

On the website of Statistics Netherlands¹³, we also find a series for total deposits, starting in 1900 and with continuous values from 1935. Inspection of this series yields that it is a bit higher than the official National Accounts total, 2.9 billion instead of 1.9. The same holds for the values of the balance sheets for 1947 and 1948. Hence, we downweight this series by the ratio of the series in 1938 ($2.9/1.9 \approx 1.5$).

After 1970, we use the deposits total noted in the CPB balance sheet. This amount is quite a bit higher than the

13. Link: <https://opendata.cbs.nl/#/CBS/nl/dataset/37758/table?dl=6E2C5>.

adjusted deposits series, with a jump of about 17 billion guilders. However, if we adjust the previous series using the CPB balance sheet (or take it at face value), we lose consistency with the balance sheets in 1938, 1947 and 1948. Hence, we decided to preserve consistency with the earlier official balance sheets, and accept the (small) trend break that occurs in 1970. The scale of the discontinuity is relatively minor, around 20% of national income.

After 1995, we use the National Accounts.

A.3.2 Currency

The value of coins and printed money was consistently published in the Annual Statistics for the Netherlands. We only had to interpolate some missing data points in the years between 1881 and 1884. We cross-referenced our figures with similar estimations made by Kymmel (1992).

As with deposits, we use the value recorded in the 1938 balance sheet to adjust this series, to obtain the amount of currency held by households. We also use the same sources and procedures for currencies after 1947 as with deposits, outlined above. However, the trend break is much less severe in 1970, only 1.7 billion guilders. After 1970, we use the CPB balance sheet, and after 1995 the National Accounts.

A.3.3 Pension and insurance funds

The value of funded occupational pension entitlements and private insurance savings are based on the technical reserves as recorded in the Statistical publication by the Dutch Central Bank. We simply transcribed the results from this publication, as this data was readily available. This data can be found in table A.11.

A.3.4 Securities

A.3.4.1 Domestic Government Bonds

The value held by privately owned **treasury bonds** was listed in the Annual Statistics for the Netherlands from 1891 onward; similar series appear before 1891 as well. There seems to be no trend-break in 1891, hence we use the full series from 1880 until 1938. We confirm that the value of privately held bonds corresponds almost identically to the value listed in the 1938 official balance sheets: 3.2 billion guilders.

After World War 2, we no longer possess direct information on the value of privately-held bonds, hence we take the entire value of Dutch bonds until 1970. From 1970, we use the bond holdings listed in the CPB balance sheets. Remarkably, despite using the full value of bonds from 1947 onward, we find no trend break when we switch to the CPB balance sheets in 1970, with only a slight jump from 29 to 38 billion guilders. Of course, the bondholdings recorded in the CPB balance sheets would plausibly also include corporate bonds and bonds from other countries; yet for our purposes this does not matter, since we are only interested in reconstructing total securities holdings by

households, which thus seem to be captured quite accurately, especially when combined with the other components, which are detailed in the next sections. From 1995, we use the official National Accounts.

A.3.4.2 Listed Domestic Stocks

The NEDHISFIRM project at the University of Groningen is developing a comprehensive information system on Dutch corporate and stock exchange data. However, it has not yet gathered information on the market value of stocks listed on the Amsterdam Stock Exchange. To address this gap, we manually calculated the value of domestic securities by collecting the paid-up capital of all Dutch companies listed on the Amsterdam Stock Exchange. Our primary source was the Gids bij de Prijscoorant. We compiled paid-up values for the years 1880, 1885, 1890, 1895, 1900, 1910, 1913, 1920, 1931, and 1938. This covered 39, 66, 82, 121, 229, 281, 363, 555, 625, and 551 unique companies in each respective year – 2,912 companies in total. These data allowed us to calculate the exact book value of paid-up capital for the listed companies during those years. Because these sources are not available every year and because the manual data collection is highly labour-intensive, we interpolated missing values for the years between 1880 and 1938. For this, we used NEDHISFIRM project data, which includes end-of-year prices for all stocks listed on the Amsterdam Stock Exchange from 1796 to 1973. By combining manually collected data with the total number of stocks from the NEDHISFIRM database, we estimated average book values and constructed a consistent series on paid-up capital for every year up to 1953. To convert these book values into market prices, we applied a price-to-book ratio scaled using the Amsterdam Stock Exchange index series from the CBS study van der Bie (2001). From this aggregate volume of equity holdings, we deducted the holdings of institutional sectors such as commercial banks, mortgage banks, private savings banks, the state-guaranteed Post Office Savings Bank, and insurance companies. These deductions relied on detailed data from the Dutch Central Bank (DNB). This process enabled us to calculate the household share of equity holdings. For years after 1953, we relied on official CBS estimates for the total value of domestic stocks on the Amsterdam Stock Exchange. The market price series we constructed for Dutch stocks in 1953 closely matched the official CBS figures available from 1954 onward, validating our approach. Our methodology aligns with that of Artola Blanco, Bauluz, and Martínez-Toledano (2020) in their study of wealth inequality in Spain.

A.3.4.3 Foreign Securities

We know the net primary income received, which is calculated by Smits, Horlings, and van Zanden (2000) until 1913 and by Statistics Netherlands for most years afterwards¹⁴. Then, we capitalize these dividend streams $y_t^{f,div}$ using an average dividend yield $r_t^{f,div}$, using

14. The years 1918-1920 are missing and are linearly interpolated from the values of 1917 and 1921, which reasonably captures the decline in foreign capital income due to the upheavals of the war, the Russian Revolution, and other large international shocks.

$$y_t^{f,div} := r_t^{f,div} \cdot W_t^f.$$

Note that for our purposes, the dividend yield is the correct variable by which to capitalize the dividend streams and not the total return, i.e., dividends plus capital gains. This is because we are interested in the nominal value of equity at time t , and not in its real value, corrected for price revaluations.

For each year, we take the average of the dividend yields of Berlin, Brussels, London, New York, and Paris; the stock exchanges which were by far the most important for Dutch non-colonial foreign investment in terms of cross-listed equities and bonds (Moore 2012). Data on dividend yields for those exchanges are taken from Jordà et al. (2019). The five series are generally quite close to each other, with an average standard deviation over the 1880–1938 period of slightly more than 1%. During crisis years, such as 1917, the standard deviation increases; nevertheless, we feel that the average dividend yield gives a reasonable capitalization factor even in volatile years, particularly when considering that the resulting series is quite smooth; sticking with only one series would likely result in much more artificial volatility in the equity series.

When capitalizing net dividends from abroad, we implicitly capitalize Dutch dividends paid to foreigners with the same yield as foreign dividends paid to Dutch households. Unfortunately, no systematic information exists on Dutch dividend yields for the entire pre-war period; the only available series covers 1900–1917, and is included in Jordà et al. (2019). Inspection of dividend yields in this series reveals that Dutch dividends did obtain higher yields than the average yield we have chosen for this period. This outperformance is on average 1.6 percentage points. However, the volatility is large, with a standard deviation of 1 percentage point. In short, we are not certain that Dutch dividends systematically performed better than foreign dividends even in this limited sample. This conclusion also holds for each of the five different series individually: none of them seem systematically over- or underperformed by the Dutch series, and the Dutch series does not track any of them particularly closely. Hence, we stick with the averaged series throughout, noting that this likely represents an *underestimation* of Dutch equity holdings, since we capitalize dividends paid to foreigners by a too large factor.

Our series on colonial dividends, covered in Smits, Horlings, and van Zanden (2000) and den Bakker (2019), is mainly based on the work of Korthals Altes (1986), who carefully reconstructs the Indonesian balance of payments from 1822 until 1939¹⁵. Unfortunately, neither Korthals Altes nor anyone else has provided consistent estimates of the dividend *yield* of Indonesian stocks. Bosch (1948) presents estimates based on a sample of firms on the Batavia stock exchange, but his series are problematic since he does not weight stocks by market capitalization, nor does he compute geometric averages of monthly yields, but only simple averages. As a result, his series of returns are much too high.

15. As noted in Smits, Horlings, and van Zanden (2000), no sources exist on equity holdings in the other Dutch colonies, which were the Dutch Antilles and Surinam. Particularly the inclusion of Surinam would be interesting, since the abolition of slavery in 1863 and the subsequent compensation of Surinamese slaveholders would be an important aspect of the Dutch private wealth distribution to cover; we hope that future research uncovers methods to estimate these colonial holdings.

van der Eng (1998) presents several estimates, but notes that these are mostly unweighted as well, and agrees with our assessment that this likely results in upward-biased dividend yields; his critical conclusion is that dividend yields were probably only 2 percentage points higher than bond yields on average, which would put Indonesian dividend yields closely in line with our calculated world average. Buelens and Frankema (2016) present average rates of return and dividend yields for 1919-1958, for a sample of 17 firms which were listed on the Belgian stock exchange. They find geometric average dividend yields of 2.7% for the 1919–1928 period, and 1.3% for the 1929–1938 period. These averages are *lower* than our estimates of the world dividend yield by several percentage points. Since it is unclear how representative their sample is of the whole, we stick with capitalizing Indonesian dividend yields with the world dividend yield; this results in a more conservative series of colonial wealth, if anything.

The resulting series of colonial and other foreign asset holdings align quite well with existing estimates. The colonial holdings in 1938 are estimated at approximately 4 billion guilders (70% of national income), which is exactly Tinbergen's estimate and very close to a number of other estimates covered in Bosch (1948). Moreover, we estimate the total amount of listed equity in 1914 at 6.5 billion guilders, which is very close to the 6 billion given by de Vries (1976); moreover, his estimates of domestic shares in that year, at 1.7 billion, are almost identical to ours; his figures for foreign equity – which do not include colonies – is given at around 3 billion, which is close to our 3.5 billion estimate.

Bosch (1948), meanwhile, critically analyzes several estimates of Dutch investments in the United States, one of the major destinations of foreign investment. He suggests a total investment in the U.S. of 1.5 billion guilders in 1908, 1.5-1.7 billion in 1914, 1 billion in 1919, 600 million in 1924, 1.1 billion in 1929, 1.2 billion in 1935, and 1.5-1.75 billion in 1939. All these numbers are well within the range of possibility in our series, consistently suggesting an American share in total non-colonial investment of around 50%, which is very plausible. The only year where this doesn't align well is 1908, where Bosch's estimate is almost our entire estimate for foreign wealth. Since it would be implausible in our view for U.S. investment to remain stagnant for the entire 1908-1914 period, this suggests to us that his 1908 figure might be an overestimate.

After 1995, we use the official National Accounts.

A.3.4.4 Nonlisted Stocks and other Financial Wealth

Nonlisted stocks are the most difficult item to estimate, since there are no official sources for them until 1970. Dutch corporate law did not make a distinction between corporate forms until the early 1970s, when a 'closed' corporation with limited liability was established, the *besloten vennootschap*. Until the 1970s, the main corporate form was the "nameless" corporation, *naamloze vennootschap*, which could be either listed or non-listed. Remarkably, there exist no official figures on the total number of corporations until 1930, shortly after the first official law on this corporate

form was established. Hence, for the vast majority of our period, we do not possess any additional information about even the number of corporations, let alone their balance sheets. Hence, we resort to estimating this wealth component residually until 1970. All other wealth components are accounted for, as described in this appendix. Hence, any remaining difference between an official balance sheet and our series must be attributable to the part of $K_t + NFA_t$ not “covered” by these components, which is the sum of capital stock directly owned by households and non-listed claims on the capital stock of the corporate sector (i.e., non-listed stocks). Hence, we group these together, and term it business assets, as described above.

After 1947 until 1970, we continue with this residual approach, until 1970, when we use the information in the CPB balance sheet for households, which notes ‘aanmerkelijk belang’ (significant ownership), i.e., whether a household owns more than 5% of shares in a firm. Almost always, significant ownership pertains to non-listed firms; nowadays, the majority of significant ownerships are in closed limited liability corporations (*besloten vennootschappen*). Our residually estimated series aligns quite well with the 1970 balance sheet, being a bit higher (88 billion guilders in 1969 versus 65 billion in 1970). This difference – amounting to 20% of national income – is unlikely to significantly affect our results. After 1995, we use the total value of equity holdings, which include non-listed corporations.

Although we can distinguish between capital and nonlisted shares after 1970, we continue grouping nonlisted shares with business assets to avoid sharp trend breaks in our compositional figures which would arise solely due to reclassification.

A.4 Liabilities

The total value of private liabilities was based on the total value of private mortgages (loop der hypotheeken/ openstaande inschrijvingen), which are made available in the Annual Statistics for the Netherlands. Not all mortgages can be ascribed to the household sector; a large fraction is attributable to the corporate sector instead. We have a first breakdown of mortgage debt in 1970, when we both have the historical sources described above and the balance sheet compiled by the CPB. We take the average ratio of household mortgages to total mortgages and apply this pre-1970. The result is a consistent series of mortgage debt; while we might miss some fluctuations by taking this ratio, we have no indication that there were dramatic trends in mortgage debt prior to the 1970s that would qualitatively challenge our results.

We added the number of loans issued by cooperative banks, help banks and credit unions. Unlike commercial banks, these banks were known to issue private, consumer loans. We retrieved this data from Westrate (1948), de Vicq and van Bochove (2023b, 2023a) and de Vicq (2022) respectively.

After 1970, we use the CPB balance sheets for both mortgage debt and other liabilities, until 1995, when we switch to the National Accounts. There is a small trend break in 1995, as the Financial Accounts record more liabilities for

the household sector than the CPB estimates, on the order of 30% of national income.

A.5 Total Household Wealth, 1947–1969

We have balance sheets for the years 1946–1952, available in the National Accounts of 1954, which we show in Figure . These balance sheets also show the single estimate for 1938, which we use to calibrate our manual reconstruction of the national accounts from 1880–1938, detailed in the previous section. These balance sheets, although they do not decompose total wealth into components, do include estimates for total household wealth.

After 1952, the National Accounts no longer feature balance sheets regularly. Two exceptions exist: For 1958, we have a breakdown of national wealth, from which we can subtract the value of government assets to arrive at private wealth; and 1960, where the total size of national wealth is mentioned. We assume that government wealth is the same proportion of national wealth in 1960 as in 1958, and subtract this estimated government wealth to arrive at household wealth for 1960. In sum, we have estimates from National Accounts for household wealth for 1946–1952, 1958, and 1960. As discussed in the main text and in the next section, we also have estimates of balance sheets from 1970 onward. We then interpolate all missing years using the multiplicative decomposition (4), where we residually estimate an average capital gains rate q such that the known endpoints (1958, 1960, and 1970, respectively) are reached. We define private savings as the sum of household, corporation, and financial institution saving. After having estimated the endpoints of each year using this method, we average W_{t-1} and W_t to reach middle-of-year estimates, as is consistent with DINA practice. This means that we have to disregard the data point for 1946, as its value is subsumed in the averaged value for 1947.

The main source for our balance sheets are the balance sheets constructed by the CPB Netherlands Bureau of Economics Analysis, which they published as an appendix to their 2013 *Macro Economische Verkenningen* (Macroeconomic Explorations, MEV). These balance sheets include financial assets, deposits, housing, other real estate, business wealth, and pension claims. We verify that all estimates of these wealth components correspond closely with estimates from other sources, such as various series by Statistics Netherlands and De Nederlandsche Bank. All series mentioned so far match very closely with National Accounts totals. Stocks and bonds are a bit noisier, but the results are still very comparable.

The largest difficulty with the 1970–1994 balance sheets lies in life insurance, which is not included in the MEV balance sheets. There are three sources: Long-run data from DNB on life insurers’ technical reserves, data from Statistics Netherlands on life insurers’ technical reserves, and the data from the National Accounts. The first source is the only one available for the entire period, but is also one that diverges widely from the other two. Hence, we opt for the following approach: For 1970–1974, we adjust the DNB series such that it merges perfectly with the Statistics Netherlands series in 1975, which we use until 1994. This adjustment ensures that the life insurance series

Figure A.1: Household Wealth Estimates in National Accounts, 1938 and 1946–1952

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P. NATIONALE REKENINGEN

159. Nationale Balans, 31 December ¹⁾

	1938	1946	1947	1948	1949	1950	1951	1952
	× mld gld.							
Activa								
Bedrijven en banken:								
Kapitaalgoederen	20,5	44,9	48,3	52,3	57,6	62,8	77,9	78,6
Buitenland:								
Buitenlands saldo	8,5	8,1	5,9	5,5	4,2	4,8	6,6	8,9
Nationaal vermogen	29,0	53,0	54,2	57,8	61,8	67,6	84,5	87,5
	× mld gld.							
Passiva								
Verzekeringsfondsen:								
Potentiëel privaatvermogen .	3,5	6,1	6,5	7,0	7,6	8,3	9,1	10,0
Verbruikers:								
Particulier vermogen	29,9	63,7	65,2	66,9	71,6	74,6	88,3	88,6
Overheid:								
Overheidsvermogen ²⁾	- 4,4	- 16,8	- 17,5	- 16,1	- 17,4	- 15,3	- 12,9	- 11,1
Nationaal vermogen	29,0	53,0	54,2	57,8	61,8	67,6	84,5	87,5

¹⁾ Zie voor toelichting „Statistische en econometrische onderzoeken” jrg. 9, no. 1 en de daarin genoemde publicaties. ²⁾ Deze negatieve bedragen representeren het verschil tussen activa en passiva van de Overheid.

160. Nationaal vermogen per 31 December ¹⁾

	1938	1946	1947	1948	1949	1950	1951	1952
	× mld gld.							
Grond	4,6	11,0	11,5	12,0	12,7	13,5	16,0	16,1
Vorraden	2,6	0,7	1,4	2,1	2,8	4,5	6,8	5,5
Overige kapitaalgoederen	13,3	33,2	35,4	38,2	42,1	44,8	55,1	57,0
Buitenlands saldo	8,5	8,1	5,9	5,5	4,2	4,8	6,6	8,9
Nationaal vermogen	29,0	53,0	54,2	57,8	61,8	67,6	84,5	87,5

¹⁾ Zie noot 1 bij tabel 159.

do not counterfactually exceed the values reported by Statistics Netherlands or the National Accounts, which ensures consistency.

B Estate Multiplier Methods

Table B.2: Exemptions for the succession tax in the Netherlands since 1818

Period	Direct accession line	Indirect accession line
<1878	Exempt	Exempt when below 300 guilders
1878–1896	Exempt when below 1,000 guilders	Exempt when below 300 guilders
1897–1910	Exempt when below 1,500 guilders	Exempt when below 500 guilders
>1911	Exempt when below 1,000 guilders	Exempt when below 300 guilders

Notes: Table shows the exemptions that applied to the inheritance tax in various years. ‘Direct accession line’ refers to direct family of the decedent; ‘indirect accession line’ refers to other family.

The procedure that the authorities went through to identify the amount of tax to be paid has as follows: If after a formal application by the successors of an estate, it was found that the estate’s net worth was likely higher than the appropriate threshold, then a detailed evaluation called “Memorie van Successie” was drawn up. The net worth of those estates – along with the all other deceased individuals with net worth lower than the threshold – were listed alphabetically in Tafel V-bis, which functioned as an annual ledger for the more detailed “Memorie van Successie”. To ensure a high tax morale the authorities maintained “[p]enalties for fraud and evasion were about twice the due tax plus any costs” (Gelderblom, Jonker, Peeters, and de Vicq (2022)). Several crosschecks where in the disposal of the tax inspectors. The actual value of the estate’s land, deposits, and other investments where relatively easy to be verified. In contrast, various types of debt where significantly more difficult to validate (Gelderblom, Jonker, Peeters, and de Vicq (2022)).

Table B.3: Succession tax data thresholds for different periods (for 1900-1910 the data are available in two publications with different brackets/threshold).

Period	# Brackets	Thresholds
1882–1910	20	300; 500; 1,000; 1,500; 2,000; 3,000; 5,000; 7,500; 10,000; 15,000; 20,000; 25,000; 30,000; 40,000; 50,000; 75,000; 100,000; 150,000; 200,000; 300,000; 500,000; >500,000
1900–1955	8	100; 1,000; 2,000; 5,000; 10,000; 25,000; 50,000; 200,000; >200,000
1956–1984	10 (12)	(<0; 0;) 100; 1,000; 2,000; 5,000; 10,000; 25,000; 50,000; 100,000; 200,000; 500,000; >500,000

In terms of population coverage, during the early period of 1854–1878 it is only the indirect heirs that were subject to the estate tax. However, we do not have data on how many indirect heirs (which are the actual filers) are included in the reported aggregate wealth totals. The number of filers is important in making the conversion from the amount of

wealth identified by the death duties tax to the aggregate wealth in the economy. But for the years 1878–1910 we do have the data split between direct and indirect heirs, so we can extrapolate backward and approximate the number of (indirect heir) filers for the 1854–1878 period, as shown in table B.4. In this we are assuming that the ratio of indirect heir filers is equal to that from 1880 (and therefore the coverage remains fixed at 5.27%). The data from 1878 onward are available in tabulated form, with more granular thresholds, as shown in table B.3 above.

Table B.4: Coverage of the death duties tax in the Netherlands 1850-1980 from selected years (see text for details regarding the 1850-1870 estimation).

Year	Total Deceased	Filers	Coverage
1850	69,377	3,656	5.27%
1860	84,382	4,447	5.27%
1870	95,289	5,022	5.27%
1880	95,282	9,508	9.98%
1890	93,246	10,090	10.82%
1900	92,043	11,101	12.06%
1910	79,984	10,712	13.39%
1920	81,525	13,623	16.71%
1930	71,682	14,382	20.06%
1940	87,722	18,251	20.81%
1948	72,459	19,602	27.05%
1956	85,000	37,119	43.67%
1963	96,000	35,874	37.37%
1970	110,000	38,167	34.70%
1975	114,000	48,398	42.45%
1980	114,000	43,410	38.08%

The specific Tafel V-bis that was processed and made available by Gelderblom, Jonker, Peeters, and de Vicq (2022) contains all individuals that died in 1921, that had a wealth above the tax threshold, and also includes their demographic profile (age and gender), and their total wealth valuation. A limitation of using this source to estimate an estate multiplier is that it is we need to use the same multiplier for all the years. To address this limitation we devise a method based on the ratio of the estimated estate multiplier for 1921 and the dynamic estate multiplier (which is the one obtaining by dynamicly assuming that there is no mortality rate differential between the rich and the general population). We estimate this dynamic multiplier as the ratio of total population size over the total number of deaths. We index the series by dividing with the dynamic multiplier for 1921. Multiplying the 1921 multiplier that we estimate based on the Tafel V-bis data with the indexed series of these dynamic multipliers we produce a dynamic series of alternative dynamic estate multipliers that consider the changes in the population dynamics. The last step in this procedure is to take the average of the fixed and the alternative series to obtain our final estate multiplier series. This step is based on the observation that the bias from the fixed multiplier and the bias introduced from the dynamic alternative series move in opposite directions. Both methods and the rationale behind these biases are discussed next.

Given the availability of detailed wealth and age data on the individual level for 1921 from Gelderblom, Jonker,

Peeters, and de Vicq 2022, we will use them to estimate the aggregate estate multiplier for 1921. Our problem, however, is that for 1921, although we have the population that died at various wealth and age groupings, we do not know what is the corresponding size of each of those groupings in the general population. For example, we do know that in 1921, there are say 3275 50-60 year old with wealth more than 15K who died, but we do not know in 1920 how many were the living 50-60 years old with wealth more than 15K. Therefore, we do not have a proper denominator to estimate the mortality rates for each wealth group. In the solution described in the next paragraph we are able to estimate an average mortality rate for the rich as a whole, and through that arrive at an aggregate estate multiplier.

To overcome the lack of proper denominator problem, we work as follows: from a different source (see next section) we have the wealth tax data from 1920 (which is the reference year for the death rates of 1921). We have these wealth tax data for the population as a whole distributed in various wealth buckets. But, we have no information with respect to their age distribution per bucket. To address this we combine the wealth tax data buckets with the 1921 data in the following way: for each of the wealth buckets we get the age distribution from the 1921 Tafel-V bis data, by splitting our complete 1921 inheritance tax data into the same buckets that the wealth tax data are provided with. Doing so for all buckets in 1921 we obtain an estimate for the age-wealth distribution. We then re-combine the 1921 data using the wealth buckets used in 1920 in order to get an estimate of the 1920 age structure of the wealth tax data. In this we assume that the individual sample in the death duties for 1921 is not substantially different compared to 1920. Unfortunately though we do not have enough data to populate all the age-wealth groups required from the wealth tax data buckets. We therefore gather all the rich in one group (>15000 guilders),¹⁶ and we thus obtain the mortality rate of the rich in general, as we are not able to distinguish the age wise distribution of the death rate of the rich.

Our end goal here is to estimate an aggregate estate multiplier that can be applied upon the total death duties wealth, since we do not have the inheritance data split across age groups. To estimate this aggregate estate multiplier for 1921 we will exploit the mortality rate for the rich that is estimated based on the procedure in the previous paragraph. A byproduct of the procedure is the age distribution of the rich (we already have the total number of rich we have for 1920 based on the wealth tax). We then multiply each age group in that distribution with the mortality rate of the general population, to get the number of the rich that would exist should the rich and the general population have the same mortality rates (R_t). The ratio of the actual number of rich over R_t is the ratio of the average mortality rate differential between the rich and the general population (M_d). We now divide the mortality rates from 1921 with this ratio M_d to create the adjusted mortality rate table. We populate the adjusted mortality rates table with the expected wealth for each age group based on the data from Tafel V-bis, which gives us the average wealth per age group. Dividing each average wealth per age group cell with the adjusted mortality rate for each age group, gives us the total wealth in the

16. The aggregate from the official data is 451,912,000 but in the Tafel V-bis data for 1921 we have 412,440,216. We therefore multiply all inheritance entries with this ratio.

population for each age group. Summing all these total wealth estimates produces our estimate for total wealth in the population for 1921. Finally, taking the ratio of the estimated total wealth in the population over the total wealth captured by the estate tax gives us the estimate for the aggregate estate multiplier for 1921.

For the period 1854–1878 period, where only indirect heirs are taxed and registered, we work in two steps: first, we use one multiplier from the years 1878–1910 for which we have the data split between direct and indirect heirs, to bring the indirect–heir–only data to a comparable level with the post-1878 period; second, we multiply by the same mortality rate multiplier as we do for all other years.

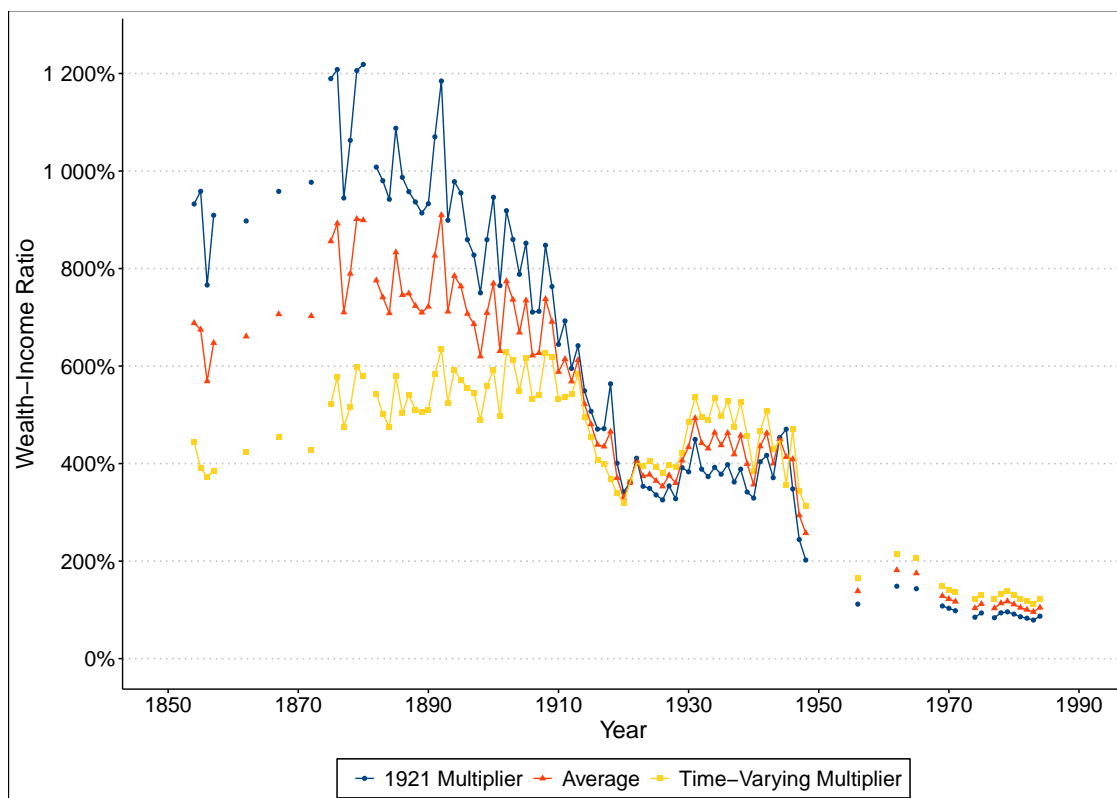
Applying the estate multiplier from 1921 on all years assumes that the age differential between the rich and the entire population is constant across all years. To incorporate a dynamic element in our estate multiplier estimates we introduce the concept of the dynamic estate multiplier. The dynamic estate multiplier for year t is the ratio of all the living in year $t - 1$ over all that died in year t . The dynamic estate multiplier assumes that there is no differential in terms of mortality rates between the rich and the general population. Taking the ratio of the dynamic estate multiplier over the estimated multiplier for 1921, we isolate the differential between the two in one year of reference. We then index the entire series of dynamic estate multipliers. This way we have another series of estate multipliers that can be used under the assumption that the ratio between the *true* multiplier (meaning the multiplier that we would obtain from ideal data) and the dynamic multiplier is constant across the years. This implies that the mortality rate differential between the rich and the rest of the population is constant across the years. But we know from other sources, that there are evidence that do not support this claim, and indicate that this differential is probably diminishing in time (Kopczuk and Saez (2004)). Therefore the adjustment required to move from the available total mortality rates to the (estimated) mortality rates of the rich becomes smaller. This means that the results of our fixed multiplier series and the dynamic multiplier series will move relatively as a product of time, and this is captured well in figure B.2). The two methods provide reasonably close estimates for the post 1911 period, but diverge seriously in the earlier years.

One reason of this divergence may be the substantial increase of the crude death rate in the earlier period. On average, during the 1910–1979 period the crude death rate is around 9.5% while in the 1850–1909 period it is 21.7% (Petersen 1960). Most of the divergence takes place during the 1890–1910 period, which also corresponds to the period where the bulk of the divergence builds-up as shown in the figure above. Given this large deviation in the earlier period between the two series, one solution would be to take the average of the two series as our final estate multiplier series, so that we reasonably lower the probability that our results are driven from the surge in the crude death rates prior to our benchmark year.

However, since our ultimate concern is to produce estimates which match the historical national accounts (HNA) series in 1880, we choose the series based on the dynamic multiplier. While this multiplier makes strong assumptions, it does introduce time-variation in the estimates, and matches the 1880 HNA estimate quite closely (see Figure 2). Hence, the estate multiplier series based on the dynamic multiplier is the one reported in Figure 2.

Regarding our final estimates of household wealth we turn to the *growth rates* of these estimates instead of their levels. Given our preference for using the HNA estimates as our core set, we take the first year for which we have an estimate based on the HNA method (1880), and use the dynamic estate multiplier series as an index to get the values for the pre-1880 period. For that period, as seen in Figure 2, the fit with the HNA series is good, and the indexing approach guarantees continuity with the reference HNA series.

Figure B.2: Estate Multiplier Estimates per Method



Notes: Figure shows total wealth estimates based on the estate multiplier method, using three alternatives: (a) the fixed aggregate estate multiplier for 1921, (b) the dynamic aggregate estate multiplier, and (c) the average of (a) and (b). Our death duties series in Figure 2 is the series using the dynamic multiplier.

C Wealth Tax

We use the tabulated figures produced in *Jaarcijfers voor Nederland*, which became its English equivalent *Statistical Yearbook* in the 1970s and which provide values from 1894–1993. The following Table C.5 reports the structure of brackets over the years.

The method applied by Wilterdink (1984) and developed by Potharst (2022) uses information on the thresholds of each wealth bracket to estimate a lognormal distribution. Essentially, the method estimates the overall mean μ and

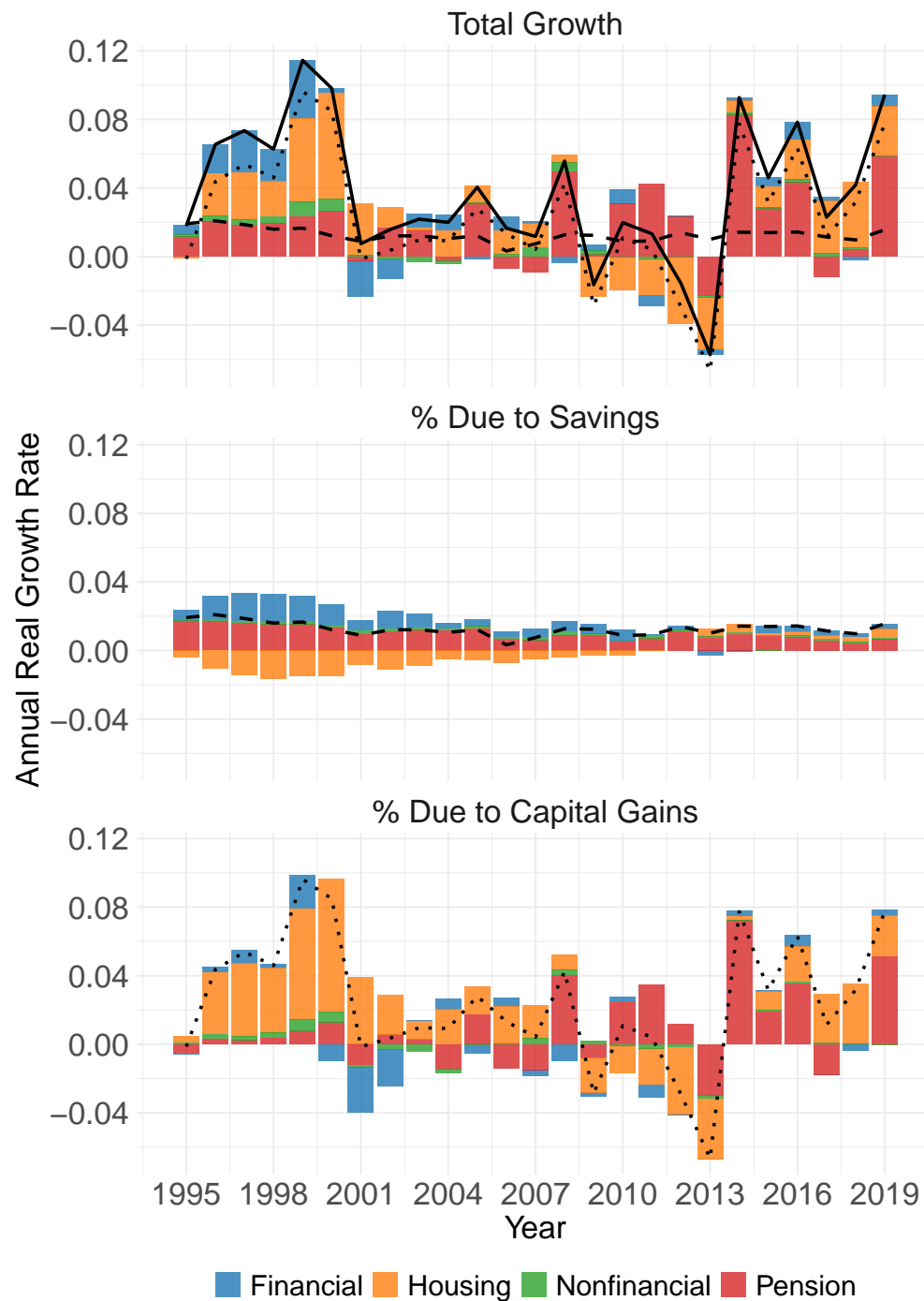
Table C.5: Wealth tax data thresholds for different periods.

Period	# Brackets	Thresholds (in 1,000 NLG)
1894–1914	18	13; 15; 20; 30; 40; 50; 75; 100; 150; 200; 300; 500; 750; 1,000; 1,500; 2,000; 5,000; 10,000; >10,000
1915–1924	17	15; 20; 30; 40; 50; 75; 100; 150; 200; 300; 500; 750; 1,000; 1,500; 2,000; 5,000; 10,000; >10,000
1925–1941	9	16; 30; 50; 100; 200; 300; 500; 1,000; >1,000
1942–1956	11	<10; 10; 15; 20; 30; 50; 100; 200; 300; 500; 1,000; >1,000
1957–1969	7	<50; 100; 200; 300; 500; 1,000; >1,000
1970–1973	16	100; 150; 200; 300; 400; 500; 600; 700; 800; 900; 1,000; 1,500; 2,000; 3,000; 5,000; 10,000; >10,000
1974–1975	10	100; 150; 200; 300; 500; 1,000; 1,500; 2,000; 5,000; 10,000; >10,000
1976–1982	6	100; 150; 200; 300; 500; 1,000; >1,000
1983–1993	6	200; 300; 400; 500; 750; 1,000; >1,000

variance σ^2 by minimizing the squared distance between the observed percentile-bracket average pairs of each bracket, and the theoretical lognormal distribution. Once we have an estimated mean and variance, we can integrate over the density to arrive at an estimate of total wealth. Then the estimated total wealth above the lowest wealth threshold that it is captured by the wealth tax data is substituted by the actual total wealth contained in the wealth tax tabulations (although the difference between the estimated and the data is relatively small with the theoretical being on average 0.5% – and a standard deviation of 4% – lower than the data across the entire period). We refer the reader to Potharst (2022) for further details.

D Additional Figures

Figure D.3: Decomposition of Household Wealth Growth by Wealth Component, 1995–2019



Notes: Figure shows annual real wealth growth rates since 1995 (solid black line). The growth rate is decomposed into a part due to savings (dashed black line) and a residual component due to capital gains (dotted black line). Both the total growth rate and the parts due to savings and capital gains are further split into relative contributions per broad wealth component.