Online Appendix to "Wealth-Income Ratios in a Small, Open Economy: the Netherlands, 1854–2019"

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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) in the main text, 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	1880 – 1994	Residential dwellings from capital stock + estimate of land under dwellings, benchmarked to official balance sheets
		1995 – 2019	National Accounts
	Business Assets: Agricultural Land	1880 – 1994	Agricultural area + price index for farmland
		1995 – 2019	National Accounts
	Business Assets: Livestock	1880 – 1938	Annual statistics (+ interpolations) for cattle + assumed value for horses from wealth tax
		1947 – 1994	Total number of livestock + agricultural land price index, benchmarked to 1958 total value
		1995 – 2019	National Accounts
	Business Assets: Remainder	1880 – 1968	Residually estimated based on identity $W_t = K_t + \mathrm{NFA}_t$
		1995 – 2019	National Accounts (incl. non-listed shares)
Financial Assets	Deposits	1880 – 1938	Total deposits at banks, benchmarked by 1938 balance sheet for split household/corporate
		1947 – 1969	Statistics Netherlands series, benchmarked by 1938 balance sheet
		1970 – 1994	CPB estimates
		1995 – 2019	National Accounts
	Currency	1880 – 2019	Same sources and procedure per subperiod as for deposits
	Pension and life insurance	1880 – 1969	Central bank statistics
		1970 – 1994	CPB estimates (pension); Central bank estimates, adjusted to match trends
		1995 – 2019	National Accounts
	Bonds	1880 – 1938	Value of privately held treasury bonds (benchmarked to 1938 balance sheet)
		1947 – 1969	Total value of treasury bonds
		1970 – 1994	CPB estimates
		1995 – 2019	National Accounts
	Listed Stocks	1880 – 1938	Total value of stock market index, + capit. value of net foreign income
		1947 – 1969	As above
		1970 – 1994	CPB estimates
		1995 – 2019	National Accounts
	Nonlisted stocks & Other	1880 – 1969	See Business Assets, Residual
		1970 – 1994	CPB estimates (part of Business Assets)
		1995 – 2019	National Accounts (part of Business Assets)
Liabilities	Mortgages	1880 – 1969	Annual statistics, adj. for part of mortgages attributable to households
		1970 – 1994	CPB estimates
		1995 – 2019	National Accounts
	Other Liabilities	1880 – 1969	Annual statistics
		1970 – 1994	CPB estimates
		1995 – 2019	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) in the main text. 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 Netherland 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 Netherlands[1], 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

1. 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 Prijscourrant. 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 afterwards[2]. Then, we capitalize these dividend streams $y_t^{f,div}$ using an average dividend yield $r_t^{f,div}$, using

2. 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.

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

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 1939[3]. 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.

3. 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 household 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 $K_t + \text{NFA}_t$ 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 hypotheken/ 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 know 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

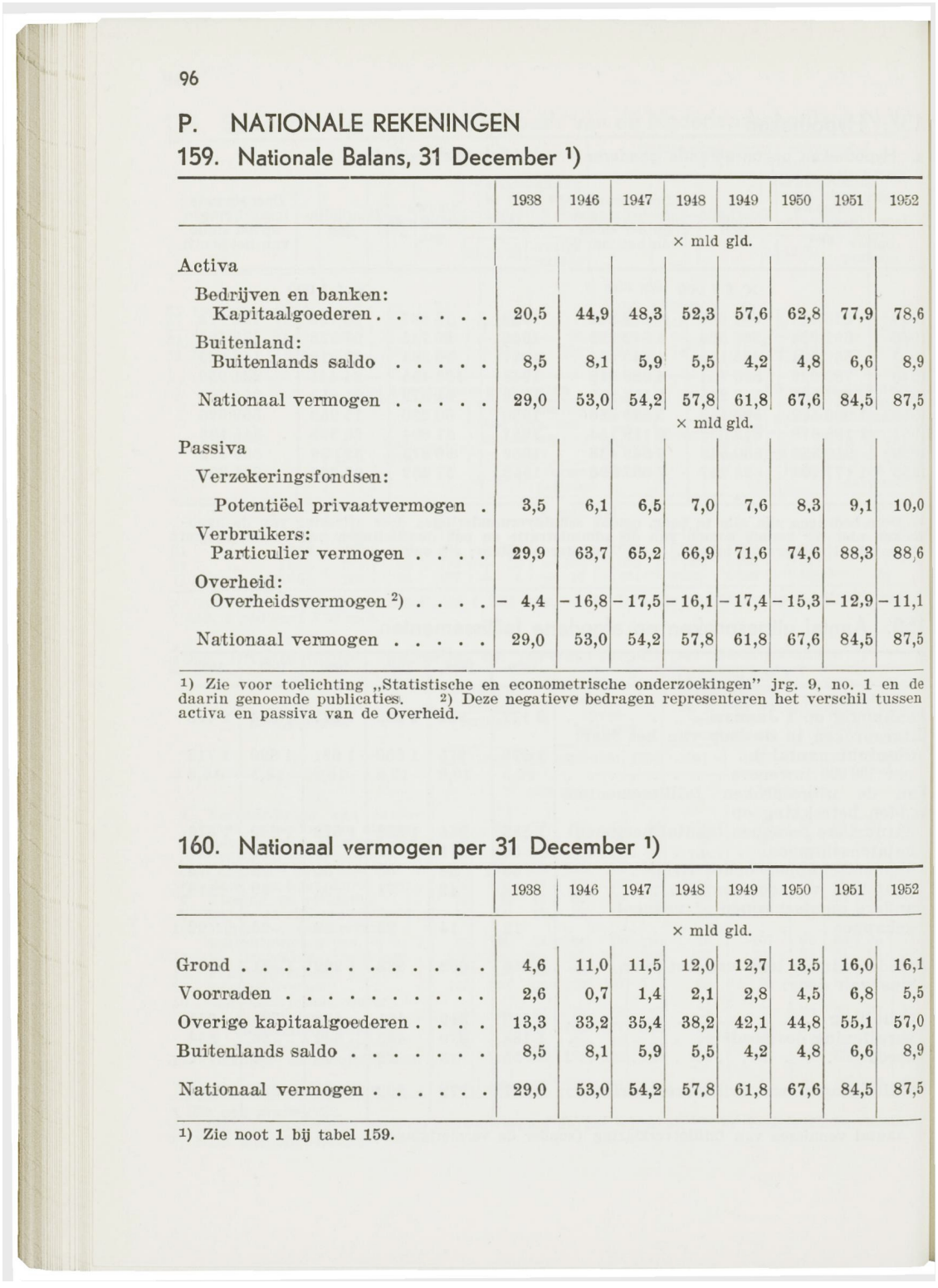
We have balance sheets for the years 1946–1952, available in the National Accounts of 1954, which we show in Figure . These balance sheets also show the single estimate for 1938, which we use to calibrate our manual reconstruction of the national accounts from 1880–1938, detailed in the previous section. 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 household 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 (equation (4) in the main text), 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 onderzoekingen" 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
Voorraden	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 thought 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),[4] 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 spit 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

4. 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.

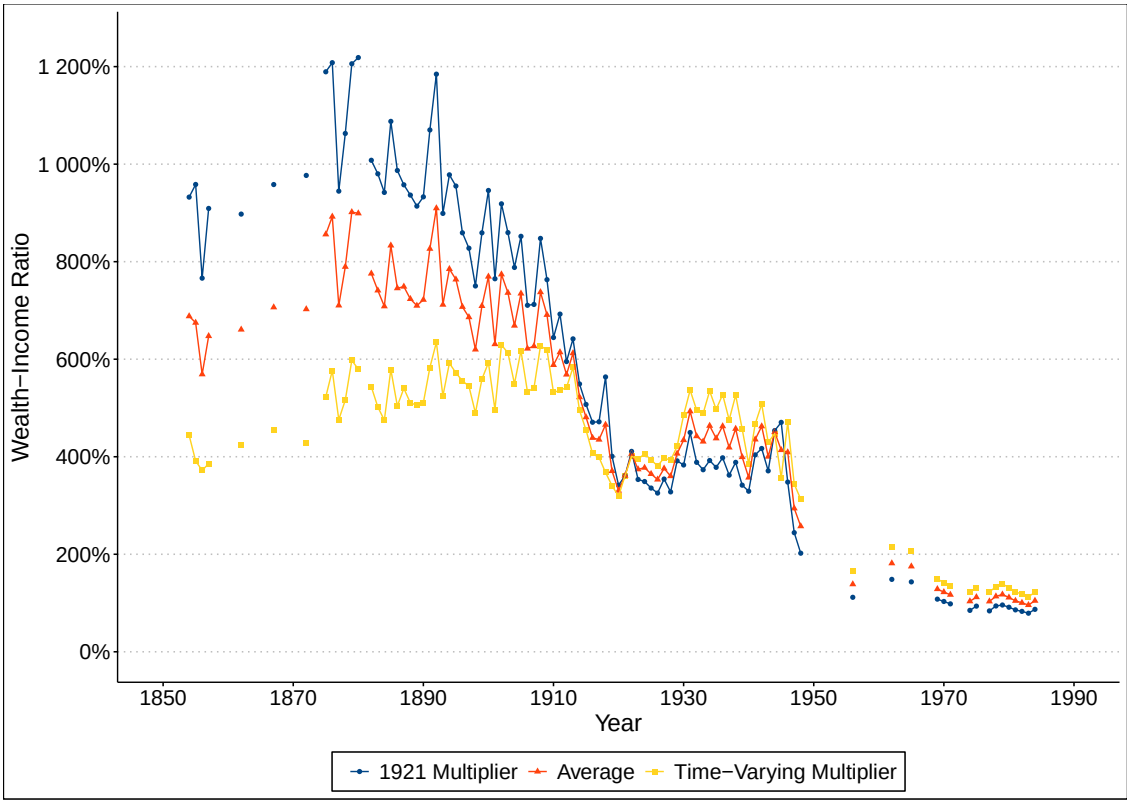
One reason of this divergence may be the substantial increase of the crude death rate in the earlier period. On average, during the 1910–1979 period the crude death rate is around 9.5% while in the 1850–1909 period it is 21.7% (Petersen 1960). Most of the divergence takes place during the 1890–1910 period, 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) in the main text). Hence, the estate multiplier series based on the dynamic multiplier is the one reported in Figure (2) in

the main text.

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) in the main text, 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) in the main text 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

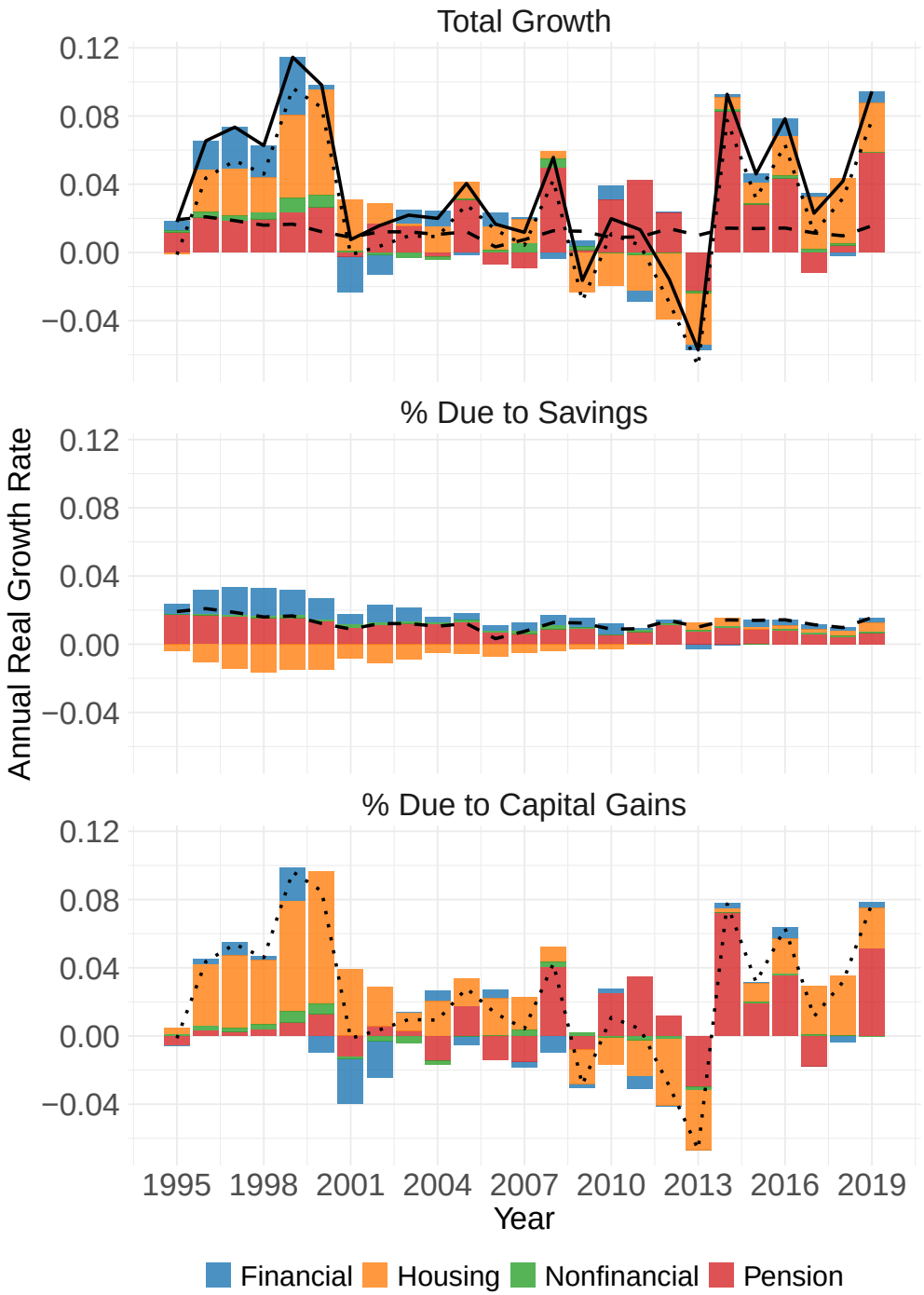
Table C.5: Wealth tax data thresholds for different periods.

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

each wealth bracket to estimate a lognormal distribution. Essentially, the method estimates the overall mean μ and 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.

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