Data Appendix for Wealth and its distribution in Germany, 1895-2018

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Abstract

This Data Appendix supplements the paper 'Wealth and its distribution in Germany, 1895-2018'

Contents

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Overview

The first part of this data appendix provides an extensive discussion of data sources, assumptions, methodologies, and previous estimates. It is structured by period to give the reader the opportunity to quickly find the information that she is interested in. In addition to this appendix, we provide spreadsheets that likewise provide references, the raw data, and required transformations thereof.

In the second part, we provide an additional overview about how we dealt with border changes, more details and validations of the counterfactual exercises that we conduct in the main paper, and auxiliary data series that we have created for the purpose of this paper.

We make available all data on our websites. Shall you be interested in obtaining scans of the primary sources that we have used in this study, please do not hesitate to contact us.

DA 1 Prussia and German Empire, 1895-1914

To track the evolution of wealth and its distribution in the pre-WW I period, we proceed as follows:

- We calculate a benchmark estimate of total wealth and its composition for the German *Reich* in 1913. Furthermore, we estimate the distribution in this year using the official statistics about the *Wehrbeitrag*, a wealth levy collected for increasing Germany's military power on the eve of World War I.
- To track the evolution for the years leading to 1913, we rely on Prussian data on the *Ergänzungssteuer*, a wealth tax first levied in 1895 in Prussia. Based on these data, we
  - estimate changes in the total wealth, which we employ to extrapolate the German wealth total.
  - track changes in the composition of wealth, which we then project to the *Reich*'s totals.
  - estimate changes in the distribution, which we then project into the *Reich*'s shares.
- Accordingly, this part of the documentation has 3 subsections: Section DA 1.1 provides the documentation for the Prussian data, Section DA 1.2 documents the benchmark estimate for Germany for 1913, and Section DA 1.3 documents why and how we employ the Prussian wealth tax to infer the level, distribution, and dynamics of wealth for the whole German Empire.

DA 1.1 Prussia 1895–1914

DA 1.1.1 Wealth tax regime and definition of fiscal wealth

To levy the wealth tax ("Ergänzungssteuer"), households' wealth was assessed in 1895, 1896, 1897, 1899 and from that year onwards every three years. A big advantage of these data is that they rely on a personal net wealth concept similar to today's understanding. The wealth definition comprises (1) real estate and (2) agricultural land, including the housing structures and farm capital stock respectively (in this period (1) and (2) are called *Grundbesitz* in German), (3) capital assets and capital rights (*Kapitalvermögen und Kapitalrechte*), (4) business assets net of the company's debt (*Anlage- und Betriebskapital*). It excludes consumer durables (see Buck, 1914, a handbook for tax officers).[1] The definition of capital/financial assets encapsulates amongst other items cash, domestic and foreign stocks, bonds, life insurances, and non-public retirement funds. To reach the total taxable net wealth (*Reinvermögen*), all liabilities were deducted from the total gross wealth (*Rohvermögen*).

Except for agricultural and forestry assets, the valuation of the above mentioned assets followed the idea of a 'common value' (*gemeiner Wert*). This is best described as the market value abstracting from very short-run fluctuations (Buck, 1914, p. 222). Buck (1914, p. 223f) describes the valuation for each asset class (and all the types belonging to the respective class) in great detail and thus we constrain ourselves to the most important ones.

(1) Real estate:

For the valuation of real estate the last sales price of a house or lot is taken. If they were not sold for a reasonable amount of time, then the prices of neighbouring lots and houses should be used (taking into account the size and quality, etc.). In general, the land registry (*Katasteramt*) was required to assist the valuation of real estate. They registered all sales and leases of land lots according to three categories (buildings, farms with land, and land only). They then calculated cadastral values (*Einheitswerte*) for these three categories, which could be used if no recent sale was made to base an estimate upon.

(2) Agricultural and forestry assets:

Agricultural and forestry assets represent a special case. Because of practical reasons (rare sales), it was not possible to value them based on sales prices. Instead, the land value was assessed by capitalising income from land by the factor of 25 (Buck, 1914, p. 233). The local land registries would provide a typical net yield based on their assessment

[1] The only major difference is that land property and small businesses outside Prussia were not included (Buck, 1914, p. 241). Shares in foreign companies, however, were part of the taxable wealth. Crucially, wealth in private retirement funds was also included and similar capital wealth was included.

of leasehold contracts. There also existed detailed tables (by size of the farm) and exact guidance for the valuation of agricultural land. In general, this valuation method was very sophisticated for the end of the 19th century (see Buck, 1914, p. 233-245 for further details). We consider it to represent a plausible approximation of market values. We benchmark the results of this valuation against other sources later.

(3) Capital assets:

These were assessed at their market value. Tax units declared their cash and cheques at their nominal values and the market valuation of their stock and bond holdings. For non-traded interest bearing assets, tax units had to declare a potential selling price based on the interest they received for the asset. All special cases are described in Buck (1914, p. 224). While being novel, the taxation of capital wealth was very sophisticated. For example, the handbook for tax officers and those who had to declare wealth taxes included tables to calculate the net present value of usufructuary rights.

(4) Business assets:

These include only companies that are *not* limited liability companies such as joint stock companies (*Aktiengesellschaften*) and so-called *Gesellschaften mit beschränkter Haftung*. These two types are already included among the capital assets. If a balance sheet was available, it was used to assess the value of the business (Buck, 1914, p. 233). If there was no balance sheet available the valuation of the company was carried out in market prices and largely followed the valuation for real estate and capital assets where appropriate. Both types of valuations could be re-assessed by local commissions.

DA 1.1.2 Reference total population

The reference total population is the number of taxpayers plus the number of tax exempt. Potential tax units were either adult non-married persons or the nuclear family according to the Prussian wealth tax law (*veranlagte Haushaltsvorstände und Einzelwirtschafter*). More precisely, the household head jointly declared his wealth and the wealth of his wife and his children, but not the wealth of more distant relatives.

Table 1 displays the total number of tax units, the share of those having less than 6,000 Marks (and thus were not assessed), and those above the threshold. Throughout the period 1895-1914, the share of tax units that were subject to the wealth assessment ranges from 12.3 to 13.4%. Among those assessed were households that had to (i) pay the wealth tax without any reduction, (ii) pay the wealth tax, but with a reduction because of special circumstances (§19.1) or (iii) being exempted because of special circumstances, but having a wealth of more than 6000 Mark (§17.2, §17.3, §19.2). Household heads with a wealth of less than 6000 Mark were exempted from the tax (§17.1) and they had no

Table 1: **Reference total population for Prussia, 1895–1914**

Year	∑ tax units	<6,000 marks	≥6,000 marks, of which...			
			paying full tax	paying reduced tax	assessed, but exempted	∑
1895	11,256,643	87.4%	7.9%	2.3%	2.3%	12.6%
1897	11,723,457	87.7%	7.7%	2.3%	2.3%	12.3%
1905	13,567,150	87.6%	8.0%	2.1%	2.3%	12.4%
1914	16,254,480	86.6%	9.4%	2.6%	1.5%	13.4%

Sources: Königliches Statistisches Bureau (1918, p. 189, 306) and various editions of the *Statistik der preussischen Einkommen- und Ergänzungssteuer-Veranlagung.* See spreadsheet *Population_totals_Kaiserreich.xlsx* for additional years.

obligation to declare this to the authorities. For the law's commentary, see Buck (1914).

DA 1.1.3 Reference total wealth

In this section, we discuss the sources and methods to estimate total net private wealth, compare our estimates to existing ones, and provide an estimate of the structure of wealth.

Methodology and data for net private wealth estimate The most direct way to estimate total net private wealth of Prussia according to the above definitions is to combine the wealth of three different types of tax units: (1) those paying taxes, (2) those paying reduced rates, (3) those being exempted either because they fell below the 6,000 Mark threshold or for other reasons. Finally, one wants to adjust for the under- and mis-reporting of wealth.

The contemporary Prussian bureaucrat Biedermann (1918) followed precisely this procedure to calculate the private net wealth held in Prussia for 1895 and 1914. Because the reductions and exemptions apply to certain levels of wealth, it is easy to make reasonable assumptions for the wealth of these individuals. For his estimates of the average wealth of those being exempted, Biedermann relied on deposit data. He also made a 10% allowance for mis- and under-reporting, which he apparently considered more reasonable than the 20% suggested by Helfferich (1914a, more details on this estimate later). Following Biedermann's strategy, we calculate the total net private wealth as:

taxable net wealth in tax statistics × adjustment for under-reporting (1)

+ net wealth of those paying the reduced rate × adjustment for under-reporting (2)

+ net wealth of those being exempted × adjustment for under-reporting (3)

= total net private wealth

(1) Taxable net wealth in tax statistics:

These data are available in various statistical publications by the Königliches Statistisches Bureau: 1895 (Königliches Statistisches Bureau, 1906, p. 402-407), 1896 and 1897 (Königliches Statistisches Bureau, 1897, p. 236-308), 1899 (Königlich Preussisches Statistisches Landesamt, 1899, p. 243f), 1902 and 1905 (Königlich Preussisches Statistisches Landesamt, 1905, p. 219f), 1908 (Königliches Statistisches Bureau, 1909, p. 245–246), 1911 (Königliches Statistisches Bureau, 1912, p. 492–494), and 1914 (Königliches Statistisches Bureau, 1915, p. 548).

(2) Net wealth of those paying the reduced rate

The law makes the following provisions:

> §19.1 Individuals who have wealth less than 32,000 Marks and do not pay income tax, pay a maximum of 3 Marks. If they are within the first four income tax brackets (up to 1350 Marks income), they pay a maximum of 2 Marks less than their income tax. This rule results in payments of 4, 7, 10, or 14 Marks.
>
> §19.2 Individuals with wealth up to 52,000 Marks could get a reduction of two brackets ("Stufen") if they could show that they had special circumstances as defined in the income law §19. This paragraph had little practical relevance as few were eligible.[2]

In order to get a tax reduction, tax units had to report their exact wealth. Königliches Statistisches Bureau (1909, 1912, 1915) reports the respective sums for those paying reduced taxes in 1908, 1910, and 1914 respectively. The average wealth per households implied for these years differs very little. It was around 20,500 for those paying 3,4, and 7 Marks and 26,800 for those paying 10 and 14 Marks, respectively. It is fair to assume that tax units that could claim these deductions had a similar wealth throughout the period. We thus apply the average net wealth for the three available years to the remaining years for which the corresponding numbers had not been reported. To create an estimate of the total net wealth owned by these individuals, we multiply the average wealth with the number of individuals paying the respective reduced rates — the number of them can be found in Königliches Statistisches Bureau (1918, p. 189).

(3) Net wealth of those being exempted:

The Prussian tax law allowed for tax units to be exempted in four cases:

> §17.1 The tax unit's net wealth was less than 6000 Mark.

[2]For example, in 1897, only 124 household heads would fall in the category 32,000-52,000.

§17.2 The net wealth of a male tax unit was less than 20000 Mark and his income less than 900 Mark.

§17.3 The net wealth of a female tax unit was less than 20000 Mark and her income less than 1200 Mark.

§19.2 Individuals could get a reduction of two brackets ("Stufen") if they could show that they had special circumstances as defined in the income law §19. This required a case-based decision. In some cases this would lead to an exemption, i.e. if the wealth was within the first two brackets.

Unfortunately, the tax tabulations themselves do not provide information on the wealth of those being exempt other than that they have to fall into certain ranges as defined by the law (see above). Yet, the wealth of the bottom 85 % and its development over time is important for estimating the overall wealth distribution.

Fortunately, the above-mentioned Prussian statistician Biedermann published estimates of the wealth of those paying no wealth tax for 1895 and 1914. These estimates were presumably based on internal documents and the evolution of savings over time. They appear to have been overlooked so far, likely because they were published during the war years in one of the many official Prussian statistical journals. Taking them has certain advantages over using other contemporary estimates of total wealth in Prussia. The main advantage is that the estimates follow the definition of wealth of the wealth tax. Moreover, of all contemporary observers, the statisticians in the Prussian ministry working on wealth statistics seem the ones that are likely to give the best estimate of the wealth of those not paying taxes.

For 1895, Biedermann (1918, p. 68) makes the following calculations for those exempted from the wealth tax:

- $\frac{5{,}276{,}000{,}000\ M}{8{,}140{,}000\ Households} \approx 645\ p.h$ Marks for those that have less than 6000 Marks net worth
- $\frac{2{,}882{,}000{,}000\ M}{356{,}000\ Households} \approx 8{,}095\ p.h.$ Marks for those that are exempted by §17.2, 17.3, 19.2.

For 1914, Biedermann (1918, p. 75) makes the following calculations for those exempted from the wealth tax:

- $\frac{5{,}300{,}000{,}000\ M + 6{,}290{,}000{,}000\ M}{7{,}595{,}000 + 6{,}290{,}000\ Households} \approx 835\ p.h.$ Marks for those that have less than 6000 Mark net worth
- $14{,}500$ Marks for those that are exempted by §17.2, 17.3[3]

[3]A mere 72 people were exempted after §19.2, which is why we assume the same average wealth for them in 1895 as for those exempted after §17.2 and 17.3.

We can now interpolate these per household wealth values for the two groups between 1895 and 1914. To do so, we calculate the respective compound annual growth rates:

$$g_B = \frac{835}{648}^{\frac{1}{1914-1895}} - 1 \approx 1.34\%$$

$$g_A = \frac{14,500}{8,096}^{\frac{1}{1914-1895}} - 1 \approx 3.12\%$$

Table 2 reports the wealth total for Prussia by summing the three parts and making an additional adjustment for mis-reporting as discussed above.

Table 2: **Reference total net wealth for Prussia, 1895–1914**

Year	Wealth in b Marks of those paying...			Total unadjusted (4)	Total adjusted (5)
	..full taxes (1)	..reduced amount(2)	..no tax (3)	(1 + 2 + 3)	(4) × 1.1
1895	58.27	5.53	8.49	72.29	79.52
1897	59.75	5.82	9.14	74.71	82.18
1905	76.06	6.19	12.18	94.43	103.88
1914	106.66	8.78	15.27	130.72	143.79

Notes: Own calculations (see text for details and sources). See spreadsheet *Weatlh_totals_Kaiserreich.xlsx* for additional years.

Comparison to existing estimates The magnitude of personal wealth in Prussia and Germany was debated intensely at the eve of World War I. As Delbrück (1909, p. 176) was interested in the amount that is not covered by the wealth tax, he came up with an estimate of 166b marks for 1907 using mainly fire insurance statistics. He concluded that the amount of wealth declared to the tax authorities should be around 142b Marks leaving 14b Marks of the wealth exempted from the tax. However, the wealth declared to the tax authorities only totalled 91.6b Marks. His estimations were heavily contested in the same year by May (1909) using similar sources, who produced an estimate of 140b Marks for 1907 out of which 112b Marks should be taxable wealth under the provisions of the tax law. This suggests that fire-insurance based estimates were very uncertain.

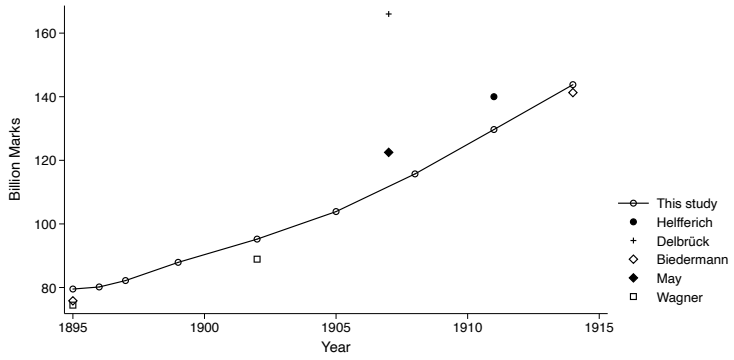
Another problem of contemporary estimates is that they were often driven by nationalistic attitudes. Steinmann-Bucher (1916) even documented a supposed rapid rise of wealth during the war, obviously at odds with reality (Biedermann, 1918, p. 85). The qualification that contemporary estimates were tainted by nationalism certainly also

holds true for the oft-cited estimate by Helfferich[4] (e.g. in Piketty and Zucman, 2014, Appendix, p. 82).

Helfferich (1914a) estimates net private wealth in Prussia to be 160.2 b Marks in 1911 based on the following components: (i) total wealth recorded for the wealth tax: 104b Marks, (ii) unrecorded items/misreporting: 20 % of that value, (iii) wealth of those not paying the tax: 15.4 billion Marks, (iv) consumer durables: 15b Marks, and (v) unrecorded items by companies: 5b Marks. Most of these items are not actually estimated but rather assumed ad hoc. Two other problems are most obvious. Our definition of wealth would not include (iv) consumer durables. Nor do (v) unrecorded items by companies seem an item one should include if business assets are already in the tax data (and inflated by 20% for potential misreporting). Helfferich's wealth estimate pertaining the exempted (iii) is relatively similar to ours. However, we trust Biedermann's estimates more as he was actually working for the ministry and his study appears to be more elaborate.

The difference between our and Helfferich's net private wealth estimate thus mainly originates from the allowance for (ii) unrecorded items. As mentioned above, Biedermann estimates that these could account at most for 10% of the reported wealth and we stick with his estimate rather than Helfferich's 20%.

Figure DA 1.1: **Comparison with contemporary estimates for Prussia**



Notes: Data are own estimate and from Delbrück (1909), May (1909), Helfferich (1914a), Biedermann (1918), and Wagner (1904). Not all of them follow the same wealth concepts (see text). Helfferich's estimate is adjusted to conform with our wealth concept.

Figure DA 1.1 shows a variety of wealth estimates for Prussia. Not surprisingly, our estimate is close to Biedermann's, but smaller than the estimates of May (1909) and Delbrück (1909). These two authors include assets not subject to the wealth tax and not following our definition of wealth. Finally, note that the estimates by the then-renowned

[4]Helfferich later joined the DNVP, an influential German nationalist party in the early Weimar years. He was a glowing nationalist and some considered his speeches and agitation as one reason of the murder of Walther Rathenau (Gall, 2009, p. 244).

German economist Wagner (1904) are very much in line with our estimates.

Wealth composition A severe caveat of the above method is the fact that the type of wealth has only been recorded for those having more than 3,000 Marks income. This group owned 59% and 64% of total net private wealth in 1895 and 1913, respectively. In order to estimate composition for the total, we have to approximate the structure of wealth for the remaining tax units, which held correspondingly $\approx 40\%$ of all wealth.

It is likely that the portfolios of these citizens contain small houses, farms, modest savings (capital assets), but very few business assets. A natural way to obtain an estimate of the composition for them is to find a typical portfolio for Germans with modest wealth and income from a different period for which such portfolio data are available. In particular, we employ the portfolio data for the lowest class still paying wealth tax in 1934. In terms of gross wealth, the assumed portfolio structure is: agriculture and real estate (46.6%), business assets (9.8%), capital assets (43.6%), and debt (19%). Combining the wealth composition of those having more than 3,000 Marks income with those having less than 3,000 Marks income provides an estimate of the total wealth composition in Prussia.

We are confident that this procedure does not introduce major measurement errors for three reasons. First, we know the exact structure of wealth for about 59-64% of all net wealth. Second, the procedure suggests that the remaining wealth was heavily biased towards small farmers and saving accounts (recorded as capital wealth); something one would expect based on the historical evidence. Third, the Prussians carried out an estimate on how much the new tax would yield. For this purpose, they produced an estimate of all wealth held in agricultural and real estates assets in Prussia. Based on a completely different source from ours (namely land tax – *Grundsteuer*), their estimate amounted to 46.6 b Marks (Preussisches Abgeordnetenhaus, 1893). This is very close to our estimate of 43.4b Marks for these assets in 1895.

However, a remaining challenge is that the Prussian tax statistics do not further distinguish wealth in real estate and agriculture. We create three benchmark estimates (1895,1906,1914) for the distinction. For 1896, we rely on the above-mentioned source: the draft bill for the *Ergänzungssteuer* published in *Finanzarchiv* (Preussisches Abgeordnetenhaus, 1893). Its appendix contains an estimate of Prussian wealth, most likely executed by the Prussian statistics bureau. According to statistics about the total agricultural land, other taxes (i.e. *Grundsteuer* and *Gebäudesteuer*), the agricultural and real estate wealth totals 45.62 billion Marks (Preussisches Abgeordnetenhaus, 1893, p. 396). Of these, 25 billion Marks are the value of land, 5.87 billion Marks value of farms and associated farm buildings, 1 billion marks non-farming residential housing on the countryside,[5] and 13.75 billion Marks dwellings and the underlying land in cities. We

[5]We assume that 5.87 of the 6.87 billion marks of property in houses and the respective non-agricultural

use these proportions (68 % agricultural assets and 32 % real estate assets) to divide our own benchmark estimate for wealth in agriculture and real estate of 43.5b Marks into its two parts. For 1906, we rely on Rothkegel's (1910) work. Based on a large database of sales of agricultural estates, he estimates the Prussian agricultural wealth to be 37.9 billion marks or 66% of the agricultural and real estate wealth. For 1914, we multiply the average agricultural wealth per hectare by the total agricultural possessions (from Statistisches Reichsamt, 1915, p. 43).[6] To get a continuous series, we interpolate the shares for the respective periods between our three benchmarks (1895, 1906, 1913). Reassuringly, the share of agriculture in agricultural and real estate wealth is declining from 68% to 57% from 1895 to 1914. This squares with the historical evidence on the grain invasion (farms loosing value) and urbanisation (urban land is becoming more valuable).

Table 3 reports the estimated structure of Prussian aggregated wealth in 1895 and 1914.

Table 3: **Wealth estimates – Prussia**

Year	Agriculture	+Real estate	+ Business assets	+Capital assets	=Gross wealth	−Debt	=Net wealth
1895	30	14	13	41	98	19	80
1914	45	34	21	84	184	40	144

Notes: Column 'capital assets' encapsulates marketable rights. See spreadsheet *Weatlh_totals_Kaiserreich.xlsx* for additional years/details.

DA 1.1.4 Tabulations

The Prussian statisticians recorded the tax returns by wealth bracket (e.g. 6,000 Marks to 32,000 Marks) from the very first collection of the wealth tax (*Ergänzungssteuer*) in 1895 onwards. Until 1908, these tabulations only reported the amount collected. From 1911 onwards, wealth tabulations reported both the actual wealth and the tax paid. Prussian statisticians presumably estimated the total net wealth by wealth bracket by dividing the total taxes by the tax rate in the respective bracket. We follow this strategy for all years (for those paying the full tax rate). Table 4 provides the sources for the tabulated tax returns. The large number of recorded tax brackets, especially in later years, allows us to estimate the top-1 and top-10 % very precisely.

land are farm buildings or residential buildings associated with farms. The remaining 1 billion belongs to non-farm dwellings. In light of rural life at the turn of the century, this seems to be a reasonable assumption.

[6]We assume that the average agricultural wealth per hectare was the same in Prussia as it was for the whole German Empire. For the latter, we divide our benchmark estimate for agricultural assets (see Section DA 1.2) by the total agricultural area (Statistisches Reichsamt, 1915, p. 43).

Table 4: Tax Data- Prussia

Years	Tax Brackets	Currency	Source
1895	9	MARK	Königliches Statistisches Bureau (1906, p. 402-407)
1896	50	MARK	Königliches Statistisches Bureau (1897, p. 236-308)
1897	50	MARK	Königliches Statistisches Bureau (1897, p. 236-308)
1899	50	MARK	Königlich Preussisches Statistisches Landesamt (1899, p. 243f)
1902	50	MARK	Königlich Preussisches Statistisches Landesamt (1905, p. 219f)
1905	50	MARK	Königlich Preussisches Statistisches Landesamt (1905, p. 219f)
1908	98	MARK	Königliches Statistisches Bureau (1909, p. 245–246)
1911	154	MARK	Königliches Statistisches Bureau (1912, p. 492–494)
1914	154	MARK	Königliches Statistisches Bureau (1915, p. 548)

Table 5 shows a selection of tax rates. The last column shows the tax rate assuming the mean of the upper and lower bound of the wealth bracket as the wealth. For the lower classes the tax rate was a bit below the 0.052 % of the upper wealth brackets. That the tax rates were so low is an advantage for this study, because incentives for tax dodging were accordingly limited.[7]

Table 5: The Tax schedule

Wealth (lower bound)	Wealth (upper bound)	Initial tax (proposed)	Tax actually levied from 1895 onwards	Tax rate in %
6000	8000	3	3.2	0.046
8000	10000	4	4.2	0.047
10000	12000	5	5.2	0.047
12000	14000	6	6.4	0.049
14000	16000	7	7.4	0.049
16000	18000	8	8.4	0.049
...	...	..	...	...
1000000	1020000	500	526	0.052
1020000	1040000	510	536.6	0.052
1040000	1060000	520	547	0.052
1060000	1080000	530	557.6	0.052

Notes: The schedule for 1895 is given in Buck (1914, p. 292). Given the large amount of tax brackets only an excerpt is shown.

After estimating the reported wealth from the reported tax collection by wealth bracket, we inflate the reported wealth by 10% to account for under- and mis-reporting (following our earlier discussion). We assume that this failure to report accurately is equi-distributed across all classes. Finally, we have to integrate those that are paying reduced rates and those that are exempted but own more than 6,000 Marks. To do so, we (i) collapse the lowest wealth brackets from the tax statistics (e.g. 6,000-20,000, 20,000-32,000)

[7]The wealth tax did not affect the substance of wealth substantially. If we assume a common market rate of 5 % (see Jordà et al., 2017, for the exact numbers), the wealth tax would only decrease the potential capital gain to 4.948 % without affecting the stock of wealth at all.

into one with the bounds 6,000-32,000 Marks (the range in which the individuals paying reduced taxes would fall by law) and (ii) then add those that are paying reduced rates and those that are exempted but own more than 6,000 Marks to this class. This has no effect at all for our top-1 % wealth share estimates as the threshold for falling into the top-1 is around 100,000 Marks.

DA 1.2 Germany Empire - A Benchmark Estimate for 1913

DA 1.2.1 Wealth tax regime and definition of fiscal wealth

The German federal government levied a one-time wealth tax to fund the expansion of the German army (*Wehrbeitrag*) on December 31, 1913 (see Deutsches Reich, 1914, for the law). In drafting the legislation, politicians and bureaucrats relied on the experiences from the Prussian wealth tax as parliamentary material from the national archives suggests. The valuation and classification of assets for the *Wehrbeitrag* thus closely followed the Prussian *Ergänzungssteuer* (compare §16-30 of the law (Deutsches Reich, 1914) with Section DA 1.1.1). The main difference lies in the allowances, which are discussed below.

DA 1.2.2 Reference total population

The definition of tax units followed the Prussian definition: tax units were either single individuals or married couples and their children. Unlike in Prussia, the total number of potential tax units appears not to have been calculated for the whole empire. We thus estimate it in two steps: (i) estimating a general population total for 1913 and (ii) converting it into a tax unit estimate by applying the Prussian $\frac{\text{tax units}}{\text{population}}$ ratio.

For (i) estimating the population in 1913, we rely on data from the population censuses of 1905 and 1910 (see Statistisches Reichsamt 1911, p. XXX.1 for 1905 and Statistisches Reichsamt 1921, p. XLI.1). We estimate the compound annual growth rate between these two dates and use this growth rate to extrapolate the 1910 value to 1913. In step (ii), we use the Prussian $\frac{\text{tax units}}{\text{population}}$ ratio for 1905 to convert the population estimate into a tax unit estimate.[8] This procedure yields 24,607,380 potential tax units in 1913.

An important difference between the Prussian wealth tax and the *Wehrbeitrag* is that the minimum taxation threshold for the latter was 10,000 Reichsmark instead of 6,000 Reichsmark for the former. Moreover, there are some exemptions for low income families. This, however, is not a problem at all. Besides the brief version of the statistics in the statistical yearbook used by Piketty and Zucman (2014, p. 84), there exists a detailed account of the results of the *Wehrbeitrag* (Statistisches Reichsamt, 1919). It actually provides the number and wealth of those being exempted. Of the total number of potential tax units, the *Wehrbeitrag* thus provides information about the wealth of:

$$\frac{1,220,114\ (\textit{paying Wehrbeitrag on wealth}) + 1,450,651\ (\textit{being exempted})}{24,607,380\ (\textit{potential tax unit estimate})} \approx 10.85\%$$

[8] See Section DA 1.1.2 for tax units and Statistisches Reichsamt (1911, p. XXX.1) for population.

DA 1.2.3 Reference total wealth

Methodology and data for net private wealth estimate As for Prussia, we follow the wealth estimate by the Prussian bureaucrat Biedermann (1918). He estimated total net private wealth to be 250 billion Marks. To generate his estimate, Biedermann (1918, p. 82) draws on records of the state wealth taxes of Prussia and Baden as well as income tax statistics (by sector) for other regions in Germany.[9] As for the Prussian case discussed above, he adjusts the resulting 227 billion Marks 10% upwards for mis- and under-reporting ($227 \times 1.1 \approx 250$). The reasons why we follow Biedermann's estimate are the same as for the Prussian estimates (see Section DA 1.1.3). It appears more prudent to follow this bureaucrat than the estimates by German nationalists such as Helfferich (1914a), not least because Biedermann worked in the statistics division of the government, made careful calculations published in the text, and drew on much material unavailable to others.

As Biedermann's estimate is for the tax year (May 1913–April 1, 1914), we adjust this estimate by using 1/4 of the annual compound growth of the Prussian total wealth ($\frac{1}{4} * 2.61\%$) $\approx .65\%$. This leaves us with a net private wealth estimate for the end of 1913 of $\frac{250}{(1+.0065)} \approx 248.4$ billion Marks.

Wealth composition To analyse the structure of the wealth-income ratio, we have to approximate the wealth composition. We proceed analogously to the Prussian case. For 153 of the total 248 billion Marks, we know the exact composition from the *Wehrbeitrag* statistics (Statistisches Reichsamt, 1919). For the remaining 38 % of the total net wealth as well as for the amount of debt, we assume the "typical wealth portfolio" of the lower classes as we did for the Prussian data (Section DA 1.1.3).

Table 6 compares the composition of private wealth for the whole of Germany in 1913 with that of Prussia. Prussian households owned slightly more agricultural assets and accumulated larger amounts of debt. This is consistent with contemporary reports showing a very high indebtedness of East Prussian farmers relative to their Western counterparts (Kühnert, 1907, p. 293).

Table 6: **Wealth Composition Benchmark - Germany 1913**

Territory	Agricultural	Real estate	Business	Capital	Gross	Debt
Germany (1913)	23%	20%	12%	45%	100%	20%
Prussia (1914)	24%	19%	11%	46%	100%	22%

Sources: See Appendix DA 1.1.3 for details on the sources and calculations that are analogous for the Prussian case.

[9] We gathered large parts of Biedermann's source material, but in the end simply followed his estimate.

Comparison to existing estimates The most recent private wealth estimate is by Piketty and Zucman (2014) and amounts to 324b Marks for mid-1913. Our preferred estimate by Biedermann (1918) deviates substantially from this value. As we, like Biedermann (1918), estimate the value of agricultural assets 'bottom-up', we consider our estimate more accurate.[10] Given the prominence of the work by Piketty and Zucman, we now analyze the origins of the differences between our and their estimate by asset types.

Table 7: **Difference to Piketty/Zucman estimate - Germany 1913**

	Piketty/Zucman		This study	
	in b Marks	% of NI	in b Marks	% of NI
Agricultural land	72	138%	70	135%
Fixed agricultural assets	52	100%		
Real estate	66	126%	63	122%
$\sum$ Real estate and agricultural assets	190	364%	134	257%
Total private net wealth	325	623%	248	477%

Sources: Piketty/Zucman estimate and national income data are from Piketty and Zucman (2014).

There are some differences across our and the Piketty-Zucman estimates but the most important one relates to the valuation of agricultural assets (see Table 7). Piketty and Zucman rely on Hoffmann's (1965) capital stock, housing stock, and land value estimates. While Hoffmann's work continues to be the standard reference for much work on German economic history, his late 19th century estimates have undergone considerable revisions. Fifty years after its initial publication, it is impossible to understand how Hoffmann arrives at values so incompatible with the contemporary taxation-based wealth estimates by Helfferich (1914a) and Biedermann (1918).

The capital stock estimates are based on the perpetual inventory method, and rely on investment data that are partially estimated as residuals (e.g. for housing), and are potentially very imprecise. A useful comparison is also the independent estimate of agricultural assets based on sales prices by Rothkegel (1910, p. 146), which puts the total

[10] Biedermann (1918) relies on the Prussian wealth tax data and on regional wealth and income statistics for other parts of Germany. These data are particularly valuable, because large parts of the population had to declare their wealth for the tax (e.g. more than 13% in Prussia–see Table 1). For the non-taxpaying part of the population, Biedermann then makes estimates on the basis of saving deposits. The valuation concepts for these wealth taxes as for the Germany-wide levy of 1913 were market-price oriented or based on reasonable capitalization factors where tax officers were unable to provide market prices. Biedermann's and thus our estimate make considerable allowances for under-declarations and misreporting.

value of land *and* fixed agricultural assets (farm houses and animals) in Prussia at 38b Marks, implying about 70b Marks for the whole of Germany.[11] Table 7 confirms that the majority of the difference between our estimate and that of Piketty and Zucman originates in the valuation of land and agricultural assets.

As discussed by Piketty and Zucman (2014), there exists a number of contemporary wealth estimates. Aust (1928, p. 65) provides an overview of these estimates, but most of them are unreliable. There are two main reasons for that. First, they typically rely on fire insurance statistics, which were considered heavily inflated by contemporaries (Biedermann, 1918, p. 85) and later scholars (Hoffmann, 1965, p. 220). Second, the problems raised with regards to the Prussian wealth estimates (see Section DA 1.1.3) apply likewise to the *Kaiserreich*, e.g. the inclusion of household durables and public assets. Beyond these practical problems, national pride drove up "estimates" (Biedermann, 1918, p. 85), in particular the one by Steinmann-Bucher (1916). In our view, the only contemporary estimate one can seriously consider except for Biedermann's is the one by Helfferich (1914a).

Helfferich's tax-based private wealth estimate makes an allowance of 20% for under- and misreporting and assumes that the average German had the same per capita wealth as the average Prussian. In total, he arrives at 260b Marks in 1911 (Helfferich, 1914a, p. 106). Helfferich's estimate is thus very close to our and Biedermann's (1918) estimate of 248b Marks in 1913—the difference originating in the allowances for under-declarations.[12] That our estimate chimes better with this estimate and that it is consistent with the tax data makes us confident that our estimate constitutes an improvement over the Piketty-Zucman estimate for this time period.

DA 1.2.4 Tabulations

The tabulations for those paying the *Wehrbeitrag* are given in a comprehensive statistical publication (Statistisches Reichsamt, 1919). Contrary to the Prussian wealth tax, the wealth of the assessed but exempted taxpayers is given in considerable detail such that no adjustments for them is necessary. Finally, we add 10 % for under-declaration as we did in the Prussian case and in accordance with Biedermann (1918). For the counterfactual exercise measuring the effect of the hyperinflation, it is necessary to approximate the portfolios by wealth bracket. We describe our method for estimating these portfolios among the rich in Appendix DA 6.2.4, where we discuss the counterfactual in detail.

[11] Assuming 1,400 Marks per hectare and 50 million hectares (Rothkegel, 1910, pp. 71 and 82).

[12] Indeed, Piketty and Zucman (2014) report it as 250b Marks. With reference to Table 7, it is worth pointing out that Helfferich puts the value of agricultural land at around 40b Marks (see also Pfister, 2019, for back-of-the-envelope calculations of the land rent). Unlike Biedermann, Helfferich does not make use of the material for German states other than Prussia.

DA 1.3 German Empire, 1895-1913

Combining our German benchmark estimate for 1913 and our calculations for Prussia 1895–1914, we present an estimate for the wealth-income ratio and the distribution of wealth for the period before World War I. In the following, we describe our methodology and provide a comparison to the Piketty-Zucman estimate over time.

DA 1.3.1 Extrapolating German benchmark backwards

Representativeness of Prussia for Germany Contemporaries often employed Prussian data to estimate the German national wealth (see e.g. Helfferich, 1914a; Biedermann, 1918). They did so as Prussia made up a large part of the German Empire by any measure, for example almost two-thirds of its population (Table 8).

Table 8: **Regional population and wealth distributions - Germany 1913**

	Share of		
State	population	wealth	tax units with wealth $\geq 10,000$ Marks
Prussia	62.1%	56.8%	59.5%
Bavaria	10.5%	8.8%	9.3%
Saxony	7.4%	7.9%	8.4%
Baden	3.3%	4.5%	3.5%
Hamburg	1.7%	5.3%	3.5%
Bremen	0.5%	2.2%	1.1%
All others	14.6%	14.5%	14.7%
$\sum$ = Empire	100%	100%	100%

Sources: Population data/total wealth share: Biedermann (1918); Wealth above 10,000 Marks Statistisches Reichsamt (1919): includes those exempted but assessed with wealth above 10,000 Marks.

Along the population distribution of the German Empire, Table 8 displays the distribution of total wealth and the distribution of those assessed for the *Wehrbeitrag*. The comparison with the population shares reveals that Prussians were on average poorer: the average Prussian had a net worth of about 8,673 Marks in 1913 as compared to 10,094 for the Empire. In addition, Prussian households had slightly more debt and their portfolios were biased towards agricultural assets relative to the rest of Germany (Table 6 in the previous section). They were also less likely to have a net worth larger than 10,000 Marks (last column). This is consistent with the differences in national income per capita for which Hoffmann and Müller (1959[2005]) provide regional estimates. The Prussian per capita income amounted to between 95% and 97% of the German average during the period under consideration. In terms of its average wealth and its wealth structure, Prussia was thus slightly different.

More important for the extrapolation is that the dynamics between 1895 and 1914 were broadly similar for Prussia and the rest of Germany. According to Biedermann (1918, p. 82), Prussia's population grew by 34% and that of the Empire as a whole by 31%. National income per capita grew by 43% in Germany as a whole and by 44% in Prussia. These trends appear very similar.

Finally, we consider it plausible to employ the Prussian data to extrapolate backwards the German benchmark estimate at a qualitative level. While Prussia did not include many thriving regions (like the Hanse cities), it also did not include many poorer agricultural regions (like Bavaria). Prussia itself was a mix of industrial and more agricultural regions — just as the rest of Germany.

In sum, we decide to extrapolate backwards the benchmark with Prussian data for four reasons: (i) it was the strategy used by contemporaries, (ii) Prussia was not completely dissimilar in its wealth levels and structure at the benchmark year, (iii) the trends in population and per capita national income were very similar for the period under consideration, and (iv) qualitatively, Prussia comprised agricultural and industrial regions just like the rest of Germany. By applying the Prussian movements in the top-1 share and the total, we are unlikely to misrepresent the *trend* of German wealth inequality 1895–1913.

Method of extrapolation Below, we provide details on how exactly we extrapolate the different kinds of data. The calculations can also be found in the spreadsheet *Weatlh_totals_Kaiserreich.xlsx*.

Extrapolation: total:

We extrapolate backwards the net private wealth benchmark estimate for the whole German Empire by indexing it on its Prussian counterpart.

Extrapolation of the composition:

We apply the changes in the Prussian wealth structure (including agricultural, real estate, business, and capital assets as well as debt) to our benchmark estimate for 1913. We ensure that the components sum up to 100% of net wealth (see excel sheet for details).

Extrapolation of top-wealth shares:

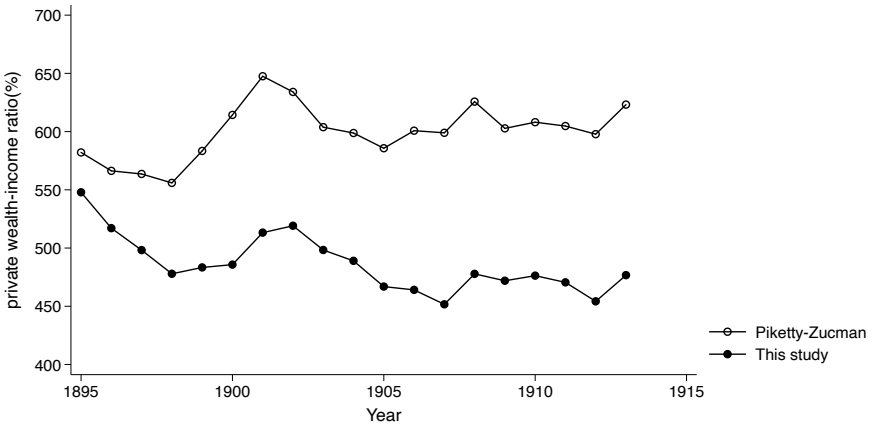
To capture the evolution of the top-wealth shares, we estimate the top-1 shares for Prussia and then apply the changes of them to the German benchmark estimate.

DA 1.3.2 Comparison with Piketty and Zucman's estimate for 1895-1913

Figure DA 1.2 compares our wealth-income ratio estimate to that of Piketty and Zucman (2014). The fluctuation in the two series are indeed very similar as their correlation of .78 suggests. However, the level differences between the Piketty-Zucman series and our estimate are substantial. As discussed in Section DA 1.2, this difference predominately

originates in the estimate of agricultural assets. Above, we discuss in length why we consider our estimate more reliable.

Figure DA 1.2: Wealth-income ratio



Sources: Own estimate, national income and alternative wealth estimate are from Piketty and Zucman (2014).

DA 2 Interwar Germany, 1924-1934

After World War I, Germany introduced a federal wealth tax (*Vermögenssteuer*) and conducted wealth censuses (leading to the so-called *Einheitswertstatistik*). While the new federal wealth tax was levied annually, new tax assessments were carried out in 1924, 1927, 1930, and 1934.[13] In the following, we provide a detailed account on how we estimate wealth and its distribution at these four benchmark dates based on these sources. In particular, we discuss how we harmonize the data in face of frequent changes of the tax law and the way in which the statistics were compiled. Finally, we compare our estimates for total wealth to previous ones.

DA 2.1 Wealth tax regime and definition of fiscal wealth

In principle, every adult person living in Germany and every German company were subject to the wealth tax as well as foreigners owning assets in Germany. Married individuals and their kids had to make a joint wealth declaration.

In Weimar Germany, companies also had to pay wealth taxes. This led to what some called 'double-taxation' of assets, namely that corporate assets were taxed in the company and then again the individuals holding shares in them were taxed. Before 1934, two special taxation rules existed with regards to the taxation of companies. The tax assessments for 1924, 1927, and 1930 considered *Offene Handelsgesellschaften und KGs* (German forms of personal liability companies) as separate economic entities. While the company itself was taxed, shares in it were not taxed 'again'. The second rule is the so-called *Aktienhalbierung*. To lessen the impact of double taxation,[14] the value of stocks was only assessed with half of the market value. These make the calculation of pre-1934 wealth distributions cumbersome, but not impossible (more on that in the Section DA 2.5). They have no relevance for our wealth total estimates.

There were four separate asset classes: (1) agricultural assets, (2) real estate, (3) business assets, and (4) other (mainly capital) assets.[15] Like for the Prussian estimates,

[13] Technically, the values refer to January 1^{st} of the succeeding year (1925, 1928, 1931, 1935) but we use the above-mentioned years to avoid confusion. Also note that German hyperinflation in the beginning of the 1920s initially posed large problems for the collection of the wealth tax. In 1923, the tax assessment was stopped due to it and in 1924 valuations from the Wehrbeitrag of 1913 were used (Statistisches Reichsamt, 1929, p.8).

[14] The taxation of the company itself and the one of the shareholders.

[15] Other assets would comprise the following according to Krelle et al. (1968, 408): savings (*Sparguthaben*), building society deposits (*Bauspareinlagen*), life insurances (*Lebensversicherungen*), capital claims (*Kapitalforderungen*), net present value of private pensions and usufructuaries (*Kapitalwert von privaten Renten und Niessbrauchrechten*), stocks (*Aktien*, investment shares (*Investmentanteile*), shares

we rely on handbooks for tax officers and taxpayers to understand valuation practices and, where necessary, make specific adjustments (Beuck, 1925; Biedermann, 1935). The following paragraphs summarise the most important ones by asset class. They also report how we transform fiscal values (*Einheitswerte*) to market values.

(1) Agricultural assets:

As in the prewar period, taxpayers had to declare their agricultural wealth using capitalized revenues (*Ertragswerte*). In order to assure a fair valuation across farms, the government selected a group of agricultural enterprises in every state and estimated their annual return per hectare (Biedermann, 1935, p. 50). Further details on the valuation of agricultural, forestry and horti- and vinicultural assets can be found in the handbook (Biedermann, 1935, p. 38-70). Unlike for the pre-war values, the tax assessment values for agricultural assets do not reflect market prices well. Fortunately, Jaggi (1945, p. 91) summarises the results by Rothkegel for the period 1929-1934, who analysed the relationship between the tax values and actual market values from sales of farms. The resulting ratio between the fiscal value (*Einheitswert*) and actual sales values is 52 % (using a variety of regions and a reasonable number of cases). To arrive at market values (for both total wealth estimates and wealth tax tabulations), we thus multiply the fiscal values by $\frac{1}{.52} = 1.92$ (Table 9).

Table 9: **Adjustment indices - interwar Germany**

Year	Agricultural assets	Real estate assets	Business assets	Capital assets
1924	192.3%	93.7%	110.0%	110.0%
1927	192.3%	124.2%	110.0%	110.0%
1930	192.3%	130.0%	110.0%	110.0%
1934	192.3%	120.0%	110.0%	110.0%

Note: See text and spreadsheet *Wealth_totals_Deutsches_Reich_adjusted* for details.

(2) Real estate and underlying land:

For the valuation of real estate and land, taxpayers had to follow the concept of the common value (*gemeiner Wert*), which would be derived from sales prices of comparable structures and land on a relatively local level. If apartments or land were rented out, taxpayers had to capitalize the annual rent. More details on different types of land and

in limited liability companies (*GmbH-Anteile*), shares in cooperatives (*Geschäftsguthaben bei Genossenschaften*, and an 'others' category, including, for example, collections (*Sonstige Vermögenswerte, z.B. Sammlungen*). Biedermann (1935, 104) provides the commentary to the law and hence all important details. The most notable ones are that cash and deposits are not taxable below 1000 Reichsmark, that art collections are not taxable below 50000 Reichsmark, and that jewellery is not taxable below 10000 Reichsmark. No attempt is made to account for these specificities.

structures can be found in the handbook (Biedermann, 1935, p. 70-81). In general, these values appear to be close to market values. Yet, the tax valuation has been subject to multiple German court cases concerning restitution for the expropriations committed by the Nazi regime. After reviewing archival materials of the compensation courts, Bopf (2003, p. 116) notes with respect to the end-of-1934 fiscal values that these "usually lay fifteen to twenty-five percent below the true market value." We thus multiply the fiscal values with 1.2 to arrive for market values for this year. For previous years, we adjust the ratio with a rent index by the Statistisches Reichsamt (1936, 1937). Table 9 reports the corresponding values.

(3) Business assets:

For business assets, companies had to declare the value of their assets in terms of common value (*gemeiner Wert*). This means that they were evaluated at market prices abstracting from short term fluctuations (Beuck, 1925, p. 164). Further details on the rules concerning the valuation of companies can be found in Beuck (1925, p. 161-191). We generally consider the valuation of business assets accurate. We make, however, an allowance of 10% for mis- and under-reporting as we did for the pre-war data.

(4) Capital assets:

Finally, capital assets (and other assets) were valued at market prices and mostly followed previous legislation. The specifics can be found in (Beuck, 1925, p. 217-230). Finally, we perform an upward adjustment of 10 % on all business capital assets for potential under-reporting (as for the pre-WW I period). This adjustment is made for both, the total wealth estimates and the tabulations. Table 9 summarises the adjustment indices.

DA 2.2 Reference total population

In principle, every individual had to pay the wealth tax in the Weimar republic. However, married couples had to make a joint declaration such that tax unit of account is the sum of nuclear families and all other singles (*Ledige*).[16] We base our potential tax unit estimate on the population censuses of 1925 and December 1933 (see Statistisches Reichsamt 1930a, p. 14 & 15 and Statistisches Reichsamt (1933, p. 104 & 105)). These censuses provide the martial status of all individuals by age and thus it is easy to exclude those below the age of 21 (age adulthood in Germany in this period). The legal marriage age was 21 for men and 16 for women (Benninghaus, 1999, p. 39). The precise way in which the statisticians recorded the two census results differed, but it is possible in both cases to calculate the

[16]Neither Krelle et al. (1968) nor Baron (1988), who have worked with 1935 wealth census and tax data seem to have noticed this. They use households including relatives such as aunts and uncles instead. Their estimates of the share of the richest 1 % for 1935 are hence not in line with the tax laws.

number of potential tax units that accords with the tax law (Deutsches Reich, 1926a,b) by adding and subtracting different groups. For example, for 1933:

Married women

\+ Single women

\+ Single men

\- Men below the age of 21

\- Women married below the age of 21

\- Single women below the age of 21

= reference total population

The corresponding formula and calculations for 1925 can be found in the accompanying spreadsheet *Population_totals_Deutsches_Reich*. As we have only exact data for June 16, 1925 and December 31, 1933, we interpolate the number of tax units for all dates in between these dates (using the compound annual growth rate). We also assume that the growth in tax units continued at the same pace throughout 1934 as it did the years before to arrive at an estimate for end-of-1934/January 1, 1935.[17] Table 10 shows the final estimates and the share of those that were assessed for the tax. This share decreases because of two reasons. The Great Depression wiped out a considerable amount of wealth. Moreover, taxation thresholds and allowances were increased in response to it.

Table 10: **Reference total population, 1924–1934**

Year	Total tax units	Total recorded in tax statistics	Share of those covered in the tax statistics
1924	25,680,814	2,457,172⋆	11.64 %
1927	26,614,479	2,733,540⋆	10.27 %
1930	27,582,089	703,913 ⋆⋆	2.55 %
1934	29,282,539	820,281	2.80 %

Notes: ⋆ 1924-1927: raw data needed to be adjusted for those living abroad (Statistisches Reichsamt, 1931c, p. 7 for data). ⋆⋆For 1930, the number of those living abroad and paying taxes was not recorded separately. We assume the same share relative to all taxpayers as in 1928 (about 1%). Data for 1935 includes Saarland. See text and *Population_totals_Deutsches_Reich* for details on the calculation.

[17] In 1935, the (small) Saarland is included in the wealth tax assessment and thus we use the ratio of its population to the one of the Reich in 1933 (see Statistisches Reichsamt, 1938c, p. 5) to create an estimate of tax units for January 1, 1935 including the Saarland.

DA 2.3 Reference total wealth (benchmark)

Methodology and data for net private wealth estimate Krelle et al. (1968) and Baron (1988) provide elaborate and detailed estimates of total private net wealth in 1934 (/January 1, 1935) based on the wealth census statistics (*Einheitswertstatistik*) and the wealth tax statistics (Statistisches Reichsamt, 1931c, 1938a). Generally speaking, these estimates take real estate, business, and agricultural wealth from the wealth census, which captured all wealth. The capital/other wealth is estimated by using the wealth tax statistics. Krelle et al. (1968) and Baron (1988) provide very detailed descriptions and are careful to avoid double-counting. We do not aim to repeat all these details here, but refer the reader to the spreadsheet *Wealth_totals_Deutsches_Reich_adjusted* and these two books (Krelle et al. in particular).

The major dimension where Krelle et al.'s estimates fall short of our standard is the valuation of agricultural and real estate assets. As discussed in Section DA 2.1, we generate adjustment factors that convert the fiscal values from the *Einheitswertstatistik* into market values. In contrast to real estate and agricultural assets, the valuation for business and capital assets is likely to generate values close to market values. Unlike the post-war *Einheitswertstatistik*, the valuation is updated every three years and the valuation principles are similar to those of today. To account for under-reporting and slight undervaluations, we follow our pre-war strategy. Furthermore, we include an allowance for cash holdings. We detail all sources and minor adjustments (accounting for the wealth held in Germany by those living abroad, accounting for publicly held companies etc.) in the spreadsheet *Wealth_totals_Deutsches_Reich_adjusted*.[18]

To verify our estimates, we make an independent estimate from the 'non-financial' side following the methodology by Piketty and Zucman (2014). They propose to calculate net national wealth as the sum of physical capital and net foreign assets. We implement their methodology for the German case and document this estimate in Appendix DA 2.4. In a nutshell, we employ our physical capital estimates for the agricultural and real estate assets from above, combine them with a new estimate of the industrial and non-industrial business capital stock, and add NFA (or in the German case: subtract the liabilities). We rely on more extensive source material than Piketty and Zucman, in particular by employing a number of sources from the *DIW*, only available in *DIW*'s library. Table 11 compares the results and demonstrates that the differences between the two ways of

[18] If we do not adjust our estimate to market prices, it is indeed very close to Krelle et al.'s estimate. They put net private wealth on January 1, 1935 at 113.6 b Reichsmark. Our estimate with a simple across-the-board adjustment for a 10% under-reporting/undervaluation is about 10% higher (126.5 b Reichsmark). Only when we properly adjust for cash holding and the undervaluation of real estate and agricultural assets do our estimates diverge.

calculating private net wealth are minor - as they should be. The deviation is about 6% for 1924, 2.6% for 1927 and 1930, and a mere 2% in 1934.

Table 11: **Reference total net private wealth for interwar Germany, 1924–1934**

	Total net private wealth estimated via	
Year	Krelle/Baron method adjusted to market prices: benchmark	Piketty-Zucman method: robustness
1924	**143 (2.59)**	152 (2.75)
1927	**176 (2.31)**	181 (2.37)
1930	**170 (2.27)**	166 (2.21)
1934	**169 (2.91)**	165 (2.86)

Sources: Own calculations (see text and Section DA 2.4). Private wealth to national income ratios in parentheses. National income is from Piketty and Zucman (2014).

Wealth composition Table 12 shows the composition of our wealth aggregate in the interwar period and contrasts it with the pre-war composition. There is a relative increase in the relevance of agricultural and real estate assets between 1913 and 1925, which is in turn due to the large price shocks in business and equity assets (see the hyperinflation counterfactual in Appendix DA 6.2.4 for the corresponding price changes). Consistent with the effects of the hyperinflation, the comparison between 1913 and 1924 suggests a stark reduction in debt.

Table 12: **Wealth Composition Benchmark - 1913 vs interwar**

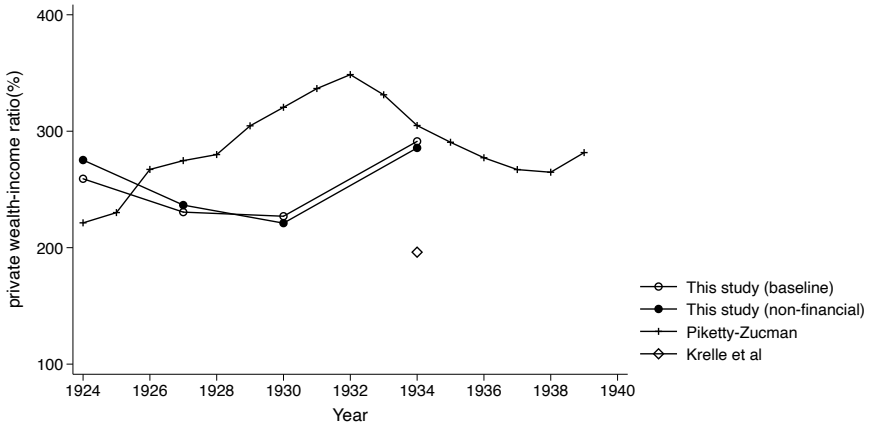
Territory	Agricultural	Real estate	Business	Capital	Gross	Debt
1913	23%	20%	12%	45%	100%	20%
1924	40%	29%	14%	17%	100%	10%
1927	33%	27%	12%	29%	100%	12%
1930	31%	29%	9%	31%	100%	14%
1934	34%	30%	8%	28%	100%	14%

Sources: See also spreadsheets *Weatlh_totals_Kaiserreich.xlsx* and *Wealth_totals_Deutsches_Reich_adjusted* for details on the calculation.

Between 1924 and 1927, wealth in capital assets recovered as the German population started to save again and equity prices increased (without reaching their pre-war levels). Consistent with the expected effects of the Great Depression, debt increased as a share of gross wealth while capital and business assets declined in their importance between 1927 and 1934. It is also important to note that there is a strong flight out of equities into cash, savings, and bonds. This is apparent in the accompanying spreadsheet and consistent with our expectations.

Comparison to existing estimates Figure DA 2.1 compares our estimates with those of Piketty and Zucman (2014). It is apparent that the estimates mostly agree for 1934. Even though the estimates are still in the same ballpark, substantial differences emerge for all other years. Given the prominence of the Piketty-Zucman estimate, we discuss in detail where these differences originate in.

Figure DA 2.1: Wealth-income ratio - comparison with other estimates (interwar)



Sources: Own estimates, national income and alternative wealth estimate are from Piketty and Zucman (2014) and Krelle et al. (1968).

Piketty and Zucman (2014, data appendix p. 87) proceed in two steps to provide estimates for interwar Germany. First, they create a benchmark estimate for 1927 based on the wealth census. As is apparent in Figure DA 2.1, our estimates also diverge for this year. The underlying reason is that Piketty and Zucman (2014, data appendix p. 87) employ gross business wealth as reported in the wealth census. This is problematic as: (i) it includes non-pyhsical capital, (ii) it is not clear that debt is consolidated within the sector, (iii) when a company held shares of another company, this led to double-counting, (iv) some companies in public ownership are included in the gross wealth number. We will discuss these points in some more detail in the following section. They explain the upward bias in the Piketty-Zucman estimate as compared to ours for 1927.

For all other years, Piketty and Zucman use savings data and an equity price index to account for accumulation and capital gains in an extrapolation from their 1927 benchmark estimate. However, the index itself is a stock market index (Gielen, 2013). Applying this index to all forms of wealth strikes us as problematic: prices for agricultural assets, real estate, and business assets diverged significantly as we discuss in the main paper (see also Table 44 in this appendix). Our estimates are all 'benchmark' estimates and apply the respective changes in asset prices. We thus consider them an improvement over the Piketty-Zucman series.

What other estimates exist for this period? Our estimates imply higher levels of private wealth than those of Krelle et al. (1968). Again, this is due to the differences in valuation. We follow market valuation principles whereas Krelle et al. employed the fiscal values (*Einheitswerte*). There exist two other estimates for 1939 by Schörry (1949) and Cornelsen et al. (1974). These estimates like some others (in particular Grünig, 1958), however, do not differentiate private and public wealth, employ other wealth definitions, focus on gross wealth, and lack appropriate documentation.[19] Unfortunately, they also repeatedly include circular references. This makes it particularly hard to put faith into them and thus we do not discuss them here.

DA 2.4 Reference total wealth from the non-financial side (robustness)

Unlike Piketty and Zucman (2014), we are simply interested in private wealth and do not attempt to estimate public wealth. However, we can rewrite the equations they propose such that they help us to arrive at a private wealth estimate using their methodology, but not having to estimate public wealth. Piketty and Zucman (2014, p. 1269) show that net national wealth W_n can be decomposed into domestic physical capital including land and net foreign assets:[20]

$$W_n = K_n + NFA_n \tag{1}$$

as well as the sum of private wealth W_{pt} and government Wealth W_{gt}:

$$W_n = W_p + W_g \tag{2}$$

In consequence, an alternative definition of private wealth is:

$$W_p = K_n + NFA_n - W_g \tag{3}$$

W_g itself can be defined as the governments capital stock K_g, its foreign assets FA_g net of government debt D_g:

$$W_g = K_g + FA_g - D_g \tag{4}$$

The total government debt can be divided into domestic and foreign financial claims against the government $D_g^{domestic}$ and $D_g^{foreign}$ respectively.

[19] The same is true for the estimates of the net capital stock by Hoffmann (1965). Dell (2008) relies on these for his estimates.

[20] Time subscripts are omitted.

$$D_g = D_g^{domestic} + D_g^{foreign} \tag{5}$$

We can thus re-write equation 3 as:

$$W_p = K_n + NFA_n - K_g - FA_g + D_g^{domestic} + D_g^{foreign} \tag{6}$$

because $K_p = K_n - K_g$, we can simplify the equation to:

$$W_p = K_p + D_g^{domestic} + (NFA_n - FA_g + D_g^{foreign}) \tag{7}$$

Note that NFA_n contains assets and liabilities for both the government and private economic subjects. The term $(NFA_n - FA_g + D_g^{foreign})$ corrects NFA_n for the government's net foreign asset position. In the German case, it is safe to assume that the government's foreign assets in the interwar period were zero ($FA_g = 0$). To estimate net private wealth for Germany, it thus suffices to calculate:

$$W_p = K_p + D_g^{domestic} + (NFA_n + D_g^{foreign}) \tag{8}$$

An estimate for non-financial private capital (K_p)

Private capital K_p can be decomposed in the agricultural capital stock + agricultural land, the real estate capital stock + underlying land, and the corporate/business capital stock + land underlying the structures. For the first two asset types, our main source are the detailed statistics of the wealth censuses. As discussed in Appendix DA 2.3, we cannot employ the wealth census to estimate corporate/business assets. We thus have to rely on other sources, which we detail below. Further details and sources can also be found in spreadsheet *Wealth_total_Deutsches_Reich_Nonfinancial*.

Agricultural capital stock + agricultural land

For our benchmark net private wealth estimate, we have computed the value of agricultural assets based on the wealth census statistics (e.g. Statistisches Reichsamt, 1931a, for 1927). As the wealth census encapsulates the value of land and the agricultural capital stock of machines, we can use the same estimate as we did for our benchmark estimate. Note that, as for our benchmark estimate, we inflate the reported fiscal values by 1.92 to arrive at market values (Appendix DA 2.1). The precise estimates and adjustments can be found in the spreadsheet *Wealth_totals_Deutsches_Reich_adjusted*.

Real estate capital stock + underlying land

For real estate, we proceed analogously to the agricultural capital stock. The precise estimates and adjustments can be found in the spreadsheet *Wealth_totals_Deutsches_Reich_adjusted*.

Net foreign assets and government debt

We rely on on Piketty and Zucman's estimates for the net foreign assets and government debt. These are derived from a compendium of German monetary and financial statistics by the Deutsche Bundesbank (1976).

Corporate/business capital stock + underlying land

The main challenge for this period is to create an estimate of the non-financial capital stock. Piketty and Zucman (2014) rely on the summary of the wealth census reported in the statistical yearbook for Germany by the Statistisches Reichsamt (1930b, pp. 534-535). These data refer to all types of assets of a company, not only physical capital but also cash. This implies that, for example, business-to-business debts are likely not consolidated (unless the net worth of companies rather than the gross wealth is taken). Furthermore, it is certain that the gross wealth reported includes shares in other companies. This leads to a double-counting in which the gross wealth of a company is first counted for the company itself and then its net wealth counted as a share in the portfolio of another company. We can only speculate about the magnitude of the double-counting as only once the share in the other company was above 25 %, its net worth was deductible for the holding company.[21] In any case, this makes clear that financial assets were included in this wealth census and, for that reason, we have to rely on an external estimate of the physical capital stock.

Given the prominence in the German economic history literature of the impressive work by Hoffmann (1965), it is important to line out why we consider his estimates unusable for our purposes. Hoffmann (1965) provides an estimate of the net capital stock, but as Piketty and Zucman (2014, Appendix p. 87) point out it is not suitable for the calculation of wealth during this period. They point out that these are unlikely to reflect market values and that land is not included. There are some further caveats in Hoffmann's data such as his ad hoc adjustments for the effects of the war.

If we cannot use Hoffman's calculations, what are potential alternative sources? In the post-war period, the *Deutsches Institut für Wirtschaftsforschung* employed a number of researchers to assess the damage to the West German capital stock caused by the war. We first discuss how we adjust this estimate to market prices and then how we scale it up to the whole of Germany for the interwar period.

Among the DIW researchers, Krengel (1958, p. 96) provides estimates of the net industrial capital stock for 1924-1956 in prices of 1950. Kirner (1968, p. 92) provides the relevant price index for investment goods,[22] which allows us to convert Krengel's estimate

[21] The statistics report about 3b Reichsmark deducted under this provision of the law, the so-called *Schachtelprivileg*. This compares to an equity value of about 53 b Reichsmark and of (probably unconsolidated) gross wealth of 132b Reichsmark.

[22] This index is based on a subindex for wholesale prices for investment goods computed by the *Statis-*

into constant 1927 prices. We use 1927 as our benchmark year. To take account of the massive equity price fluctuations rather than using the index for investment goods only, we build a new composite price index. This price index weighs the equity price index by Gielen (2013), which is based on the stock market index by the *Statistisches Reichsamt*, with 2/3. For the remaining 1/3, we use the price index of investment goods. The reason to do so is twofold. First, we do not want to assume that equity prices for stock market companies reflect the valuation of all other companies accurately. Secondly, the fall in stock market prices was so heavy that the German stock market was closed at some point. If one takes stock market valuations as the only "accurate" valuation seriously, one would have to set the value of these companies to 0. This does not strike us as reasonable and thus we decide to use the hybrid approach as described above.

It is also necessary to convert Krengel's estimate from West German Borders to the borders of 1927, to make allowances for the value of land and storage, and to provide an estimate of the physical capital in sectors other than industry. Fortunately, Cornelsen et al. (1974, p. 69b) provide sector-specific conversion factors, which are themselves based on a variety of measures.[23] This allows us to convert the estimate for West Germany to the borders of the Weimar Republic.

To convert the industry estimates to covering all types of private enterprises, we rely on the relation of the capital stock in industry relative to all other types of private businesses. In particular, Cornelsen et al. (1974, p. 70).[24] suggest that manufacturing industries constitute $\frac{2}{3}$ of the capital stock of private enterprises. To convert the industry estimates for West Germany such that they reflect the capital stock for the whole of Germany, we thus divide the the net capital stock at market prices by $\frac{2}{3}$.

Finally, we have to make allowances for stored goods, the land that the physical capital stock stands on, and for publicly owned companies. For the value of the underlying land, we follow Cornelsen et al. (1974, p. 69b) who assume that it is about 11.5 % of the total value. To make an allowance for stored goods, we deviate from their estimates. Cornelsen et al. (1974, p. 69b) relied on the statistics from the annual statements of German stock companies and put it to around 33 % of the total wealth in industrial assets. Yet, this value is certainly too high when applying it to all industries and company types.[25] We

tische Reichsamt.

[23]For example, employment, wealth census statistics, number of business etc.

[24]In particular, Table 4 (share of industry in total private capital stock: $\frac{60}{60+20+10}$). While applying a net value concept (and thus not strictly comparable), this range squares well with the share of industries in the total private sector net wealth as reported in the tax value statistics (Statistisches Reichsamt, 1931a, p. 32).

[25]It is worth noting that even for stock market values, it is exceptionally high. It averages about 25 % throughout our period of interest, making 1939 an exceptional year.

decide to value the stored good at 10.5 % of total gross wealth for the private sector.[26] Finally, we have to deduct the part that is owned by the government.[27] This is a minor hurdle as the tax value statistics for 1934 state this amount to be about 5 %,[28] which we use to correct for the public ownership in the capital stock estimate of businesses throughout.

Adding up the components

Finally, we add up all physical capital from agriculture, real estate, and industry. We then add (the negative) net foreign assets and government debt. Table 13 reports the results.

Table 13: **Interwar wealth estimates (non-financial)**

Year	$K_p^{\text{agriculture}}$	$K_p^{\text{real estate}}$	K_p^{business}	$\sum K_p$	NFA	$Debt_g$	Net wealth	W-I ratio (%)
1924	64	46	36	147	0	5	152	275
1927	66	53	55	175	-9	15	181	237
1930	61	58	47	166	-23	23	166	221
1934	66	59	32	158	-17	25	165	286

Sources: See also accompanying spreadsheet *Wealth_total_Deutsches_Reich_Nonfinancial* for details on the calculation.

Additionally, Table 11 compares this estimate to our benchmark estimate. As discussed above, the differences between the estimates are minor. More details on the raw data, all conversions, and sources can be found in the spreadsheets accompanying this article.

[26] One can arrive at this number by noting as 33 % of the private sector virtually have 0 stored goods (e.g. energy, banks, hotels, practices of medical doctors etc.), 33 % of the private sector (or half of the industrial sector) are assumed to have a 5 % of their gross wealth as stored goods (small businesses), and 33 % have 25 % of their gross value in stored goods. We do not consider this a lower-end estimate but rather a sensible correction of the assumptions made by Cornelsen et al. (1974).

[27] It is important to note that the German postal service and railway as public entities have been excluded throughout.

[28] In particular, the net worth of publicly owned companies excluding the railways and postal service is about 2.2 b Marks (Statistisches Reichsamt, 1939c, p. 87) and the total net worth of business assets is 44.1 b Marks (Statistisches Reichsamt, 1939c, p. 75). We use 1934 for benchmarking as only here publicly owned companies were assessed fully (in comparison to the values for 1927).

DA 2.5 Tabulations

Table 14 reports the sources for tabulations of net wealth.

Table 14: **Sources for wealth tabulations - interwar period**

Year	Source	Adjustment
1924	Statistisches Reichsamt (1929, p. 32)	Portfolio has to be estimated
1927	Statistisches Reichsamt (1931c, p. 157)	Portfolio has to be estimated
1930	Statistisches Reichsamt (1938a, p. 472)	Portfolio has to be estimated
1934	Statistisches Reichsamt (1938a, p. 13)	Uprating from fiscal to market values only.

Notes: For all data, the official date of the tax assessment is January 1 of the following year (e.g. January 1, 1935 for 1934). For 1924, 1927, and 1931, the portfolio structure is not recorded by total wealth in the above source. Instead, these are reconstructed based on a set of assumptions detailed below. See also accompanying spreadsheets for details on the calculation.

For 1934, these tabulations record the 'average portfolio' structure for each wealth bracket. It is thus straightforward to up-rate the different asset types according to the adjustment factors (Table 9) and to subtract debt to arrive at the tabulated net wealth in market prices.

For the other years, matters are substantially more complicated, because of the following reasons:

- The above sources do not separate German tax subjects living abroad in some of the years.
- There were changes in the law pertaining to the taxation of shares in limited liability companies (AGs and $GmbH$) and certain personal liability companies (KGs, and $OHGs$).
- While above sources provide wealth tabulations ordered by net wealth for 1924, 1927, and 1930, they do not record the structure of wealth, i.e. the 'average portfolio' in each wealth bracket. Since we have to adjust the fiscal values to market values for the various asset types, we have to estimate these portfolios by wealth bracket.

Under reasonable assumptions, we reconstruct tabulations of the distribution of net wealth and portfolios for 1924, 1927, and 1930 taking into account the changes in taxation rules. To this end, we first provide an overview about these taxation law changes. We then illustrate how we construct the portfolio for the year 1927. For all other years, we proceed analogously.

Wealth held by tax units living outside of Germany While we are interested in tax units residing in Germany only, the wealth statistics for 1927 (or January 1, 1928 in Statistisches Reichsamt, 1931c, p. 157) do not provide the wealth of those living abroad ordered by wealth class. Given their relatively small overall importance (1 %) of all taxpayers, the following adjustment cannot have a big influence on our results. As an approximation, we assume that their distribution follows the one for residents and thus estimate a tabulation for them based on the total number of tax units living abroad (28,497) and their wealth (1.5 b Reichsmarks).

Reduced taxation of limited liability companies in order to avoid double-taxation (*Aktienhalbierung*) The most significant adjustment has to be made regarding the *Aktienhalbierung*. This meant that shares in companies with the legal form GmbH, AG, similar ones according to §26.2.1 of the *Reichsbewertungsgesetz*[29], and mining companies were taxed (and declared) at only 50 % of their value by the individuals who owned them. This rule was in force to mitigate the 'double taxation' resulting from the fact that both, companies and individuals, were taxed. However, we only make use of the data on personal taxation, where these shares were only valued at 50%.

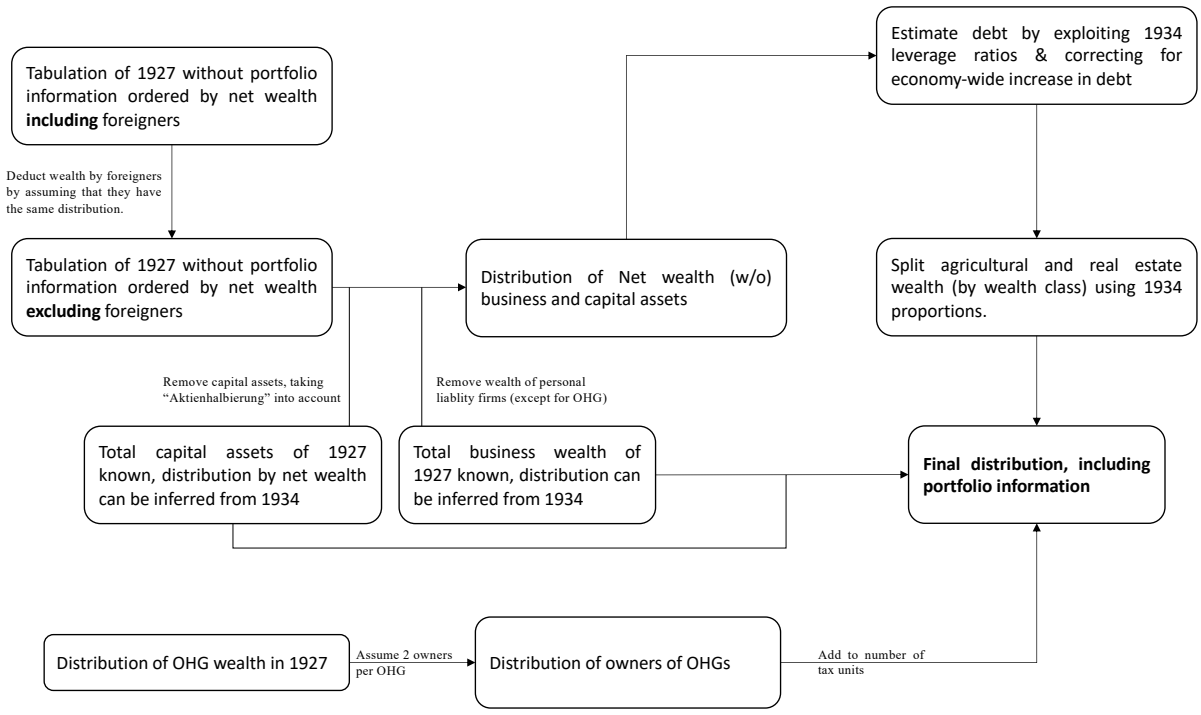
Taxation of companies having the legal form of *OHG* and *KG* *Offene Handelsgesellschaften (OHGs)* and *Kommanditgesellschaften (KGs)* are personal liability companies that can have have two or more owners that are either legal (*nichtnatürliche*) or actual (*natürliche*) persons. Before the tax assessment on January 1, 1925 and for the assessment of January 1, 1935, they were taxed as personal liability companies. However, for the years in between they were taxed as legal entities. Unlike for other shares in companies (such as AGs and GmbHs), the share was not taxed. The wealth tax law makes this explicit in §46: Shares in OHGs and KGs are not included in the total wealth of a tax unit (Beuck, 1925, p. 231). As the owners's share of such OHGs and KG's are not taxed as households, we have to make an adjustment for their number (i.e. the number of tax units) and the wealth owned by them in these company types. In the following, we refer to them only as 'OHG' owners to declutter the description.

Estimating the wealth composition by wealth bracket As the structure of wealth in 1927 was not recorded by wealth bracket, it is necessary to estimate it. Figure DA 2.2 provides the overview about our strategy. The spreadsheet *Deutsches_Reich_1927* provides further details, minor assumptions, and the corresponding sources.

The aim of this strategy is to provide a reasonable estimate of the portfolio structure of 1927 by net wealth. In a first step we correct the 1927 by removing non-residents. As discussed above, we know their number and wealth, but not their net wealth distribution.

[29]For the law regarding the valuation, see Deutsches Reich (1926a).

Figure DA 2.2: Generating the portfolios of 1927



Note: See also accompanying tabulation spreadsheet *Deutsches_Reich_1927*.

We remove them and their wealth under the assumption that their distribution follows that of residents. Given the small number of them (see also above), this is an uncritical assumption.

To generate the estimate of the portfolio itself and a tabulation of the net wealth that corrects for the law changes discussed above is more difficult. In a first step, we remove from the net wealth tabulation (less non-residents) business and capital wealth. We know the totals of both types of wealth for 1927. The distribution by net wealth can be inferred from the distribution of this particular asset class in 1934. Of course, we are careful to remove only half of the actual wealth in shares (*Aktienhalbierung*). In terms of business wealth, we remove only the personal liability firms (not the OHGs - as these were not reported by tax units/ their shares not taxable in 1927). The wealth totals are known (see spreadsheets for detailed sources) and we infer the distribution by net wealth of this particular asset class from that of 1934.

Having removed the business and capital assets from the distribution, we can now

estimate debt. Capital assets and business assets are reported net of debt and consumer debt does not exist at this time. This means that virtually all debt reported in the wealth tax forms by non-corporate tax-units must be mortgages either on agricultural land or real estate. We exploit this insight by backing out an estimate for debt by applying the 1934 ratio of debt to net wealth less business and capital assets. We correct this debt estimate for the fact that there was much less debt in the economy in 1927 (pre-Great Depression and post-hyperinflation) by exploiting the ratio of debt in 1927 relative to that of 1934 for the whole economy. Having an estimate for debt allows us to calculate the gross wealth in agricultural and real estate assets. For allocating these to either of the two asset classes, we exploit their relative importance across the different wealth classes in 1934.

To arrive at the final distribution, we re-add the tabulated business (now including the OHG wealth) and capital wealth to our estimates of the agricultural assets, real estate wealth and debt. We make the *Aktienhalbierung* undone and add business wealth. Note that we still have to add additional tax units to the wealth classes in order to correct for the fact that OHG shares were no longer reported by tax units. This does not pose a major difficulty. The distribution of OHGs is known. Furthermore, we know that OHG's were typically owned by around 2 tax units.[30] We thus calculate how many businessmen, we have to add to the distribution and add them to the officially recorded tax units.

Adjustment from fiscal values to market values We now have estimated the portfolio structure in fiscal values ordered by net wealth. We up-rate the components of the portfolio to market values by applying the asset-specific adjustment factors (Table 9), to arrive at the tabulated net wealth in market prices. We then subtract debt to arrive at market prices.

Validation of the procedure This procedure provides us with a portfolio estimate that corrects for the law changes. Below, we provide two plausibility checks of our estimates which also highlight the importance of correcting for the law changes.

In addition to our data points in the paper, there was a wealth tax assessment (based on pre-war prices) for the end of 1923 (more specifically, reflecting the wealth at January 1, 1924). At this point neither the *Aktienhalbierung* nor the special treatment of *OHG*s were in place. This allows us to assess the plausibility of our adjustment of the number of tax units at the top of the distribution. The comparison must be, of course, imperfect as the adjustment process from the hyperinflation was at a much more advanced stage one year later. Nevertheless, the comparison shows the plausibility of our assumptions and

[30] Indeed, Statistisches Reichsamt (1929, p 13) shows how the law change from 1924 and 1925 decreased the number of declared assets by human tax units in liability firms by around 120k and increased those declared as legal units by 60k.

the need for the adjustment itself.

Table 15: **Comparison of top wealth taxpayers**

Wealth class		Taxpayers				
		1924 (corrected)		1924 (raw)		1923
Lower	Upper	N	(% of 1923)	N	(% of 1923)	N
100,000	500,000	97,218	102%	71,589	75%	94,995
500,000	1,000,000	8,831	115%	4,912	64%	7,697
1,000,000		4,882	125%	2,335	60%	3,917

Sources: Statistisches Reichsamt (1931b, p. 33) and own calculations.

Table 15 displays the number of tax units with above 100,000 marks at the end of 1923, 1924 (raw), and 1924 (corrected). While we would expect an increase in these wealth classes from the end of 1923 to 1924—GDP per capita grew by around 10% due to the post-hyperinflation adjustment (according to data from Piketty and Zucman, 2014)—the raw data suggest that the number of tax units fell between 40% and 25% in the respective wealth classes. In contrast, our adjustment conveys a more realistic picture with increases of tax units between 2% and 25%.

Comparing the portfolio structure among rich households in 1927 and 1934 provides an additional plausibility check. Because the stark fall in equity prices during the Great Depression, we would expect a fall of the importance of capital and business assets and a relative increase in the importance of agricultural and real estate assets among the rich. Both expectations are indeed confirmed by our data.

In sum, we are confident that our reconstruction of portfolios reflects the composition of wealth at the top during this period. Using unadjusted data is not a viable alternative as we could not adjust for the different ratios of fiscal to market values.

DA 3 Federal Republic of Germany, 1953-1989

For the post-war period from 1953 to 1989, we estimate top wealth shares based on wealth tax data. Wealth tax data record asset types according to the legislative definition and by tax unit. Legislative definitions are cadastral values for some asset types like real estate and market values for others like stock shares. We adjust all asset evaluations to market values. The legislative definitions of wealth (fiscal wealth) and tax units are explained in Section DA 3.1. In Section DA 3.3, we explain our uprating factors, which adjust the cadastral values in the wealth statistics to current market values. The goal is to reach an equal treatment of the four asset categories evaluated at either cadastral or market values. In Section DA 3.7, we contrast top wealth shares in fiscal values and in market values.

For the estimation of top wealth shares, we construct a total tax unit series, a total fiscal wealth and total market wealth series. We describe our procedures in Section DA 3.4, DA 3.5 and DA 3.6, respectively. For our long-run wealth-income ratio, we use the total market wealth series so that the ratio is comparable across periods. The complete database of both total wealth series for the Federal Republic of Germany is documented in Table *TotalWealth1953-2018.xlsx*.

DA 3.1 Wealth tax regime and definition of fiscal wealth

Wealth tax data are available from 1953 until 1995.[31] In 1995, the German Federal Constitutional Court judged the wealth tax as incompatible with the principle of equality defined by the German constitution because wealth from real estate received preferential treatment (being evaluated at substantially lower values than market values) compared to other asset types. The government decided to suspend the wealth tax after 1996 rather than to reform the wealth tax legislation.

From 1953 until 1995, the wealth tax is levied every three years. Individuals living in Germany and German citizens working abroad in a German public institution holding wealth above the exemption limit are subject to the wealth tax. Tax unit is the married couple or a single person. Tax statistics include those who are tax exempt due to age or occupational disability tax allowances. In 1953 and 1957, wealth tax data are without the population of Saarland and West-Berlin. Saarland joined the Federal Republic of Germany (FRG) in 1957 and is included from 1960 onwards. West-Berlin is included from 1963

[31] In 1946, a wealth tax was collected in a subset of West German states, namely Schleswig-Holstein, Hamburg, Niedersachsen, Nordrhein-Westfalen, Hessen, Bayern and Baden. Bremen, and large states like Rheinland-Pfalz and Württemberg did not collect a wealth tax in 1946. The first nationwide wealth tax was collected in 1949, but no statistics were published (see Statistisches Bundesamt (1960)).

onwards. The population living in the New Bundeslaender, i.e., the territory of the former German Democratic Republic, is not subject to the wealth tax and therefore not included in our top wealth share estimates - neither before nor after German unification.

The exemption limit per individual is 10,000 DM in 1953 and 1957, 20,000 DM from 1960 to 1972, 70,000 DM from 1974 to 1993, and 120,000 DM in 1995. Exemption limits double for married couples. After 1986, an additional allowance of 125,000 DM for business wealth is introduced, which is raised to 500,000 DM in 1993. This generous exemption limit for business wealth substantially reduces the share of wealth taxpayers and, thus, mechanically reduces top wealth recorded in wealth tax data. Therefore, we use wealth tax data until 1989.

Taxable wealth is categorized as wealth in (1) agriculture and forestry, (2) real estate, (3) unincorporated business and (4) other assets. Consumer durables, patents, licences, copyrights and future claims on social security benefits are tax exempt. (1) to (3) are evaluated at cadastral values (*Einheitswerte*) based on the respective earnings value (*Ertragswert*).

Earnings values of agriculture and forestry (1) and real estate (2) are based on values assessed in the year 1935 for 1935–1973 and assessed in the year 1964 for 1974-1995. In contrast, values of unincorporated businesses (3) are re-assessed every time, when the wealth tax is collected. The earnings value of agriculture and forestry (1) is supposed net earnings in the case of orderly management varying with cultivation, soil quality, production means, livestock, technical building equipment, regional wages and prices etc. The earnings value of real estate (2) is annual rent (observed or imputed) multiplied by a factor depending on type, age and location of the house. Undeveloped land is evaluated at market values.[32] The assessed value of an unincorporated business (3) is the sum of all economic assets of the firm that would be included in the total purchase price of the firm. If the firm owns another non-listed corporate firm, shares are assessed by the so-called *Stuttgarter Verfahren* which draws on the nominal capital and profits of the past three years. If the firm owns another listed corporate firm, shares are evaluated at market values as (4). Other assets (4) include interest- and non-interest-bearing bonds, savings deposits above 1,000 DM, capital holdings at cooperatives (*Geschäftsguthaben bei Genossenschaften*) and shares of listed and non-listed corporations. These are evaluated at market values as of 31st of December. Shares of non-listed corporations are valued by their assessed value as (3).

In sum, tax-assessed values for agriculture and forestry (1) as well as real estate (2) are based on earnings values of 1935 for 1935–1973 and of 1964 for 1974-1995. In contrast, tax-assessed values for unincorporated business (3) are re-assessed in each wealth tax

[32]The tax office collected purchase prices for undeveloped land by area.

collection year and other assets (4) are evaluated at market prices. As a consequence, (1), (2) and real estate belonging to (3) are increasingly undervalued in relation to (4) over the two periods 1935–1973 and 1974-1995.

DA 3.2 Tabulations

We undertake the following modifications to the tabulated wealth tax statistics. First, we create an index to increasingly uprate tax-assessed values of (1), (2) and real estate belonging to (3) in order to reach a more equal treatment of the four asset categories. We describe the assessment of uprating factors in Section DA 3.3. Second, we add and deduct specific items from the fourth asset category (4) in order to harmonize assets across periods. We add the tax allowance on insurance assets. As the value of life, pension and capital insurance in wealth tax statistics is documented after the deduction of the tax allowance, we add the average tax allowance per tax unit multiplied by the number of tax units with positive values in this asset category per wealth bracket. However, we miss tax units whose insurance assets are below the tax allowance and who are therefore not listed in the tax statistics as insurance holders. The tax allowance for life, pension and capital insurance is 5,000 DM for the tax years 1953 and 1953 and 10,000 DM since 1961. We deduct the net present value of usufructuary rights (*Kapitalwert von Renten und Niessbrauchsrechten*, § 110(1)4 BewG) for three reasons. First, the liability corresponding to a usufructuary right is not recorded by the wealth tax. As a consequence, we do not know the distribution of the net value of usufructuary rights. Second, as usufructuary rights mainly occur within the household sector, the net total within the household sector will be zero. Third, the overall share of usufructury rights in (4) is small (e.g., 2.5% in 1966 or 6.7% in 1977). We deduct remaining other assets (*übriges sonstiges Vermögen*) from other assets (4) which include coins, medals, luxury goods, art and collections (§ 110(1) 10 to 12 BewG). Only a small share of these items is recorded by the wealth tax (Rössler et al., 1983, p.1394) and the sum of these items across all German households is unknown.

The sources for the wealth tax data published by the federal statistical office (*Statistisches Bundesamt*) are listed in Table 16.

Table 16: Wealth tax data sources, 1953-1995

Year	Source
1953	Hauptveranlagung der Vermögensteuer auf den 1.1.1953
	Statistik der Bundesrepublik Deutschland, Band 247
1957	Hauptveranlagung der Vermögensteuer auf den 1.1.1957
	Statistik der Bundesrepublik Deutschland, Band 261
1960	Reihe 6 Einkommen- und Vermögensteuern, III. Vermögensteuer,
	Hauptveranlagung 1960, Fachserie L Finanzen und Steuern
1963	Reihe 6 Einkommen- und Vermögensteuern, III. Vermögensteuer,
	Hauptveranlagung 1963, Fachserie L Finanzen und Steuern
1966, 1969	Reihe 6 Einkommen- und Vermögensteuern, III. Vermögensteuer,
	Hauptveranlagung 1966, Fachserie L Finanzen und Steuern
1972	Reihe 7.4 Vermögensteuer 1972, Fachserie 14 Finanzen und Steuern
1974	Reihe 7.4 Vermögensteuer 1974, Fachserie 14 Finanzen und Steuern
1977	Reihe 7.4 Vermögensteuer 1977, Fachserie 14 Finanzen und Steuern
1980	Reihe 7.4 Vermögensteuer 1980, Fachserie 14 Finanzen und Steuern
1983	Reihe 7.4 Vermögensteuer 1983, Fachserie 14 Finanzen und Steuern
1986	Reihe 7.4 Vermögensteuer 1986, Fachserie 14 Finanzen und Steuern
1989	Reihe 7.4 Vermögensteuer 1989, Fachserie 14 Finanzen und Steuern
1993	Reihe 7.4 Vermögensteuer 1993, Fachserie 14 Finanzen und Steuern
1995	Reihe 7.4 Vermögensteuer 1995, Fachserie 14 Finanzen und Steuern

DA 3.3 Adjusting fiscal values to market values

As noted above, agriculture, real estate and unincorporated business wealth recorded in wealth statistics are valued using cadastral values (*Einheitswerte*) which produces systematically lower values than market values, particularly for real estate. To create an index for the adjustment of tax-assessed (=fiscal) values of agriculture, real estate and business to market values. We follow the approach of Baron (1988) and use the ratio of total fiscal wealth (Section DA 3.5) to total market wealth (Section DA 3.6). Figure DA 3.7 displays the resulting uprating factors for business, agriculture and real estate. Note that we cannot account for re-reanking of tax units within the wealth distribution after re-evaluating asset categories as we rely on tabulated statistics. Similarly, we cannot check if the wealth taxpayers' share in total wealth of an asset type would be higher or lower, if this asset type would have been evaluated at market values. There are no individual wealth tax records available that would allow us to estimate the re-ranking effect of our

re-evaluation. See Section DA 3.7 for a critical evaluation of our uprating factors.

DA 3.4 Reference total population

Our reference total population of tax units draws on population statistics of the statistical office published in the statistical yearbook (*Statistisches Jahrbuch*). We obtain total tax units as the sum of married couples and bachelors reduced by the number of children. Reference total population is given by

Married Couples/2

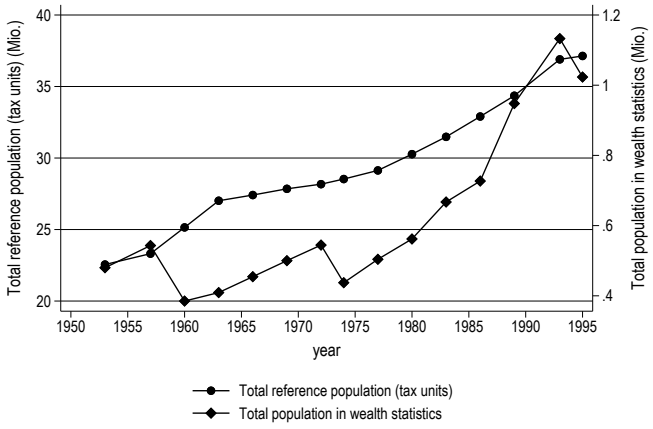
\+ Bachelors

\- Children (up to 19 years)

= reference total population

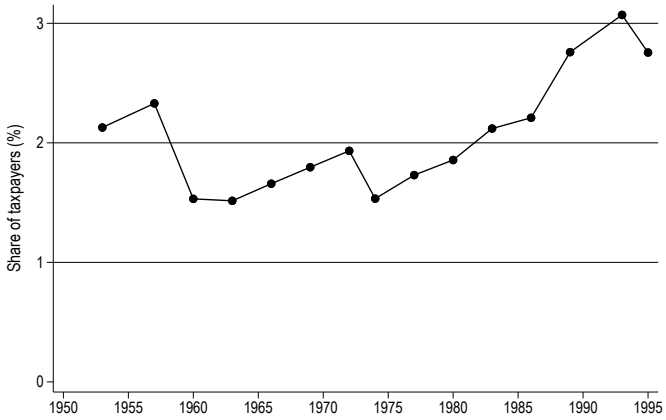
Figure DA 3.1 shows the evolution of the reference total population and the number of wealth taxpayers from 1953 to 1995. Upward shifts in tax allowances from 10,000 to 20,000 DM in 1960, to 70,000 in 1974 and to 120,000 DM in 1995 abrubtly reduce the number of taxpayers in the respective years. Figure DA 3.2 shows that the share of taxpayers increases between tax allowance reform years. But all in all, only about 2% of potential taxpayers in post-war Germany are subject to the wealth tax. Thus, wealth tax data only allow us to estimate the wealth share of the richest percentile.

Figure DA 3.1: Reference total population and wealth taxpayers, 1953-1995



Source: Reference total population from various publications of the statistical yearbook (*Statistisches Jahrbuch*). Wealth taxpayers from wealth tax statistics, see Table 16.

Figure DA 3.2: Share of wealth taxpayers, 1953-1995



Source: Reference total population from various publications of the statistical yearbook (*Statistisches Jahrbuch*). Wealth taxpayers from wealth tax statistics, see Table 16.

DA 3.5 Reference total fiscal wealth

A carefully assembled series of German household wealth from 1953 to 1980, that matches the fiscal wealth definition, is provided by Baron (1988). We update the series by Baron (1988) and extend it to 1989.

1. Total wealth in agriculture and forestry is computed from the property tax on agricultural land and forests (*Grundsteuer A*) published by the statistical office in *Fachserie 14, Reihe 10.1, Finanzen und Steuern, Realsteuervergleich - Realsteuern.* Dividing the tax amount by the tax rate gives the cadastral value of agricultural land and forests. We uprate the cadastral value with an uprating factor which is the weighted average of three uprating factors from agriculture, forestry and real estate and which is explained in Section DA 3.3.

2. Total wealth in real estate is computed from the property tax on real estate (*Grundsteuer B*) published by the statistical office in *Fachserie 14, Reihe 10.1, Finanzen und Steuern, Realsteuervergleich - Realsteuern.* Dividing the tax amount by the tax rate gives the cadastral value of real estate. The total cadastral value of real estate is reduced by real estate owned by non-profit housing enterprises, legal entities under public law and industrial enterprises. The reduced total gives the cadastral value of real estate owned by private households. We uprate the cadastral value of private households' real estate with an uprating factor, which is explained in Section DA 3.3.

3. Total wealth in unincorporated businesses is computed from the cadastral value of business assets recorded by the statistical office in *Fachserie 14, Finanzen und*

Steuern, Reihe 7.5.1, Einheitswerte der gewerblichen Betriebe. Unincorporate firms include sole proprietorships (*Einzelunternehmen*) and partnerships (*OHG, KG*). These cadastral values are re-assessed each time when the wealth tax is collected.

The cadastral value of unincorporated businesses in the statistical office's publication *Einheitswerte der gewerblichen Betriebe* exceeds total unincorporated business wealth held by private households because a share of unincorporated firms is held by corporate firms - and not by personal wealth taxpayers. This share increases over time and is between 10% and 40%.[33] For example, business wealth held in the legal form of *GmbH & Co KG*, which gains increasing popularity over time, is counted as corporate business wealth in the form of limited liability companies (*GmbHs*). For our total business wealth, we adjust the cadastral value of business assets published in *Einheitswerte der gewerblichen Betriebe* downwards accordingly.

The cadastral value of business assets includes real estate. Since real estate is evaluated with cadastral values fixed in 1935 or 1964, respectively (§109 BewG), we uprate real estate included business assets with the annual uprating factor for real estate which is explained in Section DA 3.3.

4. Total wealth in other assets is the sum of deposits (*Terminguthaben*, *Sparguthaben*, *Bausparguthaben*), securities (*festverzinsliche Wertpapiere*) and insurances as published in the Financial Accounts of the Bundesbank. Further, shares in public limited companies (*AG*) as recorded in Financial Accounts, private limited companies (*GmbH*) as recorded in the statistical office's publication *Einheitswerte der gewerblichen Betriebe* and capital holdings at cooperatives as recorded in the yearbook of the *Zentralkasse der Genossenschaften* is added.

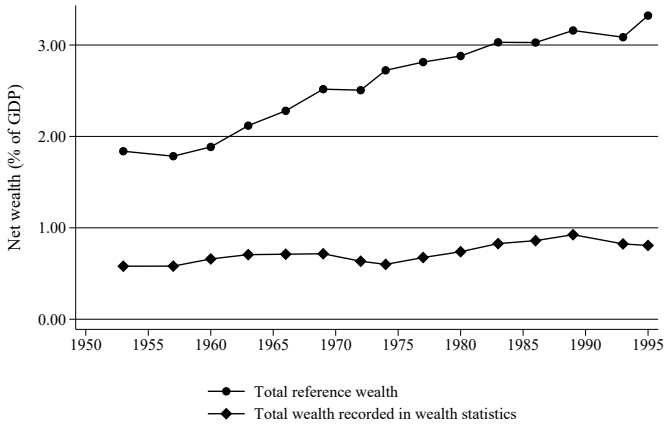
5. Debt is the sum of debt in agriculture and forestry as published in the agricultural report of the government (*Agrarbericht der Bundesregierung*), real estate debt as published in Financial Accounts of the Bundesbank, other debt recorded in Financial Accounts of the Bundesbank and outstanding debt with respect to the wealth levy (*Lastenausgleich*) as published in the statistical office's wealth tax statistics. Agricultural debt is reduced by agricultural debt held by legal enterprises to obtain agricultural held by private households. Total real estate debt as published in

[33]The share of unincorporated firms held by corporate firms is computed by comparing the hypothetically assessed business assets with the business assets assessed for the wealth tax. The cadastral values of business assets in the statistical office's publication *Einheitswerte der gewerblichen Betriebe* are grouped by their cadastral value. Only the value of those businesses exceeding the business asset tax allowance multiplied by an average number of shareholders are included in the sum of hypothetically assessed business assets.

Financial Accounts of the Bundesbank is reduced by real estate debt held by non-profit housing enterprises, legal entities under public law and industrial enterprises to obtain real estate debt held by private households.

Reference total fiscal wealth and total wealth recorded in wealth tax statistics from 1953 to 1989 as share of GDP is displayed in Figure DA 3.3. Total wealth recorded in wealth statistics is of about the same size as annual GDP. Even though only 2 percent of all potential taxpayers are subject to the wealth tax in post-war Germany, their wealth recorded in wealth statistics reaches a third of total wealth, which indicates the elevated level of wealth concentration in Germany.

Figure DA 3.3: Reference total fiscal wealth



Source: See Table *TotalWealth1953-2018.xlsx.*

DA 3.6 Reference total market wealth

We construct a new, revised series of total market wealth from 1953 to 1989. Piketty and Zucman (2014) closely build on Baron (1988) for this period, who constructed series for both total fiscal wealth and total market wealth. In the following, we describe our procedure for each asset category and discuss the differences between our estimates and those by Baron (1988) and Piketty and Zucman (2014).

1. Total wealth in agriculture and forestry is the sum of reproducible assets and land. Reproducible assets include farm buildings, machinery, animals, inventories and houses. Reproducible assets are regularly estimated as part of the government's agricultural report (*Agrarbericht*) and published by the German parliament. We compute the value of agricultural land as the product of agricultural area owned by farmers, the lease price and a time-varying capitalization factor. Lease prices are mostly taken from the agricultural report of the government and the statistical office and extrapolated with regional data from Schleswig-Holstein where a national estimate is unavailable. We compute the capitalization factor from the ratio of sales prices to lease prices in Schleswig-Holstein, where long-run series on sales prices are available, which are not biased by urbanization (the factor varies from 30 in the 1950s to 40 in 1990.[34]

   Previous estimates, in particular Baron (1988) (also used by Piketty and Zucman (2014)), have relied on sales price data for the value of land and estimates of the capital stock based on the perpetual-inventory-method reported by the statistical office. The main difference between our estimates and such estimates originates in the valuation of land. In Baron's case, the value of agricultural land is the product of land area (from: *Allgemeine Querschnittsveröffentlichungen, Lange Reihen zur Wirtschaftsentwicklung*) and the sales price per hectare (from: *Fachserie 3, Land- und Forstwirtschaft, Fischerei, Reihe 2.4, Kaufwerte für landwirtschaftlichen Grundbesitz*). As noticed by Müller (1971), these estimates are necessarily *very* upward biased and do not reflect an average for all agricultural land. The average sales prices published by the federal statistical office simply record the average of all transactions. The land sold, however, is not chosen randomly. Indeed, most farmers would sell their land only if they do not have a heir willing to continue to work on the farm or, most likely, when the land is transformed for real estate development—land in the vicinity of urban areas. The role of the latter in driving the prices is

[34] For the early 1950s, we exploit an index on sales prices in Schleswig-Holstein. During this period, our capitalization method might overestimate the value of agricultural land as large investments were hard to make in the immediate post-war period.

apparent from the regional level of prices, in which North Rhine-Westphalia has a multiple agricultural land price compared to other states. The available material on sales prices is thus not a good guide for estimating agricultural wealth and our capitalization of lease prices is a reasonable second-best solution.

Estimating the value of forestry in the ownership of private households is equally challenging. While sales prices for agricultural land are not representative, the market for forestry land is too illiquid to make time series on the development of prices. Instead, we follow the suggestion by Löffler (2005, p. 185). We use a good benchmark estimate for 1991 (Köhler, 1994, an estimate made for the purpose of wealth accounting) and infer the dynamics from the development of agricultural prices. We multiply the estimated hectare price with the forestry area owned by households (*Fachserie 3, Reihe 2.1.2, Land- und Forstwirtschaft, Fischerei, Bodennutzung der Betriebe*).

2. Business assets is the sum of fixed assets, inventories and property owned by the corporate sector as suggested by Baron (1988). A flexible share of 40 to 50% of these assets are estimated to be owned directly by households. Fixed assets and inventories of the corporate sector – excluding agriculture and forestry as well as tenant-occupied housing of the household sector – is taken from National Accounts published by the statistical office (*Fachserie 18, Volkswirtschaftliche Gesamtrechnungen, Reihe S.5, Revidierte Ergebnisse 1960 bis 1981; Fachserie 18, Volkswirtschaftliche Gesamtrechnungen, Reihe S.7, Lange Reihen 1950 bis 1984; Fachserie 18, Volkswirtschaftliche Gesamtrechnungen, Reihe 1, Konten und Standardtabellen 1984*). Data on property of the corporate sector is taken from the statistical yearbook and *Fachserie 17, Preise, Reihe 5, Kaufwerte für Bauland, 4. Vierteljahr 1983; 1. Vierteljahr 2019*.

   Our business assets estimates are two- to three-times higher than the estimates by Piketty and Zucman (2014) (see Figure DA 3.4). This is because their non-housing real assets estimate (Appendix Data Table DataDE2 column AE) only includes agricultural wealth and they seem to assume that unincorporated business wealth reported by Baron (1988) in Table 31 would be included in the financial asset measure of the Bundesbank Financial Accounts (see Data Appendix Piketty and Zucman (2014), p. 77, Footnote 189). However, Financial Accounts until 1991 only included listed shares and excluded unincorporated business wealth. As non-agricultural business wealth gains importance over time, our gap to Piketty and Zucman (2014) increases.

3. Real estate is based on the series by Sablotny (1977) from 1953 to 1963, which Baron

also relies on, without further modifications. From 1964 to 1990, we replicate and extend the series by Baron (1988). Real estate wealth R_t in year t is the sum of housing R_{ht} and land R_{lt}. Housing wealth R_{ht} is computed as

$$R_{ht} = R_{ht-1} \times (1 + \frac{p_{ht}}{p_{ht-1}}) + C_{ht-1} \tag{9}$$

where $R_{ht-1} \times \frac{p_{ht}}{p_{ht-1}}$ is the price-driven change in housing wealth between t and $t-1$ and C_{ht-1} is the construction costs for new housing. Land R_{lt} is computed as

$$R_{lt} = R_{lt-1} \times (1 + \frac{p_{lt}}{p_{lt-1}}) + NR_{lt} \tag{10}$$

where $\frac{p_{lt}}{p_{lt-1}}$ is the price-driven change between t and $t-1$. The value of new land NR_{lt} is new building land divided by a factor for the construction density. The construction density is the ratio of living space to residential land. According to Baron (1988) this factor is constant at 0.2086 between 1965 and 1970 and is, therefore, assumed as constant in later years. The input data are taken from publications of the statistical office: *Fachserie 17, Reihe 5, Kaufwerte für Bauland*, *Fachserie 17, Reihe 4, Messzahlen für Bauleistungspreise und Preisindices für Bauwerke* and the statistical yearbook (*Statistisches Jahrbuch der Bundesrepublik Deutschland*).

Importantly, our series needs a starting value of real estate wealth in 1964, that we can perpetuate. The value of real estate wealth R_t owned by private households in 1964 is taken from Sablotny (1977). This value is then divided into housing wealth and land according to the share of land, α_{lt}, in real estate wealth. This factor is computed as

$$\alpha_{lt} = \frac{\frac{R_t}{R_{t-1}} - \frac{NR_{lt}+C_{ht-1}}{R_{t-1}} - (1 + \frac{p_{ht}}{p_{ht-1}})}{\frac{p_{lt}}{p_{lt-1}} - \frac{p_{ht}}{p_{ht-1}}} \tag{11}$$

Finally, we revise our estimates from 1953 to 1990 upwards proportionately to match the level of West German housing in 1991 as estimated in Household Balance Sheets of the statistical office.

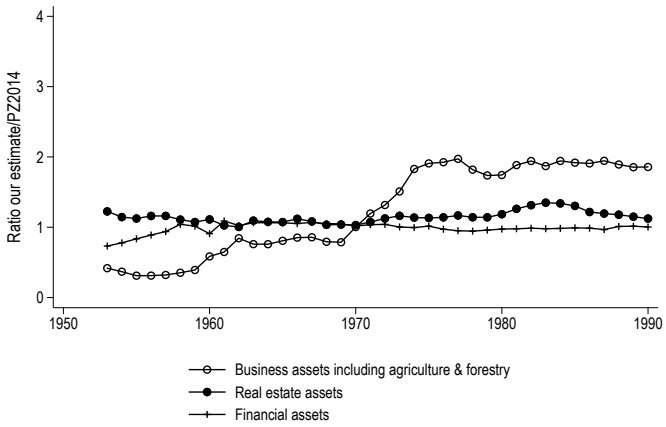
Our real estate series is slightly higher than the series by Piketty and Zucman (2014) (see Figure DA 3.4). This is because Piketty and Zucman (2014) erroneously assume that gross real estate reported by Baron (1988) in Table 31 is net real estate so that they add real estate debt to obtain their measure of gross real estate (see Data Appendix Piketty and Zucman (2014), p. 77, Footnote 189).

4. Financial assets include regular savings (*Sichteinlagen, sonstige Einlagen, Spareinlagen*), home purchase savings (*Bausparguthaben*), fixed term deposits (*Termingeld*), savings bonds (*Sparbriefe*), listed and non-listed shares (*Aktien*), investment fonds, fixed-income securities (*festverzinsliche Wertpapiere*), insurance technical reserves

(*versicherungstechnische Rückstellungen*) and other claims (*übrige Forderungen*). The data are taken from the Financial Accounts published by the Bundesbank. In the 1950s, our series shows less financial assets than Piketty and Zucman (2014) because they include cash, company pensions and count listed shares twice (*Geldanlage in Aktien* and *Aktien zu Tageskursen*) (see Figure DA 3.4).

5. Debt is the sum of housing debt, consumer debt, and business debt. Our series on housing debt is the same as in the series with fiscal definitions decribed in Section DA 3.5. Non-housing debt consists of agriculture debt, wealth tax levy debt (*Lastenausgleich*), consumer debt and business debt. Agriculture debt and wealth tax levy debt is the same as in the series with fiscal definitions decribed in Section DA 3.5. Consumer debt and business debt is based on the evolution of liabilities of private households as recorded in Financial Accounts of the Bundesbank. We uprate these figures to match the level in 1991, when we have more detailed data on liabilities of private households.

Figure DA 3.4: Total market wealth, 1953-1989: Revised estimates vs. Piketty/Zucman (2014)



Source: See Table *TotalWealth1953-2018.xlsx* and Piketty and Zucman (2014).

DA 3.7 Fiscal wealth vs. market wealth

The evaluation concept of wealth affects the wealth inequality measured. Figure DA 3.6 contrasts the top 1% wealth share series resulting from market and fiscal values. The top 1% share is at about the same level at the start and the end of our post-war series, i.e., in 1953 and in 1989. Until the 1970s, market value based series indicate less accentuated changes. Since the 1970s, fiscal value based series show less accentuated changes.

The channel through which evaluation concepts produce different trends and levels is the relative macroeconomic importance of an asset type. For example, the higher the relative importance of business, the higher the top 1% share. Let us define the wealth share of the top 1% group ω^g as the ratio between the sum of total assets A of asset type j owned by the top 1% $\sum_{j=1}^{J} A_j^g$ and the sum of total assets of asset type j owned by all private households $\sum_{j=1}^{J} A_j$. g denotes the subgroup of interest, which is the top 1% in our case. We can rewrite this equation summing up each asset's share in total wealth:

$$\omega^g = \frac{\sum_{j=1}^{J} A_j^g}{\sum_{j=1}^{J} A_j} = \frac{A_1^g}{\sum_{j=1}^{J} A_j} + ... + \frac{A_J^g}{\sum_{j=1}^{J} A_j} \tag{12}$$

We now expand the first term of this expression with the total of asset A_1, e.g., business assets, which gives

$$\omega^g = \frac{A_1^g}{A_1} \cdot \frac{A_1}{\sum_{j=1}^{J} A_j} + ... + \frac{A_J^g}{\sum_{j=1}^{J} A_j} \tag{13}$$

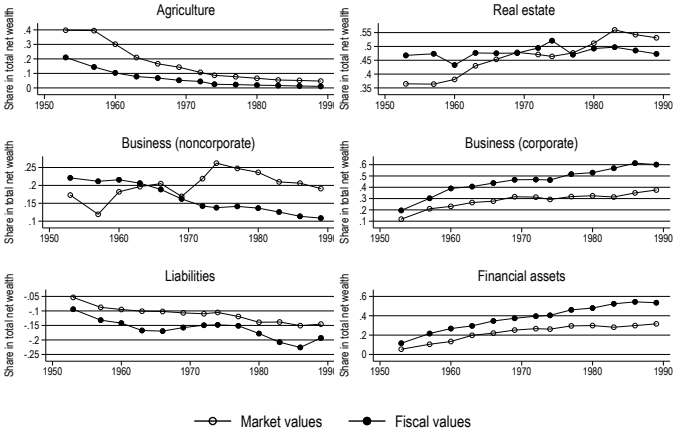
This shows that the macroeconomic importance of asset A_1 has an important impact on the group's wealth share. If we now multiply A_1^g and A_1 by an uprating factor c, this uprating factor cancels out from the first term (the groups's share in the total of asset A_1), but not from the second term (the macroeconomic importance of asset A_1).

Figure DA 3.5 shows the share of our asset types in total wealth, i.e., their macroeconomic importance, contrasting market and fiscal evaluation concepts. The Figure highlights that the share of business assets in total wealth in market values is lower than in fiscal values in the 1950s and higher since the 1970s.

As a result of the gap between the relative macroeconomic importance of fiscal wealth and market wealth, the top 1% wealth share deviates between the two wealth concepts. The top 1% wealth share in market values is lower in the 1950s and 1960s, when business wealth and real estate in market values show a lower macroeconomic share. Since the 1970s, the top 1% wealth share in market values is higher, because business wealth and real estate (since the late 1970s) in market values show a higher macroeconomic share than for fiscal values.

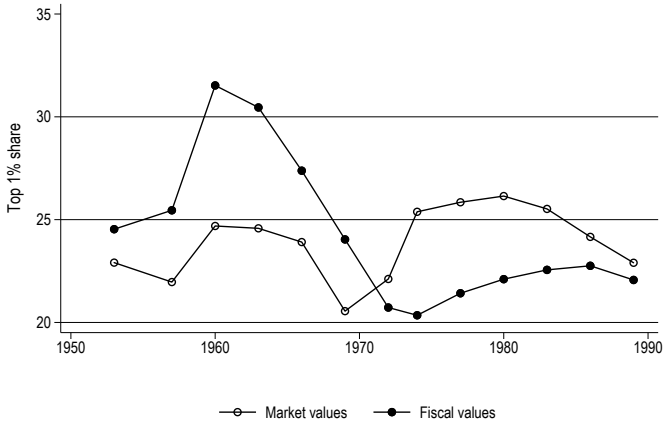
In section DA 3.3, we outline our uprating factors that adjust tax-assessed values.

Figure DA 3.5: Asset share in total wealth: fiscal vs. market evaluation concepts



Source: See Table *TotalWealth1953-2018.xlsx* Sheet *Wealth*.

Figure DA 3.6: Top 1% share: fiscal vs. market value uprating

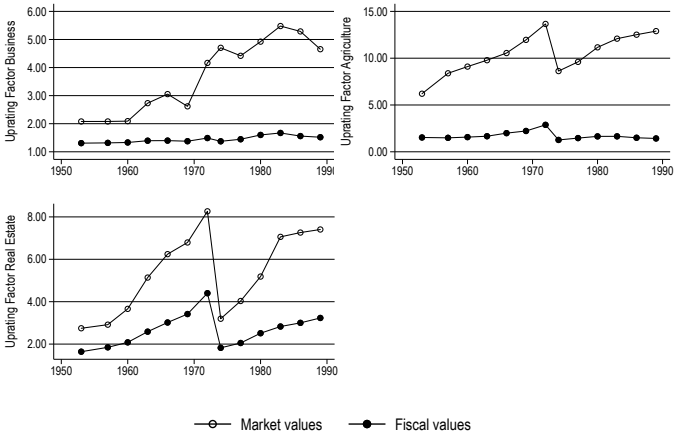


Source: See Table *TotalWealth1953-2018.xlsx*.

These uprating factors address the increasing underevaluation of tax-assessed real estate included in agricultural wealth, real estate and business wealth. Tax-assessed values for real estate were only changed in 1974 remaining so that real estate (and real estate belonging to the agriculture and businesses) was increasingly undervalued with respect to market prices over time. The goal is to reach a more equal treatment of the four asset categories evaluated at either fiscal or market values.

Figure DA 3.7 contrasts our fiscal value uprating factor with market value uprating factors. Market value uprating factors indicate by which factor we have to multiply total tax-assessed wealth in order to reach total market wealth. For example, in 1953, business wealth according to market values is twice as high as business wealth according to fiscal values. Instead of using our fiscal uprating factor of 1.3, we use an uprating factor of 2. The left-hand upper panel of Figure DA 3.7 shows that the gap between fiscal and market values of business wealth increases over time, particularly in the beginning of the 1970s

Figure DA 3.7: Uprating factors: fiscal wealth vs. market wealth



Source: See Table *TotalWealth1953-2018.xlsx* Sheet *Indices*.

when GDP growth rates are high and business asset investments surge. The right-hand upper panel contrasts agricultural uprating factors and the left-hand lower panel compares real estate uprating factors. For both, the gap increases until 1974. In 1974, tax-assessed real estate values were updated which reduce the necessary uprating factor. But as the tax-assessed real estate values remained fixed, our uprating factor has to increase again after 1974 to adjust for rising real estate prices over time.

DA 4 Unified Federal Republic of Germany, 1993-2018

Our inequality series 1993-2018 builds on household survey data uprated to official wealth aggregates. Official wealth aggregates are published in Household Balance Sheets (HBS) by the Bundesbank and the statistical office. However, HBS aggregates are known to underestimate the value of unincorporated firms in Germany (Deutsche Bundesbank, 2010, p.12) and not closely following the evolution of market values of real estate wealth. To address these shortcomings, we develop revised estimates for the value of unincorporated firms and real estate owned by private households in Germany.

DA 4.1 Definition of wealth

Household surveys and HBS include information on real estate, business wealth, financial assets and debt. To uprate household surveys to aggregate household wealth, we have to carefully reconcile the definitions of assets between the data sources. Second, we have to harmonize wealth definitions within data sources over time.

Our main inequality series builds on the Harmonized Income and Expenditure Survey (*Harmonisierte Einkommens- und Verbrauchsstichprone* EVS+) 1978-2018, which is constructed by Bönke et al. (2013) and Bartels et al. (2021). In the original EVS, variable definitions greatly vary from wave to wave, particularly up to 1993. Therefore, Bönke et al. (2013) and Bartels et al. (2021) carefully constructed consistently defined income, expenditure and wealth variables. Most importantly, the EVS+ includes four consistently defined wealth categories: real estate, financial assets, business assets, and debt. In the following, we briefly describe the main adjustments for these four wealth categories for the period 1993-2018.

1. Real estate is recorded in market values since 1993. It includes both owner-occupied and tenant-occupied housing.

2. Financial assets include regular savings, home purchase savings (*Bausparguthaben*), fixed term deposits (*Termingeld*), savings bonds (*Sparbriefe*), fixed-income securities (*festverzinsliche Wertpapiere*) and government bonds (*Staatsschuldpapiere*). Private pensions are included since 2003. Insurance assets are included in all years, but with an increasing degree of accuracy. From 1978 to 1993, insurance sums are recorded, which are converted to repurchase values in EVS+ (see Bartels et al. (2021)). We group financial assets according to official definitions of the European System of Accounting (ESA) 2010: *deposits* (F.2), *securities* (F.3), and *insurances* (F.6).

3. Business assets in EVS only cover corporate equity held in shares and investment funds. Non-corporate business wealth (the equivalent to *other equity* (F.519) of overall *equity* (F.5)) is surveyed once in 1983. In 1983, respondents are asked to state if their business wealth lies in the following ranges: 0-10,000; 10,000-20,000; 20,000-30,000; 30,000-50,000; 50,000-70,000; 70,000-100,000, above 100,000 DM. Bartels et al. (2021) convert these grouped data into a continuous distribution estimating a Generalized Pareto model and impute business wealth in the other years, assuming that the distribution of business wealth in the years 1978 and 1988 is equal to the distribution recorded in 1983. We impute business wealth in EVS building on the business wealth distribution observed in SOEP. For the EVS survey years 1993, 1998, 2003, 2008, 2013, and 2018, we use the SOEP distribution of the SOEP survey years 2002, 2007, 2012, and 2017, respectively.

4. Debt recorded in the EVS includes both consumer debt and housing debt. Business debt is imputed assuming the distribution of business wealth recorded by the SOEP in the years 2002, 2007, 2012, and 2017, respectively.

DA 4.2 Reference total population

Our reference total population is households weighted with household survey weights.

DA 4.3 Reference total wealth

Our total wealth series is based on HBS for financial assets and debt. For real estate and business wealth, we construct our own revised estimates.

1. Agriculture and forestry is included in business assets.

2. Business assets are the sum of equity in public limited companies (1), in private limited companies and quasi-corporations (2)[35] and unincorporated business (3). While the HBS estimate in public limited companies (1) is generally judged as rather accurate, it is well-known that wealth in other corporations and quasi-corporations (2) is underestimated.

   We benchmark our revised estimate of 4,000 billion Euros in 2018 against three other data sources. First, according to the official balance sheets of the German non-financial corporate sector, their net worth is 3,600 billion Euros in 2018. Given

[35] This includes private limited companies (*GmbHs*), cooperative societies, and quasi-corporations such as general partnerships (*Offene Handelsgesellschaft - OHG*) and limited parterships (*Kommanditgesellschaft - KG*).

that 90% of German firms are family owned (a), that foreign or public holdings of overall limited quantitative importance (b) and that the non-financial corporate sector is not even included here (c), our estimate of about 3,400 billion corporate and quasi-corporate business wealth held by German households is still conservative. Second, international comparisons show that business wealth (both corporate and non-corporate) is about 30% of total private wealth in the United States (Saez and Zucman, 2016). Revising upwards the German business share from 16% (official HBS) to 32% (our revised estimate) brings Germany in line with international magnitudes. Third, the *Manager Magazin* rich list of 2018 implies that the richest 1,000 families (ca. 0.01% of German households) hold a total wealth of 910 billion Euros. Most of this wealth is held in corporations or quasi-corporations. The low business wealth estimates in official HBS suggest, that virtually all corporate and quasi-corporate business wealth belongs to the top 0.01% alone. This is strongly against what we know from survey data and income tax data implying that at least 1% of German households receives non-negligible business incomes and has substantial business wealth holdings.

There are at least four good reasons to believe that privately held business wealth in corporations and quasi-corporations is under-recorded:

(a) Corporate and quasi-corporate business wealth of the household sector (HBS) is about one third of the balance sheets' net worth of the non-financial corporate sector (1,220 vs. 3,600 billion Euros in 2018). This gap can hardly be explained by large foreign or public holdings of the German business sector. Estimates show that about 90% of German firms are family owned (Stiftung Familienunternehmen, 2019). We will make generous adjustments for foreign holdings below, but most of the non-listed corporate sector likely belongs to German households.

(b) Business income from quasi-corporations and unincorporated businesses is the second-largest income source in personal income tax statistics, exceeded only by employment income. Business income was four times higher than dividend and interest income in 2007.[36] This means that wealth in quasi-corporations and unincorporated businesses has to be substantially higher than corporate wealth.

(c) International comparisons show that business wealth (both corporate and non-

[36] A withholding tax on dividends and interest income (*Abgeltungssteuer*) was introduced in 2009, which reduced the amount of divided and interest income recorded in income tax statistics. Hence, our comparison refers to the year 2007.

corporate) is about 30% of total private wealth in the United States (Saez and Zucman, 2016). The existing German data imply an unreasonably low business share of 16%, only about half as high as in the United States.

(d) The *Manager Magazin* rich list of 2018 implies that the richest 1,000 hold a total wealth of 910 billion Euros. Most of this wealth is held in corporations or quasi-corporations. But, again, the total corporate and quasi-corporate wealth of all German households is only 1,220 billion Euros according to existing figures, only slightly higher than the total wealth that the *Manager Magazin* records for the richest 1,000 German families alone.

Hence, we revise the estimate for (2). We follow the procedures of the U.S. Federal Reserve to compute the market value of closely held corporate equity in the Financial Accounts of the United States (Ogden et al., 2016). We multiply the earnings of such businesses with the ratio of market value to revenue from publicly traded companies with a discount of 25% to reflect the lack of liquidity of closely held shares. Unlike in the United States, business incomes are not available by industry in Germany, so that we cannot follow the U.S. Federal Reserve in estimating industry-specific multiples.

To estimate the earnings of private limited companies, we consult the corporate tax statistics and apply the earnings-price-ratio of listed companies, applying a 25% liquidity discount. For this part of the corporate sector, we also assume that 80% of German GmbH's are held domestically. The profits of GmbHs were around 100 billion Euros in 2014, according to corporate tax data. Conservatively, we estimate that the value of the equity claims of German households on these GmbHs is 880 billion. Corporate tax statistics are published with a lag such that the latest available year is 2015. Assuming that GmbH profits increased with GDP and using the increased earnings-price-ratio of 2018, we estimate GmbH equity of 1,660 billion in 2018.

For earnings from quasi-corporations such as KGs, OHGs and GmbH&Co KGs, we turn to income tax data. We assume that the recorded business income ("Gewerbeeinkommen") of the top 0.1% of households in the income tax statistics – hence of the very top of the German income distribution – is derived from such quasi-corporations. The business income from these sources is about 40 billion Euros in 2014, we capitalize this using the dividend-price ratio of listed companies, again applying a 50% liquidity discount to arrive at a figure of 660 billion Euros. Income tax statistics are published with a lag such that the latest available year is 2015. Assuming that business increased with GDP and using the decreased price-dividend-ratio

of 2018, we estimate quasi-corporate equity of 700 billion in 2018.

Note that, in Germany, firm owners of corporations and quasi-corporations, who work for their own firm, pay themselves a salary which is declared as employment income. Hence, we find it reasonable to assume that income tax business income from quasi-corporations ("Gewerbeeinkommen") as well as corporate profits do not contain a noteworthy share of labor income. But still, one could argue that the higher liquidity discount for quasi-corporate firms also takes away a labor income component that might be included in business income. CEO compensation is capped by German financial authorities at about 200,000 Euros.

For the remaining non-corporate business, we stick to the HBS valuation of 770 billion. It is given as the sum of cultivated assets, machinery and equipment, other buildings and structures, and intellectual property products. Given that these non-corporate businesses are mostly sole proprietorships, these firms follow different dynamics than quasi-corporations and the official statistics are likely to provide a reasonable estimate of their value. We follow Piketty and Zucman (2014) and add undeveloped and underlying land according to the share of other buildings and structures in total buildings and structures. Table 17 summarizes our estimation procedures by legal form.

Table 17: **Estimation of total business wealth**

	legal form	new method	source	estimate
	public limited companies	-	HBS	1,000 bn
+	private limited companies (GmbH)	$income \cdot \frac{price}{earnings} \cdot 0.75$	corporate tax,DAX	1,660 bn
+	quasi-corporations (KG, OHG, etc.)	$income \cdot \frac{price}{dividend} \cdot 0.5$	income tax,DAX	700
+	non-corporate companies	-	HBS	770 bn
=	total business wealth			4,130 bn

Note: Estimates in billion Euros.

3. Real estate is the sum of two separate items in German HBS: housing structures and the underlying land. The series for housing wealth is perpetuated using housing investments while accounting for depreciation. The price of construction land is evaluated annually by a board of experts for each federal state reporting a single value of land for each federal state. It is the value for land that is downward biased, likely because the land price estimates are for available plots of land that are not in prime locations. The German method diverges from many other European countries

like France and United Kingdom, where a total value of housing wealth is computed based on market prices.

The official housing wealth estimate increases rather smoothly over time and does not capture the housing boom since 2010 that is visible in surveys and in house price data (Figures DA 4.2 and DA 4.3). EVS, SOEP, and HFCS all show a marked increase since 2010. We use the housing aggregate recorded in HFCS 2011 and extend the series forwards applying the method by Davis and Heathcote (2007). The gap between HBS and Piketty and Zucman (2014) is due to a substantial revision of the value of undeveloped and underlying land in the more recent HBS.

Our revised real estate wealth is estimated as follows. Real estate wealth R_t in year t is the sum of housing R_{ht} and land R_{lt}. Housing wealth R_{ht} is computed as

$$R_{ht} = R_{ht-1} \times (1 + \frac{p_{ht}}{p_{ht-1}}) + C_{ht-1} \tag{14}$$

where $R_{ht-1} \times \frac{p_{ht}}{p_{ht-1}}$ is the price-driven change in housing wealth between t and $t-1$ and C_{ht-1} is net housing investment. The price-driven change in housing wealth $\frac{p_{ht}}{p_{ht-1}}$ is taken from the Bulwiengesa price index, which is also used by the Bundesbank.[37] We use the price average of terrace houses, owner-occupied flats and residential site for single-family houses. Net housing investment C_{ht-1} is computed in several steps. First, replacement investments are computed as the difference between gross and net operating surplus of the household sector ($B.2g - B.2n$) from national accounts data. Then replacement investments are deducted from gross housing investments in order to obtain net housing investments.

To compute the land value of new constructions R_{lt}, we follow Davis and Heathcote (2007) and use 12.6% of gross housing investment. Gross housing investment is taken from OECD data series on gross fixed capital formation (P51N1111: Dwellings).

4. Financial assets include regular savings (*Sichteinlagen, sonstige Einlagen, Spareinlagen*), home purchase savings (*Bausparguthaben*), fixed term deposits (*Termingeld*), savings bonds (*Sparbriefe*), listed and non-listed shares (*Aktien*), investment fonds, fixed-income securities (*festverzinsliche Wertpapiere*), insurance technical reserves (*versicherungstechnische Rückstellungen*) and other claims (*übrige Forderungen*). From 1953 to 1960, we use the values from Baron (1988) without further adjustments. From 1961 to 2017, we use the data from the Financial Accounts published by the Bundesbank. Only starting with year 1995, figures are listed separately

[37] The house price increase in the Destatis estimate from 2011 to 2018 is about 34%, or slightly more than 4% a year. The price index by Bulwiengesa that the Bundesbank also prefers as it is closer to actual market prices shows a more realistic house price gain of 62% from 2011 to 2018, almost twice as high.

for private households (S14) and non-profit institutions serving private households (NPISH) (S15). We adjust figures before 1995 using the share of S14 in S14+S15 by asset type.

Estimates based on survey data are much lower than those from HBS (Figure DA 4.2). For example, HFCS records a total of 150 bn Euros held in listed shares in 2014, while Financial Accounts record 212 bn Euros. Similarly, only half of the wealth held in deposits and only a fifth of wealth held in mutual funds according to Financial Accounts is recorded in HFCS. Top wealth holders are largely missing in survey data so that total financial assets, that are predominantly held by a small share of the population, are underestimated. Our estimates are lower than those of Piketty and Zucman (2014) as our more recent version of Financial Accounts from 2018 allows us to exclude NPISH.

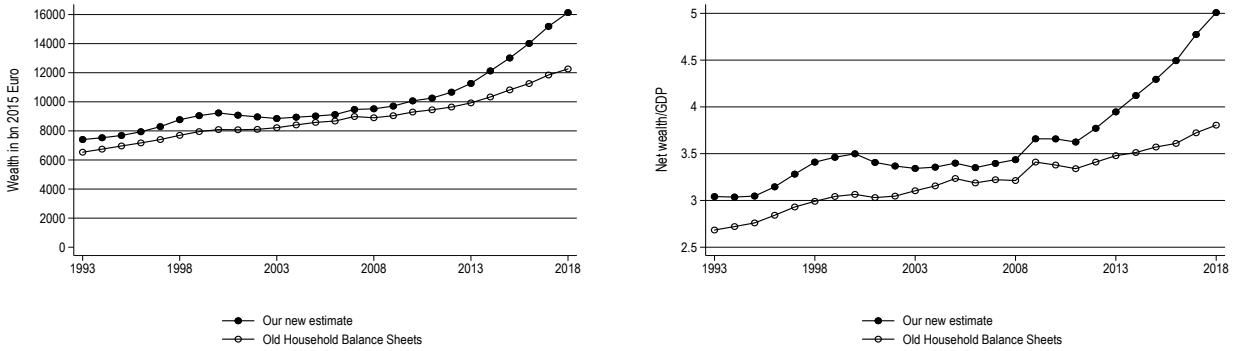
5. Debt is the sum of housing debt, consumer debt, and business debt. Sheet "1e Debt-F" in Table "TotalWealth1950-2018" provides details on calculations and sources. From 1953 to 1990, our series on housing debt is based on Baron (1988) and, since 1991, on data provided by the Bundesbank (on request). Baron (1988) excludes other housing-related debt (*sonstige Verpflichtungen*), where insurance companies are creditors, while Piketty and Zucman (2014) include this item. Therefore, their aggregate is slightly higher than ours from 1953 to 1990.

   Non-housing debt consists of consumer debt and business debt. Non-housing debt from 1953 to 1959 is from Baron (1988). From 1960 to 1989, non-housing debt is computed as the sum of agriculture debt, wealth tax levy debt (*Lastenausgleich*) and other debt. Agriculture debt is taken from Monthly Reports of the Bundesbank; other debt is taken from Financial Accounts published by the Bundesbank. Liabilities related to the wealth tax levy (*Lastenausgleich*) are taken from the wealth tax publications of the Statistical Office. Since 1991, we use consumer debt and business debt series from Financial Accounts provided by the Bundesbank since 1991 upon request.

Figure DA 4.1 summarizes and contrasts our business and real estate estimates with official HBS. The left-hand graph shows our new net wealth series and official HBS series. The right-hand graph shows both series relative to GDP. In sum, our estimate of household net wealth in 2018 is about 4,000 billion Euros higher than the total indicated by the official HBS. About half of German household wealth is invested in housing. Business assets represent almost a quarter of total wealth. Deposits and insurances each represent about a tenth. The wealth composition in 2018 is the result from very different growth

rates. Between 1993 and 2018, equity grew by a factor of 5. Net real estate grew by a factor of nearly 4. In contrast, deposits only increased by a factor of 2.

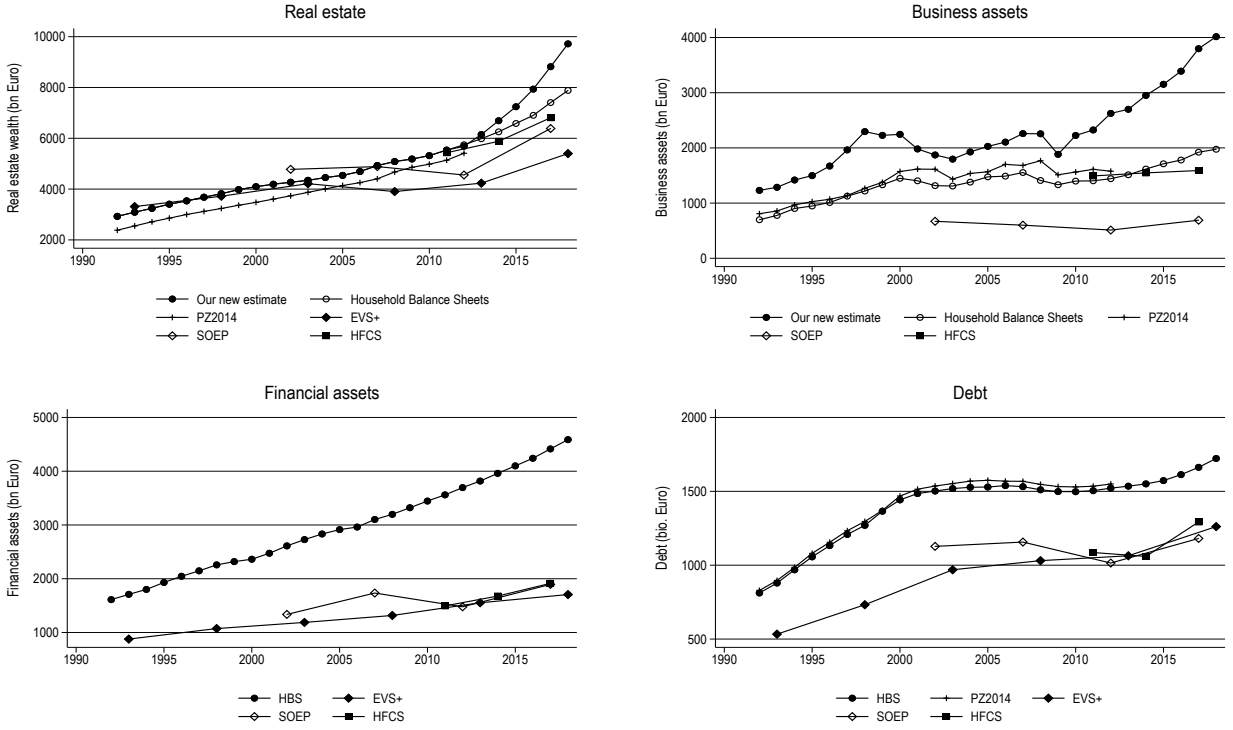
Figure DA 4.1: Aggregate household net wealth: HBS vs. revised estimates



Sources: See Data Appendix Table *TotalWealth1953-2018*.

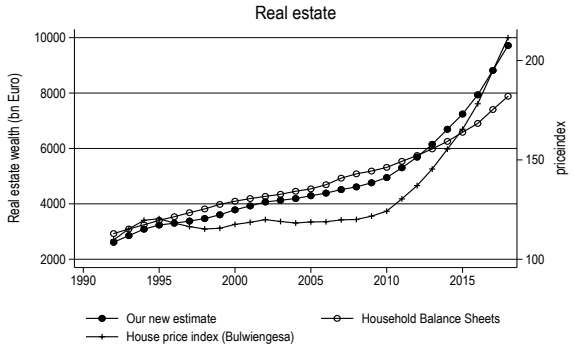
Aggregate assets recorded in household surveys follow the evolution of aggregate household wealth between 1993 and 2018, as shown by Figure DA 4.2. However, some discrepancies occur, which we then adjust for by uprating the survey data to national aggregates.

Figure DA 4.2: Aggregate household wealth and household survey data



Sources: Offical HBS, EVS+, HFCS, SOEP, PZ2014 denotes Piketty and Zucman (2014).

Figure DA 4.3: Real estate wealth and house prices



Sources: Own estimates, official household balance sheets, and house price index by Bulwiengesa.

DA 4.4 Uprated and top-corrected wealth inequality measures

The uprating and top-correction procedure is described in the main paper. Here, we provide additional discussion and comparison of results resulting from different choices.

First, we discuss the matching of the SOEP business asset distribution to EVS, which did not collect information on business assets 1993-2018. As for all other asset types, we rank survey data by total net wealth and compute each percentile's share $s_{p,a}$ in total assets as

$$s_{p,a} = w_{p,a} / \sum_{p=0}^{p=99} w_{p,a} \tag{15}$$

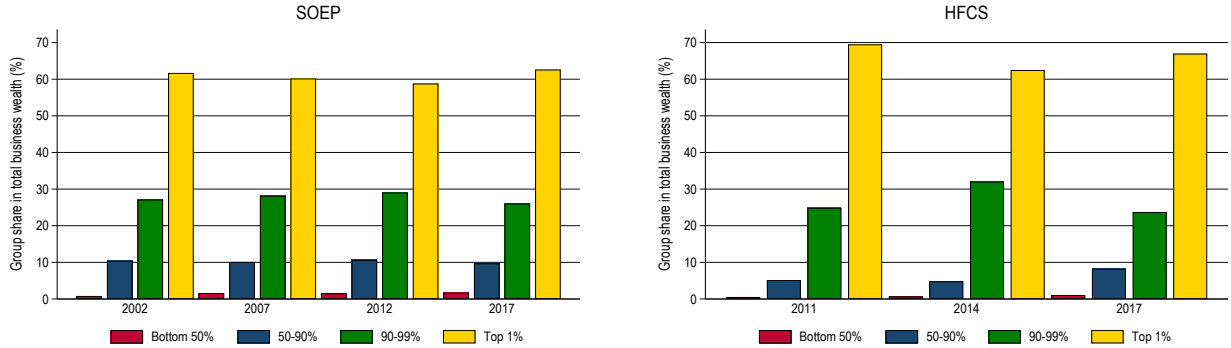
where $w_{p,a}$ is total wealth of percentile p in asset category a.

Figure DA 4.4 plots the percentile's shares in business assets in SOEP and HFCS data, respectively. We group percentiles into four wealth groups and sum their respective shares to take account of the extremely skewed distribution of business assets. In both SOEP and HFCS, the top 1% holds 60-70% of total business wealth and the 90-99% holds 25-30%. We transfer the SOEP percentile shares for business assets to the EVS percentile distribution. This means that the EVS top 1% is assumed to hold 60% of total business assets. Given that high concentration of business assets at the top percentile, we think that the re-ranking impact of ranking SOEP net wealth including business wealth and ranking EVS net wealth without business wealth (because it is not observed) will be small. We use the SOEP distribution of 2002 for EVS 1993, 1998 and 2003. We use the SOEP distribution of 2007 for EVS 2008 and so on.

Figure DA 4.5 compares wealth inequality measures based on unadjusted survey data with our results from top-corrected and uprated survey data, in turn contrasting uprating to HBS and to our revised estimates.

Two details are worth noting. First, the observed wealth inequality trends are rather

Figure DA 4.4: Wealth group's share in total survey business assets



Note: Each wealth group's share in total business assets recorded by the respective survey. For example, the top 1% in SOEP data holds about 60% of total business assets recorded in SOEP data.

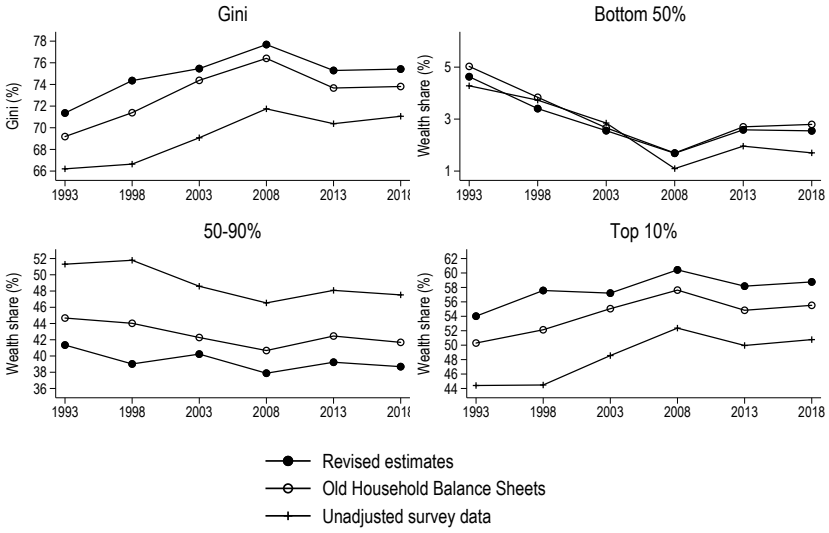
robust against different adjustment procedures. Wealth inequality increased between 1993 and 2008 and then slightly decreased. In 2018, the level of the Gini and the top decile's wealth share is still somewhat higher than in 1993, but not by much. Since unification, the bottom 50% of the distribution increasingly fell behind with respect to wealth.

Second, survey data uprated to the adjusted wealth aggregates show higher inequality levels than unadjusted survey data. Uprating EVS to macroeconomic aggregates, the Gini coefficient shifts upwards by three to four percentage points, the bottom decile's wealth share by 0.1 to one percentage point, the top decile's wealth share by six to ten percentage points and the top percentile's wealth share by nine to eleven percentage points. Note that the middle class (50-90%) looses accordingly. Recall that we add business wealth to EVS data assuming the distribution recorded in SOEP data. Hence, our study is the first to produce inequality estimates based on EVS that are indeed comparable to SOEP and HFCS data.

Both Vermeulen (2018) and Bach et al. (2019) obtain a top percentile's wealth share of more than 30% for 2011, while our estimate based on EVS is about 28% for 2008 and 26% for 2013 and our estimate based on HFCS for 2011 is 28%. Uprating survey data to macroeconomic aggregate has both an inequality increasing and decreasing effect. On the one hand, inequality increases because business wealth is under-recorded in survey data, but almost exclusively owned by the very top of the wealth distribution. On the other hand, inequality decreases because financial assets, particularly insurance assets and current accounts, are under-recorded in survey data with respect to national accounts, but these assets are held by broad parts of the population.[38]

[38]The survey aggregate of business assets is only a third of the macroeconomic aggregate. The survey aggregate of financial assets is only a third of the macroeconomic aggregate. This means that uprating business assets and financial assets to match macroeconomic aggregate increases survey wealth by a factor of two or three, respectively (see Data Appendix Figure **??**).

Figure DA 4.5: Measures of wealth inequality, 1993-2018



Source: EVS-TU.

Note: Revised Household Balance Sheets according to our preferred estimates, i.e., capitalized business incomes from corporate and income tax data and price-adjusted real estate. Whiskers indicate bootstrapped 95% confidence intervals.

DA 4.5 Portfolio composition

Figure DA 4.6 tracks the composition of average net wealth from 1993 to 2018. We display portfolios of the bottom 50%, the middle class (50-90%), the upper class (90-99%) and the top 1%. The graphs show that portfolios of these wealth groups differ both systematically and persistently.

Bottom 50%. Average net wealth of the bottom 50% fluctuates around 20.000 Euros and is mostly invested in savings deposits and other financial assets such as life insurances. Compared to their counterparts in the US, the German bottom 50% are less invested in housing and, thus, less exposed to changing house prices. Net housing wealth of the German bottom 50% represents less than 15% of their portfolio over the past 25 years.

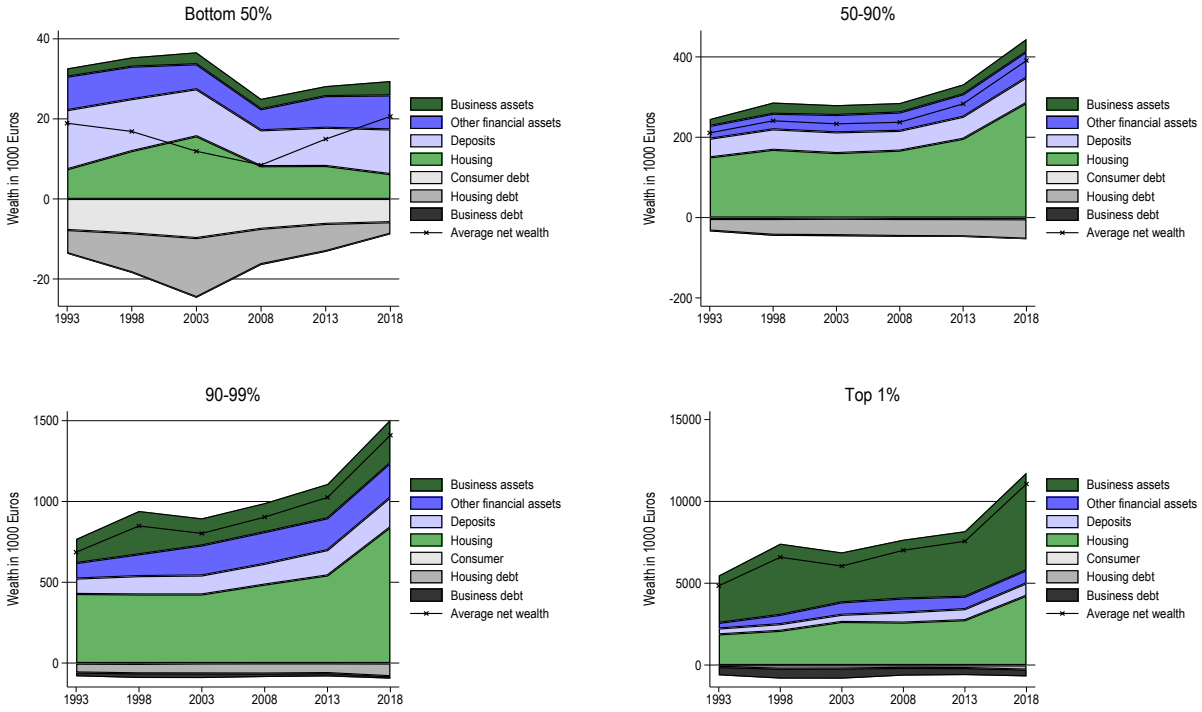
Middle class (50-90%). Housing represents the most important asset for the German middle class (50-90%). Typically, almost 60% of middle class wealth is invested in housing. Only ca. 5% of their portfolio is held in stocks, which is in line with their US counterparts (Kuhn et al., 2020). One should note however, that the US middleclass has substantial stockholdings from defined-pension plans.

Upper class (90-99%). While business assets become more relevant moving further to the top of the wealth distribution, the average portfolio of the upper class (90-99%) still looks strikingly similar to a middle class portfolio: Housing represents the most important asset with a portfolio share of 55%. Business wealth amounts to 18%.

Top 1%. Business assets become the dominating asset class when moving to the top percentile of the German wealth distribution. 50% of the top percentile's wealth is

invested in business assets – both corporate and non-corporate firms. Note that only 7% are held as stocks in public liability companies, while the remainder is held as private liability companies, quasi-corporate and non-corporate businesses. The share of housing is 36%.

Figure DA 4.6: Heterogeneity of portfolios for the bottom, middle and top, 1993-2018



Source: EVS-TU.

Note: Average net wealth in 2015 Euros. Business assets include shareholdings in both corporate and non-corporate firms. Other financial assets include securities and insurances.

What is the proportional contribution of each asset type to overall wealth growth? Wealth of group g in year t is the sum of assets j such as housing, business assets and deposits reduced by debt given by

$$W_t^g = \sum_{j=1}^{J} A_{j,t}^g \tag{16}$$

Simple growth accounting allows us to decompose overall wealth growth. Totally differentiating equation 16 and dividing by W_t^g gives the composition of wealth growth by asset type as

$$\frac{dW_{t+1}^g}{W_t^g} = \sum_{j=1}^{J} \frac{dA_{j,t+1}^g}{W_t^g} \tag{17}$$

with $dW_{t+1}^g = W_{t+1}^g - W_t^g$ and $dA_{t+1}^g = A_{t+1}^g - A_t^g$. Figure DA 4.7 shows the composition of wealth growth by asset type.

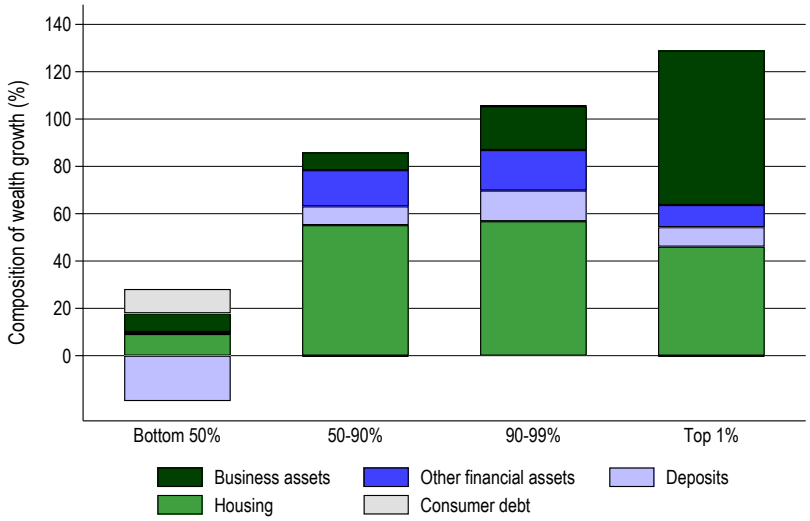
Bottom 50%. The small wealth growth of the bottom 50% is related to three factors. First, housing and business assets increased net wealth. Second, consumer debt declined, which increased net wealth. Third, declining deposits reduced net wealth, largely offsetting the positive wealth effects of the first two factors.

Middle class (50-90%). Greater housing wealth is the most important factor behind middle class' wealth growth. Housing wealth growth contributes two thirds to overall wealth growth. Increased financial assets, mostly insurance assets, contribute another 15%. Business asset growth contributes about 7%, with 5% originating from stocks from public liability companies.

Upper class (90-99%). As we move further to the top of the wealth distribution, the growth contribution of housing declines proportionately and the contribution of business assets increases. For the 90-99%, housing growth generates about half of the wealth growth, and business assets bring 19%. Around 10% of the growth is driven by shares in public liability companies.

Top 1%. Growing business assets were central for the top percentile's wealth growth. Their overall wealth growth of about 128% consists of 65% business asset growth and 46% housing growth. The remaining wealth growth comes from deposits and other financial assets. Importantly, stocks from public liability companies contribute only 13% to the overall business asset growth rate of 65%, while the highest growth comes from private liability companies, quasi-corporate and non-corporate businesses.

Figure DA 4.7: Composition of wealth growth, 1993-2018



Source: EVS-TU.

Note: Growth of average net wealth in 2015 Euros. Business assets include shareholdings in both corporate and non-corporate firms. Other financial assets include securities, and insurances.

DA 4.6 Quantifying the role of asset prices

What share of the wealth accumulation of the above groups is explained by rising asset prices over the past 25 years? For this exercise, we decompose wealth accumulation over time using the following law of motion adapted from Saez and Zucman (2016) and Kuhn et al. (2020):

$$W^g_{t+1} = W^g_t(1 + q^g_t) + S^g_t = W^g_t(1 + q^g_t + \sigma^g_t) \tag{18}$$

where W^g_t is wealth of group g in year t. q^g_t captures the contribution of capital gains to wealth growth. S^g_t denotes the savings flow and $\sigma^g_t = S^g_t/W^g_t$ captures the contribution of savings to wealth growth. Savings flows and capital gains are "synthetic" as we assume that households stay in their wealth group. Household panel data like the SOEP show that German households are very likely to stay in one of the three wealth groups, bottom 50%, middle class (50-90%) or top 10%.[39]

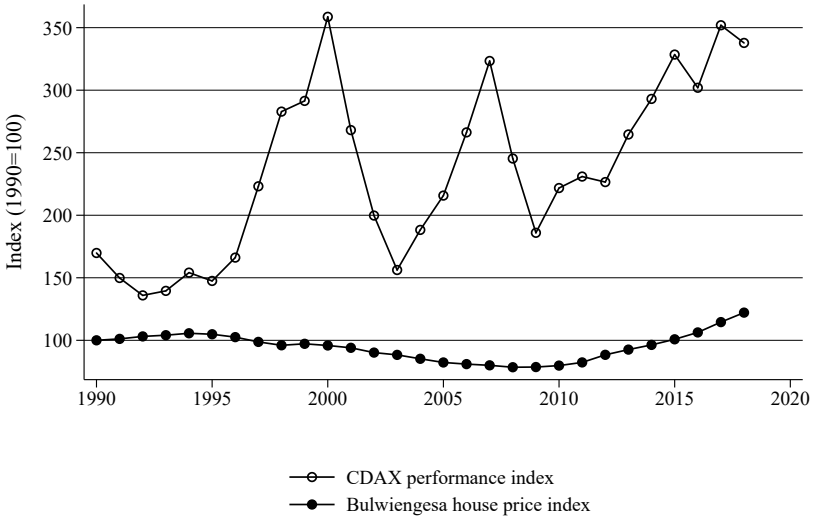
The contribution of capital gains, q^g_t, from asset price changes is computed as the price change of asset j weighted by the average portfolio share $\alpha^g_{j,t}$ of asset j for wealth group g. The overall effect of capital gains is the asset-weighted average denoted as

$$q^g_t = \sum_{j=1}^{J} \left(\frac{p_{j,t+1}}{p_{j,t}} - 1 \right) \alpha^g_{j,t} \tag{19}$$

$p_{j,t}$ denotes the real price of asset j, i.e., the excess growth rate over consumer price growth. House prices are measured using the Bulwiengesa price index and stock prices are measured using the most encompassing German stock index CDAX. Their development is displayed in Figure DA 4.8. House prices started to increase in 2010 after having declined in real terms for almost two decades. Between 2008 and 2018, house prices increased by 50%. Stock prices of firms listed in the CDAX sharply increased in the second half of the 1990s and collapsed in 2003 and 2009. Between 1990 and 2018 stock prices increased almost fourfold in real terms.

[39] For example, from those in the bottom 50%, 80% remained in this group after five years and 68% after 15 years, according to SOEP data.

Figure DA 4.8: Asset price growth, 1990-2018



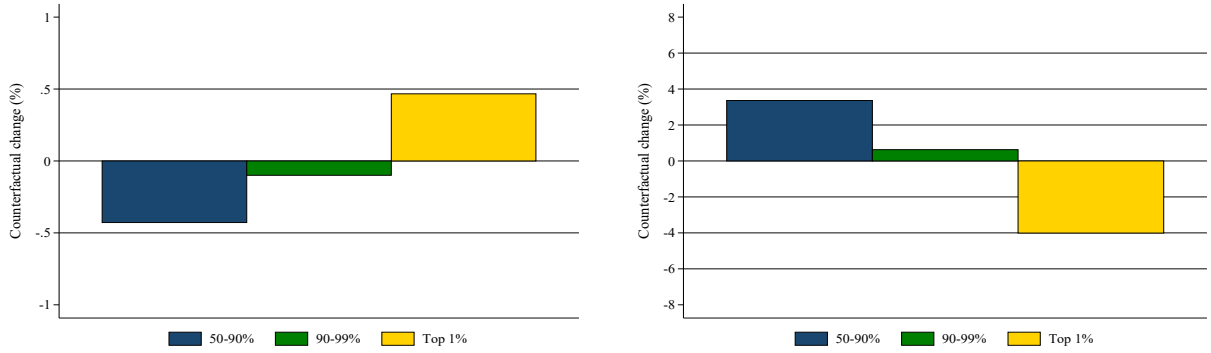
Note: Excess price growth over consumer price growth.

What would the wealth distribution in Germany look like without asset price changes? Defining the wealth share of group g as $\omega_t^g = \frac{W_t^g}{W_t}$ and making use of Equation 18, we can express the change of the wealth share ω_t^g as

$$\frac{\omega_{t+1}^g}{\omega_t^g} = \frac{1 + q_t^g + \sigma_t^g}{1 + q_t + \sigma_t} \tag{20}$$

Following this expression, the wealth share of group g increases if either capital gains or savings or both outpace the average growth rate. We now analyze the effect of asset prices on wealth inequality and counterfactually assume that either house prices or equity prices remained constant (in real terms). Figure DA 4.9 shows the result of this exercise. The left-graph shows the result assuming constant house prices and the right-hand graph assuming constant equity prices. If house prices had remained constant, the top 1% wealth share would have increased by 0.5%. Put differently, rising house prices slowed down the top 1% wealth share by 0.5%. The much larger asset price effect, however, comes from stock prices. If stock prices had remained constant in real terms (i.e., increased with consumer prices), the top percentile's wealth share would be almost 4%-points smaller and the middle class (50-90%) wealth share would be almost 4%-points larger.

Figure DA 4.9: Changes in wealth shares acccounting for asset price effects, 1993-2018



(a) Constant house prices

(b) Constant stock prices

Source: Uprated and top-corrected EVS.

Note: Counterfactual wealth growth keeping real house/stock prices constant using Equation 20. Business assets evaluated with stock prices include shareholdings in both corporate and non-corporate firms.

DA 4.7 Quantifying the impact of decreasing household size

Decreasing household size generates a mechanical increase in wealth inequality because small households dispose over smaller assets. Is the larger number of single households responsible for the near zero wealth growth of the bottom half? Average household size decreased between 1993 and 2018, because single and two-person households became more frequent. The share of single-households increased by 8% from 33% in 1993 to 41% in 2018 and the share of two-person households increased by 2% from 32% in 1993 to 34% in 2018. The share of households with more than three people declined accordingly. At the same time, the population became older with older households being richer, on average.

In order to isolate the effects of smaller households and aging, we undertake the reweighting method suggested by DiNardo et al. (1996) and create a counterfactual distribution in 2018 with the household size and age distribution of 1993. For example, we reweight observations such that our sample in 2018 includes 33% single households (as observed in 1993) as opposed to 41% single households (as observed in 2018).

Let each household be characterized by a vector (w, z, c) comprising a continuous variable w (net wealth), a vector of attributes z (household size), and a year identifier y. The joint distribution of net wealth and attributes in a given year is $F(w, z, y)$, while $F(w, z|y)$ denotes the conditional distribution. Following DiNardo et al. (1996) (DFL), the density of net wealth in a year, $f_y(w)$, can be written as

$$f_y(w) \equiv f(w; y_w = y, y_z = y). \tag{21}$$

For example, while $f(w; y_w = 2018, y_z = 2018)$ denotes the actual density of net wealth in 2018, $f(w; y_w = 2018, y_z = 1993)$ is the counterfactual density of net wealth in 2018

applying the distribution of attributes of the year 1993. The aim of the DFL reweighting method is to estimate the counterfactual density given as

$$f(y; y_w = 2018, y_z = 1993) = \int f(w|z, y_w = 2018) dF(z|y_z = 1993) \tag{22}$$

$$= \int f(w|z, y_w = 2018) \frac{dF(z|y_z = 1993)}{dF(z|y_z = 2018)} dF(z|y_z = 2018), \tag{23}$$

$$\tag{24}$$

where $\phi_z(z)$ denotes the reweighting function

$$\phi_z(z) = \frac{dF(z|y_z = 1993)}{dF(z|y_z = 2018)} = \frac{Pr(y = 1993|z)}{Pr(y = 2018|z)} \cdot \frac{Pr(y = 2018)}{Pr(y = 1993)} \tag{25}$$

The probability of being surveyed in year y, given individual attributes z, can be estimated with a probit model:

$$Pr(y_z = y|z) = Pr(\epsilon > -\beta' H(z)) = 1 - \phi(-\beta' H(z)). \tag{26}$$

where $\phi(\cdot)$ is the cumulative normal distribution and $H(z)$ is a vector of covariates.

We split the total population into five subcategories defined by household size (1, 2, 3, 4, 5 or more).

Table 18: Household size in 1993 and 2018 in %

	1993	2018	Δ
1	33	41	8
2	32	34	2
3	17	12	-5
4	13	9	-4
5	5	3	-2

DA 5 Border changes

DA 5.1 General strategy

When assessing the changes in the wealth distribution over time, we repeatedly test for the relevance of border changes. These could affect the wealth distribution as some regions are richer than others on average or because the shape of the distribution differs. A natural way to assess the relevance of territorial changes is thus to compute the wealth distribution in the 'new borders' but for the old territory, e.g. by projecting the Weimar borders into the German empire in 1913 or projecting the borders of the Federal Republic of Germany of the 1950s into interwar Germany.

Table 19: **Excluded territories relative to post-war non-unified Germany**

Germany from 1990	Weimar Republic (1925-1933)		German Empire (1895-1913)	
Sachsen	Sachsen		Sachsen	
Mecklenburg	Mecklenburg		Mecklenburg-Schwerin	
			Mecklenburg-Strelitz	
Sachsen- Anhalt	Anhalt		Anhalt	
Thueringen	Thueringen		Schwarzberg-Sondershausen	
			Sachsen-Weimar	
			Sachsen-Meiningen	
			Sachsen-Altenburg	
			Sachsen-Coburg-Gotha	
			Schwarzberg-Rudolfstadt	
			Reuß älterer Linie	
			Reuß jüngerer Linie	
			Elsaß-Lothringen	
	Prussian provinces:	Ostpreussen	**Prussian provinces:**	Ostpreussen
		Grenzmark		Westpreussen
Brandenburg		Brandenburg		Brandenburg
		Pommern		Pommern
		Niederschlesien		Posen
		Oberschlesien		Schlesien
		Sachsen		Sachsen

To generate such estimates, we proceed as follows. We calculate the reference totals (wealth and population) for the territories that are excluded in the respective estimate and subtract them from the respective overall estimate in current (/historical) borders. Table 19 shows which administrative areas one has to exclude by time period if one would

like to end up with an estimate for the 'smallest' Germany: post-war divided Germany (1953-1989).[40] If, for example, we want to estimate the effect of border changes after World War II on total wealth, we have to deduct the wealth of all administrative areas listed in the column 'Weimar Republic (1925-1933)' from the estimate for the Weimar Republic in its actual historical borders. If, for example, we want to estimate the effect of the border changes from World War I, we would make an estimate for 1913 subtracting the reference totals for territories that are listed in column 'German Empire (1895-1913)' but not in the column 'Weimar Republic (1925-1933)' from the reference estimate for the German Empire as a whole.[41]

For the estimates of tax units as well as for the population totals, this does not pose any difficulties as demographic statistics, wealth tax statistics, and wealth census statistics allow such calculations at a very fine regional level. For the tabulations regarding the historical data, the source material allows us to subtract the territories one by one as tabulations are available at the very fine-grained level.

DA 5.2 Reference total population

DA 5.2.1 Weimar borders in German Empire

We have estimated the number of tax units in 1913, $TU^{1913}_{Deutsches\ Reich}$ for the German Empire (*Deutsches Reich*) as a whole in Section DA 1.2.2. To calculate the tax units for the territory of interwar Germany (Weimar Republic) in 1913, we proceed as follows:

$$TU^{1913}_{Weimar\ borders} = TU^{1913}_{Deutsches\ Reich} \times (1 - \frac{POP_{Excluded\ territories}}{POP_{Deutsches\ Reich}}) \tag{27}$$

where we measure $\frac{POP_{Excluded\ territories}}{POP_{Deutsches\ Reich}} \approx 8.74\%$ based on the population data from the 1910 population census (Statistisches Reichsamt, 1916, p. 1 f). The excluded territories are the Prussian provinces of West-Prussia and Posen as well and Alsace-Lorraine (*Elsaß-Lothringen*). We estimate that the total number of tax units in Weimar borders in 1913 was $TU^{1913}_{Weimar\ borders} \approx 22,455,639$.

[40] There are indeed a few territorial changes that we cannot take into account pertaining to a small part of Schleswig-Holstein, Saarland, and East-Berlin. We do not consider it possible to divide up the city of Berlin before World War II. From the 1960s onwards, our estimates include Berlin and Saarland again (as they do for 1935 and 1913).

[41] Some of the smaller states are consolidated and Thueringen is created during this period. At a more aggregate level, the German Empire loses the Prussian provinces of West-Prussia and Posen as well as Alsace-Lorraine.

DA 5.2.2 Federal Republic borders in Weimar Republic

In principle, the source material would allow us to reconstruct the tax units in the same manner as we did for the whole of Germany in 1934 (see Section DA 2.2 for the total for the tax unit total for the estimates for the *Weimar Republic*). However, given that we can reasonably assume that the potential tax units and population shares are highly correlated, we proceed analogously to the previous section. The number of tax units in the borders of post-war Germany in 1934 $TU^{1934}_{FRG\ borders}$ is:[42]

$$TU^{1934}_{FRG\ borders} = TU^{1934}_{Deutsches\ Reich} \times (1 - \frac{POP_{Excluded\ territories}}{POP_{Weimar\ Republic}}) \approx 18,904,019 \tag{28}$$

DA 5.2.3 Federal Republic 1993 without East Germany

Reference total population for West Germany (without East Germany) results from adding up the number of households residing in West Germany in 1993.

DA 5.3 Reference total wealth

DA 5.3.1 Weimar borders in German Empire

To arrive at a total net private wealth estimate in Weimar borders in 1913, we require an estimate of the how much wealth was held in the territories that were lost after World War I (West-Prussia and Posen as well and Alsace-Lorraine). We make use of the *regional* data from the wealth levy of 1913 (*Wehrbeitrag*). These statistics allow us to calculate the shares of the net personal wealth of those being assessed for the tax for each of these regions (Statistisches Reichsamt, 1919). As more than 10 % of the population were assessed and these were the richest households in society (see Section DA 2.1), we consider it reasonable to assume that these shares also reflect the regional distribution of wealth of those not being assessed.

Analogously to the tax unit estimates, we calculate:

$$W^{1913}_{Weimar\ borders} = W^{1913}_{Deutsches\ Reich} \times (1 - \frac{WL_{Excluded\ territories}}{WL_{Deutsches\ Reich}}) \tag{29}$$

where WL denotes the wealth recorded in the *Wehrbeitrag*. The share of the excluded territories ($\frac{WL_{Excluded\ territories}}{WL_{Deutsches\ Reich}}$) accrues to about 5%. The corresponding net private wealth in Weimar borders in 1913 is $W^{1913}_{Weimar\ borders} \approx$ 236b Marks.

[42] For the 1925 and 1933 censuses, the corresponding regional data can be found in Statistisches Reichsamt (1935, p. 5). We calculate the compound growth rate between these years and employ it to provide estimates for the years of interest. For more details, see spreadsheet *Population_totals_Deutsches_Reich*.

DA 5.3.2 Federal Republic borders in Weimar Republic

Most of the material that we used for the estimates in the historical Weimar borders (see Section DA 2.3) is also available at the state or province level, making it unnecessary to rely on proxies for the regional distribution of wealth. Instead, we simply sum the wealth for the 'lost territories' (by type of asset: agricultural assets, real estate, business wealth, and capital assets) and subtract them from the total in the respective current/historical borders. To ensure consistency with minor adjustments,[43] for which only national estimates exist, we calculate the shares in each asset class of the tax values to weigh the respective total. We detail these estimates in the accompanying spreadsheet *Wealth_totals_Deutsches_Reich_adjusted*.

DA 5.3.3 Federal Republic 1993 without East Germany

Reference total wealth for West Germany (without East Germany) results from adding up wealth held by households residing in West Germany in 1993.

DA 5.4 Tabulations

DA 5.4.1 Weimar borders in German Empire

Statistisches Reichsamt (1919) provides the tabulation by net wealth of taxed households on a regional basis in 1913. This allows us to simply remove the households living in territories that will be lost in World War I from the national distributions.

DA 5.4.2 Federal Republic borders in Weimar Republic

Statistisches Reichsamt (1938a) provides the wealth tax tabulations by region. We subtract those of the territories lost in World War II from the total. We assume that the share of those exempted from the wealth tax (because family allowances push them below the threshold for taxable wealth) are regionally distributed in the same way as those paying the wealth tax. In terms of the portfolio structure, we assume the same as for the whole of interwar Germany.

[43] For example, shares of social housing, shares of stock market companies in limited liability companies etc.

DA 5.5 National Income

For the counterfactuals, we aim to express changes in wealth not only in the respective total wealth of the baseline geography, but also in terms of the national income of that geography. Piketty and Zucman (2014) provide estimates of national income in the respective current/historical borders and we use their estimates throughout the paper.

As there is no database covering regional *nominal* GDP by region throughout time, we have to make our own estimates where needed based on primary sources. These estimates are useful for our purpose (normalising wealth), but this might not be necessarily the case for other applications. Our general strategy is analogous to that of our calculation for aggregate wealth and the number of tax units in our geographies of interest:

$$NI^t_{preferred\ geography} = NI^t_{historical\ borders} \times (1 - \frac{PR_{excluded\ territories}}{PR_{historical\ borders}}) \tag{30}$$

where NI^t is the national income at time t. PR denotes a proxy for regional income. The national income estimate in the respective historical borders $NI_{historical\ borders}$ is from Piketty and Zucman (2014).

DA 5.5.1 Estimate for 1913 - Weimar borders

Regional nominal income estimates do not exist for this period. However, we can make use of the data on income collected on the German wealth levy (Statistisches Reichsamt, 1919). We record the share of Alsace-Lorraine (2.74%), West Prussia (1.1%), and Posen (1.4%) and deduct their aggregate percentage of all income assessed for the *Wehrbeitrag* (5.26%) from the national income estimate for 1913 by Piketty and Zucman (2014).

DA 5.5.2 Estimate for 1934 - borders of the Federal Republic

For 1937, Statistisches Bundesamt (1959, p. 14) provides an NNP estimate (the share of the lost territories was about 30% in national income). As we are interested in generating an estimate for 1934, we need also an estimate from before. We choose 1928, for which we gather income tax data from Statistisches Reichsamt (1932, p. 494). The corresponding share for the lost territories is about 31%. We interpolate between these two points in time to generate a share for 1934. We then subtract this share from the total in historical borders by Piketty and Zucman (2014) to arrive at FRG-border estimate for 1934.

DA 6 Counterfactuals

This section provides a general description on the imputation of the household-level datasets (Section DA 6.1) and a detailed description of each counterfactual performed in the main paper (Section DA 6.2, DA 6.3, DA 6.4).

DA 6.1 Imputation of household portfolios from tabulated data

Our methodology of constructing plausible historical counterfactuals posits that the effect of a given event (γ) on the top 1 wealth share can be approximated in the 'ex-ante' cases (see main paper) as follows:

$$\gamma^{\text{ex ante}} = f(N', W', \{w_j^{TP}\}') - f(N, W, \{w_j^{TP}\}) \tag{31}$$

In cases in which we construct the counterfactual after the event occurred—for example, when making the wealth taxation after World War II 'undone'—we calculate the event's effect on the top 1 share as:

$$\gamma^{\text{ex post}} = f(N, W, \{w_j^{TP}\}) - f(N', W', \{w_j^{TP}\}') \tag{32}$$

where f is the top 1 share given the information on N (total households), W (net private wealth), and $\{w_j^{TP}\}$ (the wealth at the top of the distribution). We do not have to model changes among the rich ($\{w_j^{TP}\}'$) in three cases: (i) the information on the changes among the top is known, e.g. border changes, (ii) the shock does not affect the rich, e.g. influx of expellees after World War II, or the shock is quasi-uniform, e.g. the wealth levy after World War II, which applied to all households at the top in a very similar manner.

Shocks, however, can be heterogenous for two reasons: (i) they affect the prices of various assets in a different manner or (ii) they affect some individuals among the rich, but not others. We simulate such events at three points in time:

- 1913: to assess the effects of the hyperinflation and changes in asset prices,
- 1927: to assess the effects of the Great Depression in terms of (a) business failures and (b) asset prices changes,
- 1934: to assess the effects of World War II via (a) destruction and (b) currency reform and asset price changes.

In these cases, it becomes necessary to generate a micro-dataset to model the shock as either (i) individual households are affected differently depending on the asset type they hold or (ii) some households experience no shock (e.g. farmers do not experience

business failures during the Great Depression) whereas others do (those holding financial and business assets experience business failures). In these cases, we require household-level data on the top of the distribution $\{w_j^{TP}\}$ to implement the shocks and generate a corresponding counterfactual $\{w_j^{TP}\}'$.

Three conditions for the underlying data have to be met to facilitate the imputation of a micro-dataset at the household/tax unit level:

1. **Availability of wealth tax tabulations with information on portfolios**, ordered by net wealth, provide information about the type of assets held by each class.

2. **Individual household portfolios are skewed towards one asset:** households typically hold most of their assets in one type and otherwise only hold savings (e.g. a farmer does own a farm, but not significant real estate and businesses).

3. **Wealth brackets are sufficiently small** (in the tax tabulations) or **net wealth is distributed in the same way for all types of wealth holders *within* tax-bracket**. It is thus permissible to assume the same net worth for each household in a certain class.

We now discuss whether these conditions are met in practice below and then show that they suffice to generate a household level dataset.

Condition 1: Availability of tax tabulations with portfolio information From 1934 onwards, government statisticians compiling the results of the wealth tax documented portfolios ordered by net wealth. Typically, the recorded portfolios have the following structure:

- Agricultural assets
- Real estate assets
- Business assets (personal liability firms)
- Capital assets (stocks, bonds, savings, cash, etc.)
- Debt

For 1913 and 1927, the portfolio structures are reported in the same way. However, we approximate them by employing auxiliary data and/or data from other time periods (see Section DA 6.2.4 for 1913 and DA 2.5 for 1927).

Condition 2: Individual household portfolios are skewed towards one asset
Our imputation of the household-level datasets requires that households concentrated their wealth in one asset type. We provide evidence on this for each period below.

Pre-World War I:
In practice our assumption implies that, for example, the *Junker*'s wealth was predominantly held in agricultural assets and Bertha Krupp's wealth was predominantly held in her eponymous company. As we focus on the top 1% wealth share throughout, this strikes us as a reasonable assumption. To back up the assumption, we employ a millionaires list for Prussia in 1908 originally compiled by Martin (1913). In addition to ordering all millionaires in Prussia (around 8000) by their net wealth, Martin provided detailed bibliographies for the richest 761 of them, often describing the assets they were holding.[44] We have categorized these 761 millionaires by wealth type based on these bibliographies.

Table 20: **The richest 761 Prussians (1908) by the origin of their wealth**

Predominant type of wealth held	Frequency	share households	share of wealth
Agricultural land (w/o coal)	162	21%	17%
Agricultural land (w/ coal)	24	3%	9%
Finance	180	24%	24%
Entrepreneurs	297	39%	39%
Merchants & urban landowners	51	7%	7%
Classification unclear	47	6%	5%

Notes: The underlying data are manually coded from the millionaires list and biographies reported by Martin (1913). Merchants and urban landowners are jointly reported here, because these categories often overlap. Agricultural land (w/ coal) means that the household originally was an owner of (agricultural) land, but coal was discovered on the land.

Table 20 reports the results. In particular, it shows that for only 6% of the households (holding 5% of wealth) no clear assignment to one of the listed wealth types could be done. These include those cases in which portfolios were diversified such that we could not determine the 'main' asset *and* cases in which we lacked sufficient information.

Interwar period:
As discussed in the main paper, the Economic and Statistical Unit of the *Reichsbank* (*Volkswirtschaftliche und Statistische Abteilung*) conducted a study on the holdings of 20 millionaires in Berlin (Bundesarchiv R2501/ 6627, p. 5; see also Banken 2019). As the

[44] As a Prussian bureaucrat, Martin presumably had access to wealth tax filings.

number of observations is too small and the sampling is non-random (especially because all of them were living in Berlin), we refrain from showing its results in more detail here. However, the study notes that wealth of these millionaires was often heavily concentrated in a certain asset type that could not easily been liquidated. Apparently, this was not only true for owners of firms but also for bankers, who received financial assets as part of their compensation.

Postwar period:

Table 16 documents the sources for the post-war wealth tax statistics. The statisticians often prepared overviews such as the one for 1953 documented below in Table 21. The table shows which proportion of the total of a respective asset class was owned by which type of wealth owner. For example, 91% of the agricultural assets were held by those for which agricultural asset was either the only or the main asset. The corresponding shares for real estate and business are 74% and 94%, respectively.

Table 21: **Asset concentration in wealth tax statistics (1953)**

Tax units declaring wealth tax and owning:	Share of total... agricultural assets held by	real estate assets held by	business assets held by
agricultural assets			
- only	56.9	-	-
- mainly	34.1	2.8	0.9
real estate			
-only	-	29.4	-
-mainly	3.3	44.6	5.1
business wealth			
-only	-	-	27
-mainly	5.7	23.2	67
$\sum$	100	100	100

Sources: Data are from *Hauptveranlagung der Vermögensteuer auf den 1.1.1953 Statistik der Bundesrepublik Deutschland, Band 247*, p. 17.

Overall, we find that the data supports our claim that economic subjects concentrated their wealth into one asset during the three periods under consideration.

Condition 3: Wealth brackets are sufficiently small In deriving our household dataset, we will assume that all households have the same net wealth *within* a tax bracket for sake of exposition. A less strict formulation would assume that the average wealth and the distribution are the same for each type of wealth holder, but that the households can have different levels of wealth.

This assumption is most easily justified when the brackets are small as this mechanically limits the error when calculating the number of households by type of wealth.

Table 22 reports the number of tax brackets recorded in the tax statistics for the years in question. It is important to note that implicitly, there is an additional class for each of these years: those not paying wealth taxes. Typical tax brackets below 50,000 are provided in intervals of 10,000 (e.g. in 1934: 10,000-20,000 RM, 20,000-30,000 RM,...) or similarly small intervals. For values over 50,000 Marks, intervals become larger. We consider these still sufficiently small.

Table 22: **Number of wealth brackets in tax tabulations**

Year	brackets	Highest tax bracket..		source
		..has lower bound of	includes N households	
1913	9	10m RM	367	Statistisches Reichsamt (1919)
1927	10	1m RM	3,073	Statistisches Reichsamt (1931c)
1934	10	1m RM	3,563	Statistisches Reichsamt (1938a)

The most critical part of the assumption pertains to the tax bracket that has no upper bound, i.e. the highest. Table 22 reports its lower bound and how many households fall into it at different points in time. The richest throughout our period of consideration typically have been entrepreneurs. Assuming that they have the same net wealth then the richest rural land owner may seem a strong assumption and might in fact underestimate the number of rural landowners in the highest bracket relative to that of businessmen. Given that this problem pertains to few individuals (367 in 1913, 3,073 in 1927, and 3,563 in 1934), we do conclude that the resulting error must be small.

Generating the portfolio The portfolio data has wealth brackets B with the respective lower and upper bounds $[lb_B, ub_B]$. N households have the individual net wealth w_i,$i = 1, ...N$, which is the sum of assets of type a ($a_{agricultural}$, $a_{real\ estate}$, $a_{business}$, $a_{financialequity}$, $a_{non-equityfinancial}$, $a_{savings}$) net of debt d. In the typical tax tabulation, this individual household information is aggregated across households such that the wealth in a given bracket B is $W^B = \mathbf{1}_{w_i \in [lb_B, ub_B]} \sum_{i=1} N w_i$. Similarly, we can disaggregate by asset type such that the net wealth W^B:

$$W^B = \sum_a W_a^B - D^B \tag{33}$$

, where D^B is total debt of households falling into B and W_a^B is total asset holding in type a of households falling into B.

From a variety of qualitative *and* quantitative sources (see above), we know that households typically did not diversify their portfolios at the top of the distribution. In

the case of the German statistics all assets but real estate and agricultural assets are given net of debt.[45] In the absence of (significant) consumer debt, we can thus distribute the debt among the owners of agricultural and real estate assets using the occurrence of the respective asset classes as weights. Table 23 summarises the types of wealth holders at the top and whether they held significant debt or not in the historical wealth tax statistics.

Table 23: **Wealth and debt holdings at the top**

Type of asset	representative owner	holds debt (in statistics)
$a_{agricultural}$	Rural landowner	yes
$a_{real\ estate}$	Urban landowner	yes
$a_{business}$	Business owner (personal liability)	no
$a_{financial\ equity}$	Business owner (limited liability)	no
$a_{non-equity\ financial}$	Rentier	no

How do we distribute the debt among rural and urban landowners? A simplifying approach is to assume that the debt-to-equity ratios are the same for urban and rural landowners in a given bracket. We can thus assign relative weights that correspond to the asset holdings such that the debt held by rural landowners is:

$$D^B_{Rural\ landowners} = \frac{W^B_{agricultural}}{W^B_{real\ estate} + W^B_{agricultural}} \cdot D^B \tag{34}$$

and correspondingly the debt of the urban landowners is defined as:

$$D^B_{Urban\ landowners} = \frac{W^B_{real\ estate}}{W^B_{real\ estate} + W^B_{agricultural}} \cdot D^B \tag{35}$$

Finally, we have to distribute savings. Among the wealthy, we assume that there is no household that puts their entire wealth into savings. Instead, we equi-distribute the savings $W^B_{savings}$ among all households in the respective bracket such that each household holds $w^B_{i,savings} = \frac{W^B_{savings}}{N^B}$. Taking into account the discussion about savings and debts, we can rewrite equation 33 as:

$$\begin{aligned} W^B - W^B_{savings} = W^B_{agricultural} - D^B_{Rural\ landowners} + W^B_{real\ estate} - D^B_{Urban\ landowners} \\ + W^B_{business} + W^B_{financial\ equity} + W^B_{non-equity\ financial} \end{aligned} \tag{36}$$

We now assume that *within* each wealth bracket B, net wealth is equi-distributed. This is an inconsequential assumption as long as wealth brackets are sufficiently small. Hence, all households in wealth bracket B have the same net wealth (less savings):

[45] In particular, the debt of a company was already netted out in the business assets. The same holds true for financial equity by definition—its value was recorded at market valuation.

$$w_i^B - w_{i,savings}^B = \frac{W^B - W_{savings}^B}{N^B} \tag{37}$$

Dividing equation 36 by equation 37, yields the following expression:

$$N^B = \frac{W_{agricultural}^B - D_{Rural\ landowners}^B}{w_i^B - w_{i,savings}^B} + \frac{W_{real\ estate}^B - D_{Urban\ landowners}^B}{w_i^B - w_{i,savings}^B} + \frac{W_{business}^B}{w_i^B - w_{i,savings}^B} + \frac{W_{financial\ equity}^B}{w_i^B - w_{i,savings}^B} + \frac{W_{non-equity\ financial}^B}{w_i^B - w_{i,savings}^B} \tag{38}$$

or more simply:

$$N^B = \sum_a N_a^B = N_{Rural\ landowners}^B + N_{Urban\ landowners}^B + N_{Business\ owner(unincorporated)}^B + N_{Business\ owner(incorporated)}^B + N_{Rentier}^B \tag{39}$$

where a indexes the type of wealth holder that corresponds to the the respective asset type. Finally, we can represent the wealth portfolio for individual i holding asset type $\tilde{a}$ in the tabulated wealth bracket B as follows:

$$w_i^B = \frac{W_{\tilde{a}}^B}{N_{\tilde{a}}^B} + \frac{W_{savings}^B}{N^B} - \mathbf{1}_{\text{landowner}} \cdot \frac{D^B}{N_{Rural\ landowners}^B + N_{Urban\ landowners}^B} \tag{40}$$

where $\mathbf{1}_{\text{landowner}}$ is an indicator function which takes the value 1 if the individual i is an urban or rural landowner and 0 otherwise.

DA 6.2 Contraction I: World War I

On the following pages, we provide a detailed description of the counterfactuals that we construct to explain the shift in the German wealth distribution after World War I.

DA 6.2.1 Territorial changes

If we want to understand the significance of the border changes associated with World War I, it is natural (i) to estimate the distribution of wealth as of 1913 in the borders of Weimar Germany and (ii) compare this estimate to the historical realized wealth distribution in the Empire borders of 1913. Table 24 reports some of the key facts of our exercise.

Table 24: **Border change WWI counterfactual - summary**

Variable	Value		Comment
Reference year	1913		
Reference geography	Weimar Republic		Comparison with the historical borders
Change of number of tax units	-8.74%		relative to whole Germany Empire
	Magnitude of wealth shock		
Shock to...	% of private wealth	% of national income	
...total wealth:	-5.0%	-24%	
	Modelling of shock		
Re-ranking is modelled/known	known		We rely on the regionally dis-aggegated data
Distribution of shock across distribution known or estimated	known		Relying on the Empire-wide wealth levy for armament (Statistisches Reichsamt, 1919), we can determine changes across the distribution exactly

Notes: Own calculations. See text for details.

To generate an estimate of the wealth distribution in 1913 within Weimar borders, we first have to prepare the data. In particular, we (i) define the territory, (ii) estimate total net wealth in that territory (W'), (iii) generate the tax unit total (N'), and (iv) adjust the wealth tabulations by removing those living in the territories that were lost in World War I ($\{w_j^{TP}\}'$). Finally, (v) we estimate the counterfactual top 1% wealth share and compare it to the baseline (top 1% wealth share in 1913 in the whole Empire.)

(i) Defining the territory:

We focus here on the three significant and permanent territorial losses associated with World War I: Province of Poznan (*Posen*), Province of West Prussia (*Westpreussen*), and Alsace-Lorraine (*Elsass-Lothringen*). We thus abstract from three smaller territorial losses as well as the special statuses of *Danzig* and *Saarland*.[46]

(ii) Estimate of counterfactual net wealth (W'):

We calculate the effects of the losses on total net wealth. We assume that the share of total wealth of the three territories mentioned above is proportional to the share of the taxpayers' wealth in the rearmament levy of 1913. Given that this levy was paid by around 10% of the population (Appendix Section DA 1.2) owning around 80% of total net personal wealth, this strikes us as a warranted simplifying assumption. More information on the total estimate in Weimar borders can be found on spreadsheet *Weatlh_totals_Kaiserreich.xlsx*.

(iii) Estimate of counterfactual total population/tax units (N'):

We calculate the new total of tax units in the hypothetical Weimar borders. We simply calculate the proportion of the population living in the three lost territories in the overall population and apply this ratio to the tax unit estimate for the whole empire. The corresponding sources are the same as described in Appendix Section DA 1.2 and further details can be found in the accompanying spreadsheet *Population_totals_Kaiserreich.xlsx*.

(iv) Adjust tabulations of wealth tax payers ($\{w_j^{TP}\}'$):

We have to generate new tabulations. Fortunately, the Statistisches Reichsamt (1919) allows us to calculate, rather than estimate, the effects across the distribution. This is the case because the statisticians recorded the tabulations by state in the above source. By removing the taxpayers and their wealth from the distribution, we arrive at the tabulation in 1913 in the borders of the Weimar Republic. Further details can be found in the spreadsheet *WB_Kaiserreich_1913*.

(v) Estimating the change in the top 1% share

Finally, we estimate top shares by running the gpinter algorithm on our counterfactual values $(W', N', \{w_j^{TP}\}')$. The difference between the top percentile's wealth share in Weimar borders in 1913 and the top 1% wealth share in historical borders reflects the net effect of the border change on the top 1% share.

[46] Those relate to parts of *Oberschlesien* (Upper Silesia), *Nordschleswig* (a territory bordering Denmark), and *Eupen-Malmedy* (bordering Belgium). The Saar territory would become part of Germany again through a referendum in the 1930s. In Table 19 in Appendix DA 5, we report which historical provinces, territories, and states were affected by the border changes throughout German history.

DA 6.2.2 Expellees after World War I

Table 25 summarises the key information for the expellee counterfactual. The basic idea of the counterfactual is to shock the pre-war distribution within the later territory of the Weimar Republic with an influx of refugees of the magnitude that would occur after the war.

Table 25: **Expellee counterfactual - summary**

Variable	Value		Comment
Reference year	1913		
Reference geography	Borders of Weimar Republic		
Change of number of tax units	+1.7%		
	Magnitude of wealth shock		
Shock to...	% of private wealth	% of national income	
...total wealth	+0.2%	+1.0%	We assume that each household could bring an annual salary of an unskilled worker.
	Modelling of shock		
Re-ranking is modelled/known	not necessary		
Distribution of shock across distribution known or estimated	by assumption		We assume that none of the expellees enters the top 1%.

We first have to prepare the data. In particular, we have to (i) add the refugees to the total number of tax units to create a counterfactual population/tax unit total (N') and (ii) adjust the total wealth to account for the fact that the refugees brought small amounts of wealth with them (W'). Finally, (iii) we discuss briefly why we do not adjust the mass of taxpayers ($\{w_j^{TP}\}' = \{w_j^{TP}\}$, and how we estimate the total effect on the top percentile's wealth holdings.

(i) Estimate of counterfactual total population/tax units (N'):

Oltmer (2013, p. 41) estimates the total number of expellees to be 1.06 million or around 1.7% of the 1913 population. Given the 1913 average Prussian population-tax unit ratio (see Appendix DA 1.2 and spreadsheet *Population_totals_Kaiserreich.xlsx*), this total number of individuals corresponded to 381,600 households.

(ii) Estimate of counterfactual net wealth (W'):

We assume that each household could bring an annual salary of an unskilled labourer, accruing to 1240 Mark in 1913 (Statistisches Reichsamt, 1928, p. 372). This strikes

us as an upper bound. Aggregating this assumed wealth across all refugee households corresponds to an increase of total wealth of around 0.2%.

(iii) Estimating the change in the top 1% share

As the expellees from the lost territories had to leave their real assets behind, it is safe to assume that they entered the bottom of the wealth distribution, leaving the group of taxpaying households unchanged ($\{w_j^{TP}\} = \{w_j^{TP}\}'$). Based on W', N', and $\{w_j^{TP}\} = \{w_j^{TP}\}'$, we estimate a counterfactual top-share via the gpinter program. Compared to the baseline scenario (the wealth distribution in 1913 in Weimar borders), the top 1% share increased by a tenth of a percentage point.

DA 6.2.3 Loss of lives

Table 26 summarises the key information of the effect of the loss of human life on the wealth distribution. The basic idea of the counterfactual is to shock the 1913 wealth distribution with the change in tax units that would occur during the war due to the fallen soldiers.

Table 26: **Loss of life and tax units**

Variable	Value		Comment
Reference year	1913		
Reference geography	German Empire		
Change of number of tax units	-3.5%		relative to whole Germany Empire
	Magnitude of wealth shock		
Shock to...	% of private wealth	% of national income	
...total wealth	0%	0%	
	Modelling of shock		
Re-ranking is modelled	not necessary		
Distribution of shock across distribution known or estimated	by assumption		We assume that none of the households among the top 1% disappeared.

Notes: Own calculations. See text for details.

(i) Estimate of counterfactual total population/tax units (N′):

According to the Statistisches Reichsamt (1927a, p. 25) 1,885,291 German soldiers died in World War I. As a consequence, household formation was stunted. Moreover, the death of the soldiers induced a shortfall of relatively less rich male single households, decreasing the number of tax units.

If we assumed that all German soldiers were single households, the number of fallen soldiers would equal the reduction of households. This, of course, would be an implausible assumption. Bessel (1993, p. 11) reports that 68.75% of the soldiers killed during the Great War were single. Because only unmarried males would increase the number of households, we have to make an assumption about how many soldiers still would have gotten married. Assuming a third certainly constitutes an upper bound given that overall 60% of the males aged between 15 and 45 lived in single households in 1910 (Bessel, 1993, p. 10).[47] The shortfall of tax units is thus $864,092 \approx 1,885,291 * 68.75\% * 66.6\%$.

[47] We consider it an upper bound for the soldiers *not* already married. A 1/3 marriage rate, together with the fallen soldiers that were already married (31.25%), would imply 54% of all fallen soldiers would have gotten or were married. This compares to the observed rate of 60% among males aged 15-45.

(ii) Why not to change (W) and $\{w_j^{TP}\}$:

We assume that neither net private wealth nor the wealth of the wealth tax payers are affected ($W = W'$; $\{w_j^{TP}\}' = \{w_j^{TP}\}$. The reason is simple: When a soldier died (often young men), the wealth would remain with the family. Hence the wealth total does not change. Similarly, the mass of wealth among the top 1% would not be affected, because the wealth would remain with the widow (who would re-marry or stay a single female household). Additionally, the probability of dying as a soldier in the war likely correlated negatively with wealth and very few of the soldiers were among the top 1%.

(iii) Estimating the change in the top 1% share

We implement the shock by simply estimating the top 1% wealth share from the tabulated data for the German Empire with the updated (reduced) number of tax units. The net effect of the loss of lives is the difference between this estimate and the actually observed top 1% in 1913.

DA 6.2.4 Asset price effects on net wealth caused by hyperinflation and war

Table 27 summarises the key information for the hyperinflation/asset price counterfactual. Hyperinflation and war led to a massive disruption in asset prices, with some gaining and others losing in relative terms. The basic idea of the counterfactual is to shock the 1913 wealth distribution with these price changes.

Table 27: **Asset price effects on net wealth caused by hyperinflation and war**

Variable	Value		Comment
Reference year	1913		
Reference geography	German Empire		
Change of number of tax units	No		
	Magnitude of wealth shock		
Shock to...	% of private wealth	% of national income	
	due to valuation effects		
...real estate assets	-5%	-24%	$\Delta P = -20\%$
...agricultural assets	+4%	+19%	$\Delta P = +14\%$
...business assets	-9%	-41%	$\Delta P = -57\%$
...capital assets	-40%	-188%	$\Delta P = -57\%$ for equity / $\Delta P = -85\%$ for non-equity: see text for details
	due to eradication/revaluation of debt		
...debt	+19%	+93%	$\Delta P = -80\%$: see text for details
...total wealth ($\sum$)	-30%	-142%	
	Modelling of shock		
Re-ranking is modelled	Yes		A new ranking is built after the shock
Distribution of shock across distribution known or estimated	Estimated		Household-level pre-shock portfolio data are constructed from tabulated data.

We proceed in five steps: we (i) calculate price changes between 1913 and 1927, (ii) estimate the counterfactual net wealth (W'), (iii) reconstruct household portfolios, (iv) implement corresponding household-specific shock in order to generate $\{w_j^{TP}\}'$, and (v) estimate the counterfactual top 1% wealth share.

(i) Price changes 1913-1927

Enough data are available to approximate the price changes of agricultural, real estate, business and financial equity assets between 1913 and 1927. These price changes were, of course, a joint consequence of the war and hyperinflation. Based on the statistical material, it is not possible to disentangle the effects of the two events. Even if the available data were richer, it is not clear that the hyperinflation and war should be treated as separate events. It is hard to imagine a hyperinflation in Germany without World War I (see Holtfrerich, 1980, for a treatise of the German hyperinflation).

Table 28: **Changes in asset and debt valuation due to hyperinflation and war**

	...agricultural assets	...real estate	....business assets	....financial assets - equity	....financial assets - non-equity	...debt
$\Delta P_{1913-1925}$		-40%	-71%	-71%	-85%	-80%
$\Delta P_{1913-1927}$	+14%	-20%	-57%	-57%	-85%	-80%

Sources: agricultural assets: Jaggi (1945, p.88); real estate: Knoll et al. (2017, Data from Werner Matti shown in online appendix, p. 69) ; business and financial assets - equity: Gielen (2013); financial assets - non-equity and debt: own calculations - see text.

Table 28 reports the price changes by asset class. It is apparent that the holders of agricultural and real estate assets benefitted relative to those holding equities and financial equity assets. These stark differentials are in line with the reports of contemporaries who emphasize the gains that farmers made relative to home owners (Bresciani-Turroni, 1937, p. 298). Farmers got much of their debt eradicated and benefitted from increasing food prices. On the contrary, the value of real estate declined rapidly, because nominal rents became essentially worthless. Furthermore, the government later imposed a *Hauszinssteuer*, which further depressed property prices.[48] The stark decline in the value of corporations was also noted by the former director of Deutsche Bank and author of a wealth estimate for 1913, Helfferich (1925, p. 13). He reported a valuation loss of about 68% in 1925 for a mining company that did not dilute its nominal capital as representative, actually very close to the 71% from the data by Gielen (2013).

Special to the hyperinflation, of course, was that nominal values became worthless. This affected debts as well as holdings of savings and non-equity assets such as industrial and government bonds. For example, many mortgage owners had paid back the mortgages in essentially worthless paper marks in 1922 (Holtfrerich, 1980, p. 316). The government of the young Weimar republic, however, intervened. In practice, the eradication of nominal assets and the eradication of debt was incomplete due to their partial reinstatement

[48] This tax was levied on rental income in order for the government to participate in the partial alleviation of the mortgage debt (Cohen, 1931).

through a relatively complex law in 1925 (*Gesetz über die Aufwertung von Hypotheken und anderen Ansprüchen*), which defined the new value relative to their value in Goldmarks (Marks in gold value). The degree of the so-called "Aufwertung" varied by asset and debt types, for example 25% for mortgages and at least 12.5% in savings.[49] Adding complexity, the level of reinstatement of savings depended on the regional solvency of banks. The minimum set by the law was 12.5% (§ 55 Gesetz über die Aufwertung von Hypotheken und anderen Ansprüchen), but the reinstatement could be as high as 23% in the Rhineland (Pohl, 2001, p. 134). Given that a very fine grained asset decomposition of 1913 is not available, we have to make reasonable assumptions.

In terms of savings and other nominal assets, we assume that 15% got reinstated, slightly more than the minimum of 12.5% of the minimum for savings. For debt, a good approximation can be achieved by considering the 25% "Aufwertung" and debts between 1924 and 1925. The wealth tax statistics of 1928 (Statistisches Reichsamt, 1931c, p. 42f) - about 10% of the households paid wealth tax - report that indebtedness relative to gross assets was 1.29% or 1.3b RM before the reinstatement of debts (1924) and 9.4% or 10.3b RM thereafter (1925). It seems that about 9b Reichsmark of debt got reinstated (for the taxpayers). Our debt estimate for about the richest 10% of households accrues to about 51b Marks, such that this would represent a reinstatement of debts of about 20%. This compares favourably to the 25% required by law for mortgages. We thus take this as our baseline estimate of the effect of the hyperinflation on debts, including the subsequent government intervention.

(ii) Estimate of counterfactual net wealth (W′):

How would these price changes affect the net private wealth? The total effect can be modelled relatively easily by applying the price changes in Table 28 to the value of the respective assets in 1913 (see Appendix DA 1.2). We implement one slight modification, which is important for the estimate of the effect of the hyperinflation. For our 1913 benchmark estimate, we did not implement a distinction between non-equity and equity financial assets. Based on the little statistical material available, we assume that around 50% of the total financial assets held by households are equity.[50] Accordingly, we divide

[49] Gribel (1926) published a commentary to the respective laws. See Holtfrerich (1980, Chapter 3.IV.B) for a discussion of the political process.

[50] In particular, Helfferich (1925) reports that the market value of German stock market firms was 32b marks, whereas their nominal capital was only 17.357b marks (Statistisches Reichsamt, 1939a, p. 236). The ratio of market-to-book value ratio was thus around 1.8. Applying this ratio to the reported nominal capital of 4.81b marks of *GmbHs* (Statistisches Reichsamt, 1939b), yields 8.8b marks for this company type. Finally, shares in cooperatives amounted to around 3b marks according to Helfferich (1914b, p. 43) or 5.5b when applying the above ratio. Furthermore, Helfferich (1925) reports foreign assets of around 25b marks of which we assume 80% were equities. This leaves us with about 66.8b marks in equity,

the total financial wealth into equity and non-equity and multiply it with the respective price changes.

Table 27 reports the effects on the wealth total and composition. It illustrates the wealth destruction in terms of private wealth and national income. Unsurprisingly, financial wealth was the most affected, while agricultural wealth increased slightly.

(iii) Constructing portfolios at the top of the distribution

A major challenge to construct a plausible counterfactual for the valuation effects of the hyperinflation and war is the lack of adequate portfolio data for the top 1%. While the portfolio of the top-5% is known (see Appendix Section DA 1.2 for details on the corresponding data based on the *Wehrbeitrag*), it cannot be used as a substitute. From more modern data, as well as the portfolio data from the interwar period in our dataset, it is clear that the portfolio of the top 1% is different from the one of the top-2-5% in that it is relying more heavily on business and equity wealth and less on real estate and agricultural wealth.

To overcome the lack of portfolio data for the top 1% rather than the top-5%, we rely on our portfolio estimates for 1927 (Appendix Section DA 2.5). In particular, we calculate ratios of agricultural, real estate, business, equity financial assets, non-equity financial assets, and debt relative to net wealth in 1927 by wealth class. We then apply these ratios to the observed net wealth in the tabulated data in 1913.[51] This procedure preserves the net wealth as found in the original 1913 data and simply extrapolates a relative distribution across different assets in 1927 to our 1913 data. Spreadsheet *Tabulated_Data_WarHyperinflation* provides the detailed calculations.

How plausible is this imputation of the portfolio structure among the richest households? Table 29 compares the estimate for 1913 based on the 1927 portfolio with those of comparable groups (in terms of total households) in Prussia in 1914 and 1897. The Prussian statistics recorded the portfolio of taxpayers above a certain income thresholds (3,000 Marks) in the joint income and wealth tax. In 1895, a mere 2.4% of all tax units in Prussia passed this threshold, whereas 3.7% did so in 1914. Unfortunately, the portfolio is not cross-tabulated with the respective net wealth classes. Nonetheless, these snapshots provide a good idea of how portfolios at the top looked in the German empire of which Prussia formed a significant part (see Appendix Section DA 1.1). It can be seen that in terms of the distribution of assets at the top across three classes, we match the Prussian

which would be around 50% of all financial assets. Certainly, this is a very speculative division. On the other hand: the (known) value of capital assets among the top-5% was around 100b Marks. It does not strikes us implausible that around 70% of this wealth was held in equity (assuming that no one below held equities).

[51] Fortunately, the lower and upper bounds of the wealth brackets in the tabulated tabulated data agree for the two years.

data quite well by imposing the structure of the 1927 portfolio. The comparison with the Prussian data of 1897 seems to suggests that towards the top, more assets are held in business wealth rather than in financial assets. This aligns well with our estimate.

Table 29: **Portfolio structure assumption for the rich in 1913**

Data source	...richest tax units covered	Agricultural assets	Real estate	Business assets	Financial assets			Debt (in terms of gross wealth)
					equity	non-equity: bonds	non-equity: savings	
Own estimate of 1913 portfolio	3%	22%	20%	17%	25%	4%	11%	12% [/10%]
...using Prussian classification	3%	42%		17%	41%			12% [/10%]
Prussia 1897	2%	42%		16%	42%			18%
Prussia 1914	4%	41%		13%	47%			21%
German Empire	5%	42%		13 %	45%			20%

Notes: Own calculations.

Our estimates appear to differ from Prussian aggregates mostly in their prediction of the share of debt in gross assets. Applying the ratios of 1927, would suggest the debt ratio of the top 3% was only about 10% whereas the available data for the top 5% suggests that it was about 20%. Some of this difference might be explained that the top 3%'s portfolio differs from that of the top-5% as suggested by the Prussian data of 1897. On the other hand, the Prussian data of 1897 does not serve as the best comparison here, because debt levels in Prussian agriculture were notoriously high.[52] This means that we would expect lower levels for Germany as a whole, but perhaps not as low as 10%. We thus decided to increase the debt value in each bracket by 20% predicted from our 1927 portfolios (there are 6 brackets within the top 3%). We then up-rate the wealth in agricultural and real estate proportionately to leave the net wealth unchanged.[53] We then arrive at a debt ratio for the top 3% of 12% relative to gross wealth.

Finally, we have to make an assumption about the distribution within capital assets, categorising them into equity (stocks and shares in non-listed companies, in particular the German company form of *GmbH*), non-equity financial assets, and savings. For simplicity and based on our assumptions for 1927, we assume that over 250,000 Marks net worth, individuals hold 90% of their financial assets in equity, 5% in bonds, and 5% in other non-equities such as savings or life insurances. Below this threshold we reverse this pattern and assume that only 10% are held in equity, 20% in non-equities, and 70% in savings. More details and the final tabulation can be found in the accompanying spreadsheet *Tabulated_Data_WarHyperinflation*.

[52] In a statistical treatise, Kühnert (1907, p. 293) shows that the average debt to gross wealth ratio in Prussia ranged from 33.4% for low-income farmers to 24.6% to farmers with higher income.

[53] Business wealth and financial assets are net of debt in the statistics.

(iv) Implementing household-specific shocks in order to generate $\{w_{i_{TP}}\}'$

During this period as in others, households at the top did not diversify their portfolios much. Besides the evidence provided in Section DA 6.1, the historical literature (Bresciani-Turroni, 1937; Holtfrerich, 1980) and data on millionaires in Prussia (Martin, 1913) supports the following classification of rich households:

1. The rural landowner - portfolio heavily biased towards agricultural assets; typically mortgaged
2. The urban landowner - portfolio heavily biased towards real estate assets; typically mortgaged
3. The business owner of an unincorporated business - portfolio heavily biased towards business assets
4. The business owner of a listed stock-market company - portfolio heavily biased towards financial assets (equity)
5. The rentier - portfolio heavily biased towards financial assets (non-equity, typically bonds)

Given these archetypes of the rich, it is possible to impute micro data from the classified/tabulated data as described in Section DA 6.1. With the imputed micro data at hand, we can shock the individual household portfolios (around 690,000 households in total) according to the price changes documented above. Note that each household holds at least two assets: (i) the main asset according to its type and (ii) savings. Urban and rural landholders also hold debt, which further affects their exposure to the price changes and hyperinflation.

Table 30: **Changes of individual net worth due to price changes associated with war and hyperinflation**

	Share of households in imputed data	Change in net worth		
		average	minimum	maximum
Rural landowner	24%	24%	22%	52%
Urban landowner	31%	-15%	-15%	4%
Businessman (corporate, owning stocks/shares)	24%	-62%	-63%	-58%
Businessman (non-corporate)	14%	-62%	-63%	-58%
Rentier	7%	-85%	-85%	-85%

Notes: Own calculations.

Table 30 reports the corresponding results. It is clear that, given the observed heterogenous price changes of asset classes, the change in net worth for the individual households crucially depended on the type of main asset held. Because the debt was eradicated in substantial proportions, urban and rural landowners were inflation winners. Business owners suffered a heavy loss of their net worth of about 62% on average. Naturally, rentiers lost most of their fortunes.

Table 30 can also be used to analyse the imputed structure of the 670,000 richest households. About 24% of the households are owners of land and 38% are business owners, whereas 7% are rentiers. Our imputed micro data suggests that 31% were urban landowners. This might overestimate their share somewhat, because urban business owners would own real estate in cities, too. Clearly, one could potentially integrate the ownership of a single house into the imputation of the micro dataset irrespective of the general type of wealth holder. However, we decided against this procedure as it would complicate the imputation of the micro dataset, presumably without adding much value. Overall, our imputation does not seem to be a bad approximation when we use an external validation based on the Millionaires list by Martin (1913). Among the 300 richest, we predict a share of 19% of rural landowners, whereas Martin reports that 16% among the richest Prussians are landowners.[54]

(v) Estimating the change in the top 1% share

Finally, to estimate the share of the top 1% while implementing a plausible within-class distribution, we re-aggregate our individual level data into a tabulated dataset, add the information about the new estimated total, and run the *gpinter* algorithm.

[54] Own calculation based on the classification of millionaires by the origin of their wealth.

DA 6.3 The Great Depression

DA 6.3.1 Business failures

Table 31 summarises the key information about the 'business failure' counterfactual. The basic idea is the following. A part of non-incorporated businesses fails. Households owning failing businesses lose all their wealth except for their savings, while those households owning surviving ones keep their assets unchanged. For households owning shares in listed companies, we assume a percentage reduction in their portfolio that corresponds to the reduction in stock market companies. After shocking the household-level dataset with these two shocks and adjusting the total wealth, we re-compute the top 1% share. The difference between this counterfactual share and the observed one in 1927 constitutes the effect of business failures on the top 1% share in wealth. We discuss our sources on business failure rates and the precise implementation of the counterfactual below.

Table 31: **Great Depression counterfactual (business failures) - summary**

Variable	Value		Comment
Reference year	1927		
Reference geography	Weimar Republic		
Change of number of tax units	No		
	Magnitude of wealth shock		
Shock to...	% of private wealth	% of national income	
...business & capital assets	-6.2 %	-14.3%	
	Modelling of shock		
Re-ranking is modelled	Yes		
Distribution of shock across distribution known or estimated	Estimated		Household-level pre-shock portfolio data are constructed from tabulated data.

Analogously to the other Great Depression counterfactual, we proceed in five steps: we (i) calculate business failure rates between 1927 and 1934, (ii) estimate counterfactual net wealth (W'), (iii) reconstruct household portfolios, (iv) implement corresponding household-specific shocks in order to generate $\{w_j^{TP}\}'$, and (v) estimate the counterfactual top 1% wealth share.

(i) Business failure rates

For this time period, the distinction between corporations and unincorporated (or personal-liability) companies is key. However, even within these categories, there is substantial room for interpretation (see, for example, the difference between 'Betriebe' and 'Unternehmen', as discussed in Reckendrees, 2015, p. 251). To capture businesses that have

a non-trivial size and to escape a definition that incorporates prices in any form, we settled on comparing the number of businesses with at least 5 employees in 1925 and 1933. While these dates are less than ideal, they at least provide a consistent comparison category. According to the data assembled by Reckendrees (2015), the number of such businesses decreased by 21.8%. We take this to be the failure rate of unincorporated businesses. In the absence of a better alternative, we assume that the rate of failure was uniform and independent from the firm size. This may potentially induce an upward bias for the role of business failures in moving the top 1% shares as one may expect a larger company to be able to endure the Great Depression better.

Table 32: **Business failures during the Great Depression**

Asset type		$\Delta Q_{1927-1934}$	Description & source
Unincorporated/personal-liability firms		-21.8%	Change in businesses with at least 5 employees (Reckendrees, 2015)
Corporations	lower bound	-7.1%	Change in subscribed capital (Reckendrees, 2015)
	upper bound	-20.9%	Change in number (Reckendrees, 2015)
	compromise	-16.3% ⋆	average of the above

Notes: ⋆ preferred estimate.

Table 32 highlights three alternative estimates of failures of listed companies. The first one is the change in subscribed capital. We also gather data on the change in the total number of stock market companies. The compromise estimate is the average between the two - our preferred measure.

(ii) Estimate of counterfactual net wealth (W'): We calculate the counterfactual net private wealth by applying the failure rates of businesses and corporations to our wealth account for 1927 (from spreadsheet *Wealth_totals_Deutsches_Reich_adjusted*). The spreadsheet *Tabulated_Data_GreatDepression_BusinessFailures* provides the detailed calculations. Depending on the scenario, net wealth decreases between 4.5% (lower bound), 6.2 (compromise), and 7.9% (upper bound).

(iii) Constructing portfolios at the top of the distribution

For 1927, we have carefully reconstructed portfolios within brackets ordered by wealth class (see Section DA 2.5). We impute a household-level dataset following the methodology discussed in Section DA 6.1.

(iv) Implementing household-specific shocks in order to generate $\{w_j^{TP}\}'$

With the imputed micro data at hand, we shock the individual household portfolios. Among all households owning personal liability firms, 21.8% lose their entire wealth except

for savings. The wealth of the remaining 78.2% remains unchanged. Households owning shares in corporations only lose a fraction of this wealth corresponding to the failure rates in Table 32.

(v) Estimating the change in the top 1% share

Finally, to estimate the share of the top 1% while implementing a plausible within-class distribution, we re-aggregate our individual level data into a tabulated dataset, add the information about the new estimated total, and run the *gpinter* algorithm. Comparing this counterfactual share to the one actually observed in 1927 yields the net effect of the business failures. The corresponding estimates for the effect of business failures on the top 1% share for the different scenarios are: -1% (lower bound), -2.2% (midpoint), and -2.6% (upper bound).

DA 6.3.2 Price effects

Setting up the counterfactual for the effect of the Great Depression on the top-1% share through the asset price channel follows the same procedure as the counterfactual for the hyperinflation. Table 44 summarizes the key inputs for the counterfactual.

Table 33: **Great Depression counterfactual (price shock) - summary**

Variable	Value		Comment
Reference year	1927		
Reference geography	Weimar Republic		
Change of number of tax units	No		
	Magnitude of wealth shock		
Shock to...	% of private wealth	% of national income	
...real estate	-6%	-14%	$\Delta P = -20\%$
...agricultural assets	-3%	-7%	$\Delta P = -8\%$
...business assets	-6%	-13%	$\Delta P = -43\%$
...capital assets	-10%	-24%	$\Delta P_{equity} = -43\%$; $\Delta P_{non-equity} = -4\%$; $\Delta P_{savings} = 0\%$
...debt	0%	0%	
...net wealth	-25%	-58%	
	Modelling of shock		
Re-ranking is modelled	Yes		A new ranking is built after the shock
Distribution of shock across distribution known or estimated	Estimated		Household-level pre-shock portfolio data are constructed from tabulated data.

We proceed in five steps: we (i) calculate price changes between 1927 and 1934, (ii) estimate the counterfactual net wealth (W'), (iii) reconstruct household portfolios, (iv) implement corresponding household-specific shocks in order to generate $\{w_j^{TP}\}'$, and (v) estimate the counterfactual top-1% wealth share.

(i) Price changes 1927-1934

Table 34 summarises the changes in asset prices over the period. We are carefully assess the plausibility of these price changes against alternative price indices.[55] The only smaller assumption pertains to the price changes in unincorporated business, which we proxy with the stock market index by Gielen. Even though 'business assets' are not listed, using the changes in Gielen's index to proxy the change in the market price of these businesses strikes us as a reasonable approximation.

Table 34: **Asset price shock - Great Depression**

Asset type	$\Delta P_{1927-1934}$	Description & source
Agricultural assets	-8.3%	Average change in the hectare price of 50-100 hectare farms: 1927: Statistisches Reichsamt (1931a, p. 14); 1934: Statistisches Reichsamt (1939c, p. 38)
Real estate	-19.8%	Change in average price of single-family homes and flats: 1927: Statistisches Reichsamt (1931a, p. 42); 1934: Statistisches Reichsamt (1939c, p. 61)
Business assets	-42.9%	Change in end of year values in stock market index (Gielen, 2013)
Financial assets - equity	-42.9%	Changes in end of year values in stock market index (Gielen, 2013)
Financial assets - non-equity	-4.1%	Annual average of bond price index (Statistisches Reichsamt, 1936, p. 34)
Financial assets - savings	0%	Cash kept nominal value.

(ii) Estimate of counterfactual net wealth (W'):

How would these price changes affect the net private wealth? In contrast to earlier years, our wealth accounts for the interwar period record capital assets by equity/non-equity status (see spreadsheet *Wealth_totals_Deutsches_Reich_adjusted*). The effect of the price shock associated with the Great Depression is modelled by applying the price changes in Table 34 to the value of the respective assets in 1927.

See spreadsheet *Tabulated_Data_GreatDepression_Prices* for the corresponding calculations.

(iii) Constructing portfolios at the top of the distribution

For 1927, we have carefully reconstructed portfolios within brackets ordered by wealth

[55] For example, the drop in real estate prices reported in our souces chimes with Matti's data for Hamburg reported in Knoll et al. (2017).

class (see Section DA 2.5). We impute a household-level dataset following the methodology discussed in Section DA 6.1.

(iv) Implementing household-specific shocks in order to generate $\{w_j^{TP}\}'$

With the imputed micro data at hand, we shock the individual household portfolios according to the price changes documented above.

(v) Estimating the change in the top-1% share

Finally, to estimate the share of the top 1% while implementing a plausible within-class distribution, we re-aggregate our individual level data into a tabulated dataset, add the information about the new estimated total, and run the *gpinter* algorithm. Comparing this counterfactual share to the one actually observed in 1927 yields the net effect of the asset price changes. It amounts to -4.9%.

DA 6.4 Nazi regime & World War II

DA 6.4.1 Persecution of the German Jews

Table 35 summarises the key variables for this counterfactual. The persecution, dispossession, and ultimately murder of German Jewry took many forms. They ranged from "Aryanizations" of German banks[56], company boards[57] to other confiscatory taxes targeting individuals such as emigration taxes, a wealth levy in 1938, and many smaller state-led or state-backed dispossessions.[58] Attempting to add up each of these atrocities would result in major methodological problems: it would not take into account the loss that occurred through fire sales (to pay the taxes), it may underestimate the role smaller levies for lack of proper statistics, and would be unable to detect 'unofficial' expropriations done by Nazi officials and ordinary citizens. Instead, our point of departure is the wealth of Jewish Germans before the Nazi's got into power.

Table 35: **Effects of the murder and persecution of the German Jews - summary**

Variable	Value		Comment
Reference year	1934		
Reference geography	Borders of Federal Republic		
Change of number of tax units	-0.75%		
	Magnitude of wealth shock		
Shock to...	% of private wealth	% of national income	
...net wealth	3.1 %	8.8%	
	Modelling of shock		
Re-ranking is modelled	No		Not necessary.
Distribution of shock across distribution (including $\eta_{w_{top1}}$) known or estimated	Estimated		Assumption that the distribution *among* those paying taxes followed that of all taxpayers.

Notes: Own calculations. See text for details. National income data are from Piketty and Zucman (2014).

We proceed in six steps: we (i) estimate Jewish wealth, (ii) estimate counterfactual net wealth (W'), (iii) estimate the number of tax units without the German Jews, (iv) reconstruct the wealth distribution among the Jewish population, (v) remove their wealth from the distribution in 1934 to generate $\{w_j^{TP}\}'$, and (vi) estimate the counterfactual top 1% wealth share.

[56]The number of Jewish-owned private banks decreased by about 50% and their balance hseets shrank by around two thirds between 1935 and 1938 (Köhler, 2005, p. 102).

[57]Huber et al. (forthcoming) document that around 9% of the managers in listed stock market companies in 1932 (Berlin Stock exchange) were of Jewish origin.

[58]See for a full list of "direct' dispossessions, Ritschl (2019).

(i) Estimate of Jewish wealth:

Fremdling (2016) and Ritschl (2019) draw on rich archival material from German ministries to assess the quality of earlier estimations of the wealth of German jews by Junz (2001). Based on these three sources, it appears likely that only Junz's lower bound estimate of around 8-10b Reichsmarks is plausible for 1933 (see for extensive discussions Fremdling, 2016; Ritschl, 2019). Hence, we take 8b as the lower bound, 9b as the mid-point estimate, and 10b as an upper bound. We make three adjustment to this estimate. First, we correct these estimates for the share of the Jewish population living on the later territory of our reference geography for this estimate—the Federal Republic (78%, see excel sheet for the respective sources). Second we make it comparable with our wealth concept, that is to exclude consumer durables. Fremdling (2016, p. 266) provides an internal document from the *Reichsamt* (German Statistical Office) that suggests that in such calculation usually a third of the total was assumed to be consumer durables—or put differently: the part relevant from our wealth definition was inflated by a 50%. Finally, we correct for the fact that 20% of Jews living in the German territory in 1933 had already left Germany by the end of 1934. We thus arrive at the following estimates with the share in net private wealth in parentheses: lower bound: 3.1b Reichsmarks (2.8% of net private wealth); mid-point 3.6b Reichsmark (3.1%) ; upper bound: 4b Reichsmark (3.4%). This compares to a population/tax unit share of .75% on the territory of the later Federal Republic in 1934.

Are these plausible estimates? The century-long discrimination resulted in the geographical sorting of the German-Jewish population into urban centres. It was thus over-represented in both high-status and high-income professions relative to the whole German population. For the late period of the second industrialisation, Barkai (1988, Chapter 4) reports income payments per capita for major West-German cities that supersede the German average by a factor of 3-4. Such magnitudes chime well with the estimates above, even though they are not strictly comparable.

(ii) Estimate of counterfactual net wealth (W'):

It is well-known that not all wealth was literally confiscated, but a lot ended up in the hands of other individuals or companies. Instead of decreasing net private wealth by the total estimated amount of Jewish wealth, we thus adjust the net private wealth total by 50% of it. Correspondingly, the remaining 50% either ended up in the hands of the Nazi regime (the largest part, presumably) or left the country with those fleeing. While we consider this assumption plausible based on our reading of the relevant literature, it does come with considerable uncertainty.

(iii) Estimate of counterfactual total tax units (N'):

We subtract 142,518 households from the tax unit total to account for those who had fled

and were murdered. This corresponds to the product of Jewish population share and the total tax units in 1934 (see Section DA 2.2).

(iv) Reconstructing the wealth distribution among the Jewish population

We have to determine how many Jewish tax unit of the estimated 142,518 are among those paying the wealth tax. The average wealth of those not paying the wealth tax for the whole country is known (3,337 Reichsmark). Using this value, we back out three scenarios for the share of German Jews paying wealth tax relative to all Jewish households (see spreadsheet *Tabulated_Data_ConfiscatoryTaxation* for details). The scenarios assume that 19.2% (lower bound), 22% (midpoint), 24.7% (upper bound) among the Jewish households paid the wealth tax.

(v) Generating $\{w_j^{TP}\}'$

To generate $\{w_j^{TP}\}'$, we remove the Jewish households and their wealth from the taxpayer distribution in 1934.

(vi) Estimating the counterfactual top 1% wealth share

Finally, to estimate the share of the top 1%, we run the *gpinter* algorithm for the three different scenarios. Table 36 shows the results.

Table 36: **Persecution of German Jews**

Scenario	Wealth in 1933 in...		Implied share of	Δ Top 1
	b RMs	% of net private wealth	taxpayers	
Lower	3.1 (8)	2.8%	19.3%	-0.8
Medium	3.6 (9)	3.1%	22%	-1.0
Upper	4 (10)	3.4%	24.7%	-1.1

Notes: Own calculations. Wealth is defined as excluding consumer durables. All data refer only to those living in the borders of the later Federal Republic. See text spreadsheet *Tabulated_Data_ConfiscatoryTaxation*. for more details. Numbers in parentheses in column 1 are the initial basis of the estimate by Junz.

Our estimates imply that the persecution of the German Jews reduced the top 1% share only to a limited extent. Due to the century-long discrimination German jews worked in higher-status and higher income professions. However, their number was small and thus their persecution and murder can only modestly contribute to explaining the change in the top 1% share between 1934 and 1952.

DA 6.4.2 Territorial change

If we want to understand the significance of the border changes associated with World War II for the top 1% share , it is natural to estimate the distribution of wealth in the borders of the Federal Republic as of 1934. Table 37 reports some of the key facts. The lost territories affected the number of tax units (35.4%) as well as total wealth (-32.2%) and the ranking.

Table 37: **Border changes due to WW II - summary**

Variable	Value		Comment
Reference year	1934		
Reference geography	Federal Republic		Comparison with the historical borders (see text for definitions).
Change of number of tax units	35.4%		relative to Weimar borders
	Magnitude of wealth shock		
Shock to...	% of private wealth	% of national income	
...total wealth: $\sum = \eta_W$	-32.2 %	93.8 %	
	Modelling of shock		
Re-ranking is modelled/known	known		We rely on the regionally disaggregated data
Distribution of shock across distribution known or estimated	known		Relying on the disaggregation of the wealth tax in 1934 (Statistisches Reichsamt, 1938a), we can determine changes across the distribution exactly

We proceed analogously to the counterfactual pertaining to the border changes after World War I (Appendix DA 6.2.1). In particular, we (i) define the territory, (ii) estimate total net wealth in that territory (W'), (iii) generate the tax unit total (N'), and (iv) adjust the wealth tabulations by removing those living in the territories that were lost in World War II ($\{w_j^{TP}\}'$). Finally, (v) we estimate the counterfactual top 1% wealth share and compare it to the baseline (top 1% wealth share in 1934 in the Weimar borders).

(i) Defining the lost territories:

Relative to its Weimar borders lost what is now the *Neue Bundesländer* and additional Prussian territories such as *Ostpreussen* and *Schlesien* during World War II. Table 19 in Appendix DA 5 reports in detail which historical provinces, territories, and states were affected by the border changes.

(ii) Estimate of counterfactual net wealth (W'):

We estimate the proportion of wealth held in the lost territories and deduct it from the total in Weimar borders. Spreadsheet *Wealth_totals_Deutsches_Reich_adjusted* and Appendix DA 5.3.2 provide the calculations.

(iii) Estimate of counterfactual total population/tax units (N'):

We estimate the proportion of the population living in the lost territories and deduct it from the total in Weimar borders. Spreadsheet *Population_totals_Deutsches_Reich* and Appendix DA 5.2.2 provide the calculations.

(iv) Adjust tabulations of wealth tax payers ($\{w_j^{TP}\}'$):

Regionally disaggregated tabulations of the taxpayers for the end of 1934 (provided in: Statistisches Reichsamt, 1938a) allow us to remove those living in the lost territories from the tabulation for all of Germany in 1934 borders. Details can be found in spreadsheet *CB_1934* and Section DA 5.4.2 of this Appendix.

(v) Estimating the change in the top 1% share

We estimate top 1% share using this tabulated data and new totals using the gpinter algorithm. The difference between the top wealth shares in BRD borders in 1934 and the top wealth shares in historical (Weimar) borders reflects the net effect of the border change on the top 1% share. The top 1% share in historical borders is 33.49% whereas in BRD borders in 1934, it would have been 33.51%. The territorial change was inconsequential for the evolution of the top 1% share.

DA 6.4.3 Expellee counterfactual

Setting up the counterfactual for the WW II refugees from the former Eastern territories is reasonably straightforward. Under the historically plausible assumption that the expellees entered at the bottom of the distribution, we only have to model the change in the number of tax units and in net wealth. In particular, we (i) provide an estimate for the refugees to the total number of tax units and create a counterfactual population/tax unit total (N') and (ii) adjust the total wealth to account for the fact that the refugees brought small amounts of wealth with them (W'), and (iii) estimate the top-1% share and calculate the change relative to the baseline scenario.

Table 38: **Expellee counterfactual - summary**

Variable	Value		Comment
Reference year	1952		
Reference geography	Federal Republic		
Change of number of tax units	−12.2%		see text
	Magnitude of wealth shock		
Shock to...	% of private wealth	% of national income	
...net wealth	-2.3%	-4.6%	Assuming 2,500 Marks for each household (see below)
	Modelling of shock		
Re-ranking is modelled/known	not necessary		However, top 1% share threshold is moved.
Distribution of shock across distribution known or estimated	by assumption		We assume that none of the expellees enters the top 1%.

(i) Estimate of counterfactual total population/tax units (N'):

As our counterfactual aims to explain changes between 1934 and 1952, we confine ourselves to the period until 1952, thus putting the focus on the initial influx of war refugees. Indeed, the influx of refugees slowed down significantly as early as 1949 and for post-1952 the influx was very small (Reichling, 1958, p. 15). In total, there were 8,258,000 refugees in the beginning of 1953 in West German states (Statistisches Bundesamt, 1953, p. 5).[59]

To how many tax units did the influx of 8,258,000 refugees correspond? Fortunately,

[59]This excludes, like it does in our wealth estimates up until the late 1950s, West-Berlin and Saarland. For consistency, we will ignore the refugees on these territories.

Statistisches Bundesamt (1953, p. 28) provides statistics about the household heads being refugees. Note that this is basically equivalent to our definition of tax units. For September of 1950, there were 2,642,500 households with a refugee household head and about 7,946,000 refugees (Statistisches Bundesamt, 1953, p. 5).[60] Applying the resulting ratio ($\frac{2,642,500}{7,946,000} \approx 33.26\%$) to the 1953 total number of individuals implies a total number of refugee households of 2,746,258. To create the counterfactual N', we deduct these refugees from our 1952 tax unit reference total N.

(ii) Estimate of counterfactual net wealth (W'):

As some refugees might have carried some wealth and/or accumulated further wealth until 1952, we also have to correct the wealth total. For this, we make an assumption about wealth that these refugees owned by 1952 per capita. A good yardstick for such number is the gross annual salary of an industrial worker: 5,000 Marks (see Statistisches Bundesamt, 1956). We generate estimates for three scenarios: (i) lower bound: per capita wealth of a refugee is 20% of an annual gross salary, (ii) midpoint/baseline: per capita wealth of a refugee is 50% of an annual gross salary, and (iii) per capita wealth of a refugee is 100% of an annual gross salary. We multiply this with the number of refugee households to arrive at the amount that we have to deduct from the wealth total W to arrive at W'.

(iii) Estimating the change in the top 1% share

As the expellees from the lost territories had to leave their real assets behind, it is safe to assume that they entered the bottom of the wealth distribution, leaving the group of taxpaying households unchanged ($\{w_j^{TP}\} = \{w_j^{TP}\}'$). Based on W', N', and $\{w_j^{TP}\} = \{w_j^{TP}\}'$, we estimate a counterfactual top-share via the gpinter program. For the respective scenarios, the net effect is:

- Lower bound scenario: each refugee household owns 1,000 Marks (about 20% of an annual gross salary of an industrial worker)
  $\rightarrow \Delta W = -2.8bDM \quad \rightarrow$ predicted Δ top 1% share: 1.1

- Mid-point scenario (preferred) : each refugee household owns 2,500 Marks (about 50% of an annual gross salary of an industrial worker)
  $\rightarrow \Delta W = -6.9bDM \quad \rightarrow$ predicted Δ top 1% share: **0.8**

- Upper bound scenario: each refugee household owns 5,000 Marks (about 100% of an annual gross salary of an industrial worker)
  $\rightarrow \Delta W = -13.7bDM \quad \rightarrow$ predicted Δ top 1% share: 0.2

We consider the mid-point estimate the most plausible.

[60] Number refers to first of December.

DA 6.4.4 Fallen soldiers & household formation

Table 26 summarises key information about the counterfactual assessing the effect of the loss of human life on the wealth distribution. The basic idea of the counterfactual is to shock the 1934 wealth distribution with the change in tax units that would occur due to the fallen soldiers of World War II. To compute the impact of this demographic shock, we thus follow the same procedure as for World War I (Appendix DA 6.2.3) and make the same assumptions.

Table 39: **Fallen soldiers World War II - summary**

Variable	Value		Comment
Reference year	1934		
Reference geography	Weimar borders		
Change of number of tax units	-7%		
Magnitude of wealth shock			
Shock to...	% of private wealth	% of national income	
...net wealth	0%	0%	
Modelling of shock			
Re-ranking is modelled	not necessary		However, threshold for top 1% is changed
Distribution of shock across distribution known or estimated	by assumption		We assume that no household among the top 1% disappeared.

(i) Estimate of counterfactual total population/tax units (N′):

According to the Wehler (2003, p. 942), the most trustworthy estimate puts the number of military casualties at 5.32 million. Of those, 4,456,000 (83.8%) came from within the borders of 1937 (Overmans, 2009, p. 288). The demographic shock was thus even larger than the one associated with World War I in which around 1.9 million soldiers had died (see Appendix DA 6.2.3).

How large was the shortfall in tax units resulting from the war? Historical research indicates that younger soldiers, often in the years of household formation, died more frequently (Overmans, 2009, p. 237). Unfortunately, we were unable to unearth detailed statistics about the maritial status of the dead soldiers similar to those for World War I. However, it does not strike us as unreasonable to apply similar parameters as for World War I. In doing so, we calculate the shortfall of tax units by multiplying the number of deaths with the percentage of single soldiers (68.75%) and assume that a third of them

would have married (and thus be inconsequential for the number of tax units). The estimated shortfall in tax units is thus $2,040,291 \approx 4,456,000 \times 68.75\% \times 66.6\%$ or 7% of Germany's tax units in 1934.

(ii) Why not to change (W) and $\{w_j^{TP}\}$.[61]

We assume that neither net private wealth nor the wealth of the wealth tax payers are affected ($W = W'$; $\{w_j^{TP}\}' = \{w_j^{TP}\}$. The reason is simple: When a soldier died (often young men), the wealth would remain with the family. Hence the wealth total does not change. Similarly, the mass of wealth among the top 1% would not be affected, because the wealth would remain with the widow (who would re-marry or stay a single female household). Additionally, the probability of dying as a soldier in the war likely correlated negatively with wealth and very few of the soldiers were among the top 1%.

(iii) Estimating the change in the top 1% share

We implement the shock by simply estimating the top 1% share from the tabulated data for Germany in 1934 while reducing the number of tax units N. The net effect of the loss of lives (-0.8%) is the difference between this estimate and the actually observed top 1% share in 1934.

[61] We use the same argument as for World War I (see Appendix DA 6.2.3) and simply reprint the text here for the reader's convenience.

DA 6.4.5 Destruction counterfactual

Table 40 summarizes key parameters of our destruction counterfactual, which we use to estimate the effect of the war destruction on the wealth distribution. We use the last pre-war wealth data available, which allows us to model the shock as if the destruction had happened in 1934. All data are converted to constant borders.

Table 40: **Destruction counterfactual - summary**

Variable	Value		Comment
Reference year	1934		
Reference geography	Borders of Federal Republic		
Change of number of tax units	No		Focus lies on physical destruction
	Magnitude of wealth shock		
Shock to...	% of private wealth	% of national income	
...real estate	10.5%	29.7%	
...agricultural assets	0.3%	0.9%	
...business & capital assets	5.7%	16.0%	
...net wealth ($\sum$)	16.7%	46.7%	
	Modelling of shock		
Re-ranking is modelled	Yes		
Distribution of shock across distribution known or estimated	Estimated		Portfolio/imputed micro data are used to distribute shock. The stronger effect of air raids on cities is accounted for.

We proceed in five steps. We (i) calculate the total destruction by asset class that would occur during World War II in 1934 prices, (ii) estimate counterfactual net wealth (W') in 1934, (iii) construct household portfolios, (iv) implement corresponding household-specific shocks in order to generate $\{w_j^{TP}\}'$, and (v) estimate the counterfactual top 1% wealth share.

(i) Estimates of destruction by asset class

The calculations of total wealth destruction by asset class η_{W_a} are documented below. They are partially based on primary sources (for real estate and agricultural assets) and partially based on an in-depth study on the effect of World War II on the German economy by the *Deutsches Institut for Wirtschaftsforschung* from the 1970s (Cornelsen et al., 1974). According to our portfolio estimates for the 1934 wealth distribution, we then divide up

the total amount of destruction between those that paid taxes and those that did not. We make an adjustment for the fact that cities were bombed much more and thus those paying wealth tax were hit disproportionately hard.

(ia) Destruction of real estate

The German statistical office issued a report on the destruction of agricultural and real estate assets in the 1950s in the allied sectors except for Berlin and the Saar protectorate (Statistisches Bundesamt, 1955). These statistics cover all reported damages as of June 21, 1948.[62] The underlying data are based on individual cases, which were filed either by households or the municipal authorities, the latter of which assessed the damage of buildings. The reason that these data were recorded is that updated values were needed for taxation purposes, especially the *Lastenausgleich*. Conveniently, all damages are reported reflecting 1934 tax values such that we can apply the same price adjustment that we employ for our wealth estimates. The reported damages accrue to 7.928 b Marks in tax values or 9.514 b Marks in market values.

Table 41: **Estimate of destruction of real estate through WW II**

Territory	Destruction estimate*	Share of affected real estate held by†	
	1000 Marks (1934 values)	Taxpayers	Non-taxpayers
West Germany	9,513,995	59 %	41 %
Berlin	2,475,746		
Total	11,989,741	7,028,903	4,960,837

Sources: Own calculations (see text). * includes the same upward adjustment as total wealth estimates. † Based on 1934 aggregate wealth and distribution estimate. We incorporate the fact that more valuable real estate is more likely to be located in cities, which are in turn more likely to be bombed (see text).

For Berlin, we rely on estimates from a study by the Deutsches Institut für Wirtschaftsforschung (Cornelsen et al., 1974). The estimate share of destroyed real estate in total real estate is in terms of value of the structures is 40% (Cornelsen et al., 1974, p. 97c). And the share of the value of the structures is $\frac{9.22}{11.62} = 79.35\%$. Applying this to the total value of real estate in Berlin reported by Statistisches Reichsamt (1939c) yields a destruction estimate of 2.063 b Marks in tax values or 2.476 b Marks in market values.[63] Relative to

[62] All damages that had been already repaired between the start of the air raids and the this date are not reported. While this must in turn lead to an underestimation of the war damage, we decide not to adjust for this circumstance. This is insofar justified as most of the damage of the air raids was done towards the end of the war and that it is inconceivable that significant parts had been repaired by private households. Note that if the government offered repair services, it would leave the distribution unchanged.

[63] The source material for the wealth estimates as of 1935 does not allow us to separate the wealth

the wealth total in real estate of about 41.5 b Marks in 1935, our destruction estimate of about 12 b Marks in real estate implies a destruction ratio of about 29 % in real estate for the whole of West Germany. This compares well with the reported destruction quota of 26.5 % reported in Cornelsen et al. (1974, p. 95).[64]

In order to estimate the effect on wealth concentration, we have to allocate the total real estate shock across the distribution and in doing so among those paying taxes and those who do not. In fact, the proportion of real estate held by taxpayers follows directly from our total an distributional estimates (in terms of value) and amounts to about 41 %. However, it is also true that more valuable real estate is located in cities, which in turn makes it more likely to be destroyed. To account for this fact, we assume that it is twice[65] as likely that real estate by wealth tax payers is hit by the air raids than real estate owned by those who do not pay wealth taxes in 1935. To a reasonable approximation, we can transform the known share in real estate held by wealth taxpayers $s_{wealth,taxpayers}$ to the share in destructed real estate by the wealth taxpayers $s_{destruction,taxpayers}$ by the following formula:

$$s_{destruction,taxpayers} = \frac{af \times s_{wealth,taxpayers}}{af \times s_{wealth,taxpayers} + s_{wealth,non-taxpayers}} \tag{41}$$

in which the adjustment factor $af = 2$ reflect the difference in probability of being affected.

(ib) Destruction of agricultural assets

The air raids affected agricultural wealth hardly (see Cornelsen et al., 1974, p. 97a-97c), but we include the damages in our counterfactual for the sake of completeness. As no significant agricultural wealth holdings existed in Berlin, we can rely on the same publication as for real estate on all West German territories except for Berlin (Statistisches Bundesamt, 1955). The damages reported amount to about 198 m Marks in 1935 values or 381 m Marks in market values. We assume that the bombings affected payers of the wealth tax and all other households in the same manner. Unlike for real estate assets - the air raids targeted cities - there is no strong argument to make an adjustment.

(ic) Destruction of business and equity assets

Damages to the industrial capital stock were severe, but not as heavy as for real estate other than business. Cornelsen et al. (1974, p. 94) discuss available estimates which

held in East vs. West Berlin in a sensible manner, which is why we include the whole of Berlin in our counterfactual.

[64] In particular, in 1939 valuation used by Cornelsen et al. : $\frac{15.3(FederalRepublicincludingWestBerlin)+1.22(EastBerlin)}{59.3(FederalRepublicincludingWestBerlin)+3.04(EastBerlin)} \approx 26.5$ %

[65] This assumption is reasonable as the quota of destruction (in terms of value) was 40 % in Berlin, whereas it was 24 % in West Germany, 14 % in the GDR, and 10 % in the lost territories (Cornelsen et al., 1974, p. 97a-97c).

range between 20 % and 23 % and themselves estimate the destruction of company assets to be about 22 % for West Germany.[66] We use this estimate for our counterfactual. To provide a reasonable counterfactual, we first have to estimate the total equity of companies in constant borders. These are actually part of our total wealth estimates, which differentiate "business assets" (full liability) and equity in corporations (either stocks or shares in limited liability companies). For 1934, we arrive at the following historical and constant border estimates, which, when applying the destruction quota of 22 %, lead to the estimates of destruction of business and equity assets in Table 42.

Table 42: **Destruction of business and equity assets through WW II**

Territory	Asset	Value in 1000† Marks (1934 values)	Assumed destruction (%)	Destruction in 1000 Marks (1934 values)
Germany (1934 borders)	Business	14,955,169	22 %	3,290,137
	Equity	24,998,420		5,499,652
	$\sum$	37,315,412		8,789,790
West Germany ⋆	Business	11,340,314	22 %	2,494,869
	Equity	18,077,936		3,977,146
	$\sum$	29,418,250		**6,472,015**

Sources: Own calculations (see text). ⋆ includes East Berlin as it was impossible to separate wealth estimates within Berlin. † includes 10 % upward adjustment for under-reporting.

We know that business assets with personal liability are partially held by tax units not being assessed for the wealth tax. The available statistical material actually allows us to calculate the share of business assets held by those assessed for the wealth tax. It accrues to $\frac{11{,}261{,}297}{14{,}955{,}169} \approx 75\%$.[67] Assuming this ratio for the constant border estimate yields about 1.9b Marks for those being assessed for the wealth tax and 0.6b Marks for those who are not. For equity assets, we assume that all are held by those assessed for the wealth tax. This adds a further ≈ 4b to the destruction estimate for those being assessed for the wealth tax.

(id) Destruction overview

Table 43 presents a summary of the total destruction estimate in constant borders, which we use to shock net wealth and its distribution in 1934. The table also shows the distribution of destruction among non-taxpayers vs. taxpayers. While in real estate, a significant part of the destruction hit those not paying the wealth tax, the burden of destroyed business and corporate capital was almost entirely shouldered by those paying the wealth

[66] This includes stored produce.

[67] See Statistisches Reichsamt (1938b, p. 15).

tax.

Table 43: **Destruction - summary of constant border estimate***

Asset Type	Total value in 1000 Marks (1934 values)	Extent of destruction Marks (1934 values)	of which held by tax units assessed for tax	of which held by tax units not assessed for tax
Real estate	41,538,924	11,989,741	7,028,903	4,960,837
Agricultural assets	39,066,756	381,277	116,671	264,607
Business and capital	29,418,250	6,472,015	5,855,791	616,224

Sources: Own calculations (see text). * includes East Berlin as it was impossible to separate wealth estimates within Berlin.

(ii) Estimate counterfactual net wealth (W')

To generate the counterfactual total net wealth, we simply subtract the destruction recorded in Table 43 from the market value recorded there and then re-calculate the total net wealth.

(iii) Construction of household portfolios

For 1934, the statisticians provide the portfolios within brackets ordered by wealth class (see Section DA 2.5). We impute a household-level dataset following the methodology discussed in Section DA 6.1.

(iv) Implementation of household specific shocks (constructing $\{w_j^{TP}\}'$)

To implement the shock, we first distribute the total amount of destruction for the taxpayer (Table 43) across different wealth brackets. We do so by using the proportions suggested in the tabulations (see Section DA 2.5). Further details on the tabulation can be found in the accompanying spreadsheet *Tabulated_Data_Destruction_1935_1945_micro*.

In a second step, we have to decide how many businesses and urban landlords escaped the destruction altogether. There are no data available that we could base an estimate on. However, note that our wealth tabulation for 1934 captures the top 2.8% of all tax units (Table DA 2.2). Among them are urban landowners who own not a few houses, but hold significant real estate across the city. It is hard to imagine that many of them could escape the destruction altogether. Likewise, large companies were unlikely to escape destruction altogether. We thus generate three scenarios, in which the destruction within real estate and business is divided among (i) 80%, (ii) 90%, and (iii) 100% of the tax units holding that respective asset within a given class. We then simply divide the shock by the affected taxpayers and shock their wealth (and their wealth only) with this average destruction (which is asset and wealth bracket specific).

(v) Estimating the change in the top 1% share

Finally, to estimate the share of the top 1% while implementing a plausible within-class distribution, we re-aggregate our individual level data into a tabulated dataset, add the

information about the new estimated total, and run the *gpinter* algorithm. Comparing this counterfactual share to the one actually observed in 1934 (in post-war borders) yields the net effect of the destruction. The corresponding estimates for its effect on the top 1% share for the different scenarios are: -2.0% (lower bound: 80% of taxpayers absorb shock), -2.2% (90% of taxpayers absorb shock), and -2.4% (upper bound: 100% of taxpayers absorb shock).

DA 6.4.6 Seized domestic assets (dismantling)

After World War II, the allies seized domestic and foreign assets held by German citizen and, more importantly, companies. The domestic asset seizures focused on companies in war-related industries and happened after the war. The basic idea of the counterfactual is to estimate the seizures that were made after the war and apply them to the private capital stock in 1934. Table 44 provides the key information for our counterfactual pertaining the seizures of domestic asset in the territory of the Federal Republic. The following pages discuss the details.

Table 44: **Seized domestic and foreign assets**

Variable	Value	Comment
Reference year	1934	
Reference geography	Federal Republic	
Change of number of tax units	No	

	Magnitude of wealth shock		
Shock to...	% of private wealth	% of national income	
Corporate & business assets	-2%	-3%	

Modelling of shock		
Re-ranking is modelled	Yes	A new ranking is built after the shock
Distribution of shock across distribution known or estimated	Estimated	Household-level pre-shock portfolio data are constructed from tabulated data.

We estimate the effect of the asset seizures in five steps. We (i) provide an estimate of their economic magnitude (ii) estimate counterfactual net wealth (W'), (iii) reconstruct household portfolios, (iv) implement corresponding household-specific shocks in order to generate $\{w_j^{TP}\}'$, and (v) estimate the counterfactual top 1% wealth share.

(i) Estimate of total asset seizures

These seizures were well-documented in prices of 1938 in the so-called "Reparationskartei"—a centralised system for registering the seized assets. As part of the study on war damages, the DIW collected the available information and discussed the quality of the data (Cornelsen et al., 1974).[68] The contemporary authorities documented the individual cases in an

[68]Similar data were collected for the seizure of foreign assets. However, we do not consider these of

index/punch card system, cleanly separating government-owned, individual or personal-liability firms', and corporate assets (Cornelsen et al., 1974, p. 111). This card system was also the basis for compensation claims that German personal-liability firms and individuals affected by the seizure of foreign and domestic assets could make towards the German government. The respective law was passed at the end of the 1960s.[69] Even though the final law did not extend to limited liability and stock market firms, the work by Cornelsen et al. (1974) contains estimates for them as such estimates were used for the preparation of the law (Bundestag Drucksache V/2432).

Table 45: **Seized domestic and foreign assets - total amount in 1934 prices**

Scenario		Amount of seized in...		Equivalent amount	Δ top-1
		1000 RMs (1938)	in % of asset class (1938)	in 1000s RM (1934)	share
Upper bound	Personal-liability firms	868,533	3.4%	381,727	-1.0
	Corporations	2,754,734	11.4%	2,258,859	
Mid point	Personal-liability firms	868,533	3.4%	381,727	-0.8
	Corporations		7.9%	1,566,916	
Lower bound	Personal-liability firms	868,533	3.4%	381,727	-0.4
	Corporations		4.4%	874,972	

Notes: Own calculations. See text and accompanying excel sheets. Percentages do not necessarily sum to 100% because of rounding.

The third column of Table 45 reports the seized assets in 1938 for corporates and personal liability firms.[70] Column 4 relates these to the total assets in the respective asset classes in 1938, which we have to approximate.[71] This provides us with an estimate of how large these asset seizures were that is transferable to another base year—precisely because the seized assets and the stock are valued at the same point of time. To arrive at an estimate in Reichsmark of 1934, we multiply these percentages with the respective totals of the business and corporate wealth in 1934. The estimate from Cornelsen et al. (1974) appears high to us, which is why we further assess the sensitivity. In particular, we run two additional simulations. As a lower bound, we take an estimate that relates the seizures and dismantling to the capital stock (Abelshauser, 1975) and set it to 4.4 %.

any use as the reported numbers are very unrealistic, presumably because a) liabilities were not properly accounted for or b) there was a problem in reporting them in the "correct prices" of 1938.

[69] "Gesetz zur Abgeltung von Reparations-, Restitutions-, Zerstörungs- und Rückerstattungsschäden (RepG) vom 12. 2. 1969"' (BGBl I 105). See in particular, Bundestag Drucksache V/2432 for material relating to this law, including estimates of the cost.

[70] We follow Cornelsen et al. (1974) in excluding vessels.

[71] In particular, we calculate the capitalisation of stock market, of unlisted joint stock companies, GmbHs, and personal liability companies. The latter we extrapolate from 1934 using tax data. Calculations are available upon request.

It is important to point out that net private wealth and the capital stock in industry are very different concepts. We consider the 4.4% not as a particularly realistic lower bound. As a compromise estimate, we take the average between these and the 11.36% implied by Cornelsen et al. (1974).

(ii) Estimate of counterfactual net wealth (W′):

Having constructed the relative reduction in business and corporate wealth, we create counterfactual values for net wealth W' for the three scenarios by deducting them from the wealth total W.

(iii) Constructing portfolios at the top of the distribution

For 1934, the statisticians provide the portfolios within brackets ordered by wealth class (see Section DA 2.5). We impute a household-level dataset following the methodology discussed in Section DA 6.1.

(iv) Implementing household-specific shocks in order to generate $\{w_j^{TP}\}'$

With the imputed micro data at hand, we shock the household portfolios. Only business owners and owners of financial equity experience a shock with the respective values of wealth taxation in the three scenarios. For owners of business assets, there is little ambiguity and all of them loose 3.4% of their assets. Corporations lose 4.8%, 7.9%, or 11.4% depending on the scenario (see Table 50).

(v) Estimating the change in the top 1% share

Finally, to estimate the share of the top 1% while implementing a plausible within-class distribution, we re-aggregate our individual level data into a tabulated dataset, add the information about the new estimated total, and run the *gpinter* algorithm. Comparing this counterfactual share to the one actually observed in 1934 (in post-war borders) yields the net effect of the asset seizures. We settle with the compromise estimate, implying a change in the share held by the top-1% of 0.8.

DA 6.4.7 Asset price changes & currency reform

Between 1934 and 1952, the value of assets changed substantially, partly because of the currency reform and partly because of other effects of the war. Table 46 reports our preferred estimates of these price changes. While agricultural prices more than tripled and real estate prices more than doubled, business assets fell around 20% in this time period. Because of the currency reform, the value of debts, savings and other non-equity assets fell by around 90%. Our price indices incorporate the effects of the currency reform. This is particularly true for the market valuation of business and equity assets, which should reflect the reduced debt. We thus do not consider it plausible to separate the asset price effects and the effects of the currency reform. It is clear that the latter must have increased the top 1% share as wealth tax payers owned disproportionately few savings in the economy.

Table 46: **Currency reform & asset price counterfactual - summary**

Variable	Value	Comment
Reference year	1934	
Reference geography	Federal Republic	
Change of number of tax units	No	
Price shocks		
Shock to price of...	$\Delta P_{1934-1952}$	
...real estate	129%	We do not express these in terms of wealth or income, because of the currency reform.
...agricultural assets	223%	
...business & equity	-20%	
...saving & non-equity capital assets	-90%	
...debt	-90%	
Modelling of shock		
Re-ranking is modelled	Yes	
Distribution of shock across distribution known or estimated	Estimated	

Analogously to our hyperinflation counterfactual, we proceed in five steps: we (i) calculate price changes between 1934 and 1952, (ii) estimate the counterfactual net wealth (W'), (iii) reconstruct household portfolios, (iv) implement corresponding household-specific shock in order to generate $\{w_j^{TP}\}'$, and (v) estimate the counterfactual top 1% wealth share.

(i) Price changes 1934-1952

Table 47 provides an overview about the price changes that we employ for estimating the counterfactual. Our main specification will rely on market prices. As a robustness check, we employ a composite price index from rent/yield indices for agricultural and real estate assets respectively.

It is relatively straightforward to estimate the change in market prices between 1934 and 1952. For real estate, we have created indices that uprate the values for the tax assessment (*Einheitswerte*) to market values. Because of the war, the authorities relied still on the 1934 bases in 1952. Accordingly, we can calculate the change in market prices simply by calculating the change in the "uprating" indices. For agricultural assets, we calculate the value per hectare dividing net wealth in agriculture by the total area in hectares in the respective years. We then calculate the nominal price change. Spreadsheet *Tabulated_Data_CurencyReform_Prices* provides the calculations.

Table 47: **Changes in asset and debt valuation due to hyperinflation and war**

Asset type	Price change 1934-1952 by index type				Sources
	(1) market	(2) rent/ yield-based	(3) other	(4) composite	
Agricultural assets	219%	83%		153%	(1) own estimate (2) Krelle et al. (1968, p. 394) (4) own estimate (equal weights)
Real estate	129%	10%	125%†	88%	(1) own estimate (2) Statistisches Bundesamt (1952, p. 451) (3) Krelle et al. (1968, p. 405) (4) own estimate (equal weights)
Business & equity	-20%				(1) Gielen (2013)
Savings & non-equities			-90%⋆		(3) see text
Debt			-90%⋆		Wiegand (1992, p. 27)

Notes: † construction cost index; ⋆ changes due to currency reform of 1948

For the market valuation of equity and business assets, we rely on the end-of-year values of the widely-used index by Gielen (2013). This index only tracks surviving stock market companies. While surviving bias is usually a problem, it is perfectly suitable for our purpose. We want to analyse price effects in this counterfactual, not quantity effects. For savings and non-equities, we assume a conversion rate of 10:1. This was the initial conversion rate for these types of assets.[72] It is hard to estimate the loss in other non-

[72]Parts of the savings were blocked and later erased such there was an effective conversion rate of

equity capital assets. However, most of these —especially the then-worthless debt by the German government—was held by banks. We thus simply apply the same rate as for savings. Debts were converted according to the ratio 10:1.

In addition to the changes in the market values, we gather alternative price indices to investigate the sensitivity of our results. In particular, we gather rent/yield based indices for agricultural and real estate assets as well as a construction cost index (Table 47). Rents were heavily regulated such that their economic meaning is not clear. This can also be seen in the difference between the rent index and construction cost index (column 3). Agricultural yields fluctuated heavily and they are unlikely to reflect the value storage function that land must have had in the immediate post-war period. Rather than using yields directly, we will use them as part of a composite index to provide an alternative scenario for our counterfactual. For this, we simply arithmetically weigh the available indices.

(ii) Estimate of counterfactual net wealth (W'):

How would these price changes affect the net private wealth? The total effect can be modelled relatively easily by applying the price changes in Table 47 to the value of the respective asset categories and debt in 1934 (see Appendix DA 2.3). We then calculate the counterfactual net wealth W'.

(iii) Constructing portfolios at the top of the distribution

For 1934, the statisticians provide the portfolios within brackets ordered by wealth class (see Section DA 2.5). We impute a household-level dataset following the methodology discussed in Section DA 6.1.

(iv) Implementing household-specific shocks in order to generate $\{w_j^{TP}\}'$

With the imputed micro data at hand, we shock the household portfolios with the respective price changes displayed in Table 47. Note that each household holds at least two assets: the main asset according to its type and savings. Urban and rural landholders also hold debt, which further affects their exposure to the price changes and currency reform.

(v) Estimating the change in the top 1% share

Finally, to estimate the share of the top 1% while implementing plausible within-class distribution, we re-aggregate our individual level data into a tabulated dataset, add the information about the new estimated total, and run the *gpinter* algorithm.

As discussed above, we create two scenarios. In both, we use the same price changes for business and equity, savings and non-equity capital assets, and debt. However, we use

100:6.5 (Wiegand, 1992, p. 27). As early as 1953, however, there was already a "compensation law" passed for those who lost their savings (Hauser, 2011, p. 111). Moreover, the 6.5% only applied once a certain per capita amount was surpassed and did not apply to insurances and housing saving contracts.

different sets of price indices for agricultural and real estate:

- Scenario 1 (preferred): We employ the change in market prices for agricultural and real estate assets (Table 47)
  → predicted Δ top 1% share: **0.2**
- Scenario 2: We employ the change in the composite index for agricultural and real estate assets (Table 47)
  → predicted Δ top 1% share: 0.4

DA 6.4.8 Extractive taxation

Measuring the magnitude and redistributive effects of taxation during the Nazi regime touches upon one of the most important debates in German historiography of the last few decades. In 2005, Aly (2005) published his book on the Nazi economic system. The core of his argument is that the regime orchestrated a "comfortable dictatorship (*Wohlfühldiktatur*)" and thus increased the acceptance of the regime. As a subset of this hypothesis, Aly (2005) argued that the regime instituted high taxation on the "bourgeoisie" and expropriated the German jewry, while helping the "little man".

The historical profession, Tooze (2005) and Spoerer (2005) in particular, has largely refuted his arguments. The responses to Aly's hypothesis often discuss his technical mistakes, his lack of engagement with the existing literature, and his sensationalist writing. Many points against Aly's broader argument are compelling.[73] At the time of the Aly-Tooze debate, however, an exhaustive study on taxation in the NS period was still missing. Arguments and counter-arguments were made on a thin empirical basis. This changed with the work by Banken (2018), who provides a detailed treatment of Nazi taxation and financing practices.

Table 48: **Confiscatory taxation - summary**

Variable	Value		Comment
Reference year	1934		
Reference geography	Borders of Federal Republic		
Change of number of tax units	-		
Magnitude of wealth shock			
Shock to...	% of private wealth	% of national income	
...business and corporate wealth	-0.6	1.6%	
...real estate wealth (*Hauszinssteuer*)	-1.9%	5.3%	
Modelling of shock			
Re-ranking is modelled	No		A new ranking is built after the shock
Distribution of shock across distribution (including $\eta_{w_{top1}}$) known or estimated	Estimated		Household-level pre-shock portfolio data are constructed from tabulated data and respective taxation shocks are implemented .

Notes: Own calculations. See text and spreadsheet *Tabulated_Data_ConfiscatoryTaxation*.

[73] Living standards actually declined during the Nazi years (Baten and Wagner, 2003) and industry seemed to have made large profits until 1941 (Spoerer, 1996). Moreover, Aly's critics rightfully point out that Aly miscalculated the domestic vs. foreign contribution to war finance (Tooze, 2005).

From our reading of Banken's work and other recent historical literature, we identify two pillars of extractive wealth taxation (in addition to the dispossession and murder of the German Jews). First, the Nazis extracted significant revenue from non-agricultural businesses through excessive increases in income taxation for personal-liability companies and corporations (Banken, 2018, p. 611). Second, the so-called *Hauszinssteuer*, more specifically the conversion of this tax into a one time levy through the Nazi regime (Führer, 1995), was a significant burden for real estate owners. Table 48 summarises the key aspects of these two additional pillars of confiscatory taxation and the respective counterfactuals. The following pages provide the details and alternative scenarios to those presented in the main paper.

DA 6.4.8.1 Extractive business taxation

According to Banken (2018, p. 455), the Nazi's taxation regime for companies can be divided into three phases. In the first phase from 1933-1934, the Nazis actually decreased taxes to foster employment. From 1934 until the outbreak of the war, the regime increased the taxation of companies through various means (higher tax rates, but also tighter control of the submitted tax declarations). During the war, the Nazis did not only tax profits up to 80%, but also changed rules for the deductibility of past investments. This is also reflected in the change of tax revenue. Table 49 expresses them as a percentage of national income.

Table 49: **Tax revenue in terms of national income**

Year	Income taxes	Corporate tax	Wealth tax
1929	4%	0.7%	0.7%
1933	3%	0.4%	0.6%
1938	6%	2.7%	0.4%
1943	8%	4.0%	0.4%

Notes: Own calculations. Tax data are from Banken (2018, p. 39), and national income from Piketty and Zucman (2014).

The increases in corporate taxes is mirrored in the decline of the number of corporations (i.e., non-personal liability firms) under the Nazis. The regime viewed "anonymous capital" as a problem and incentivised the conversion of stock market companies and limited liability companies into personal liability companies through changes in the corporate taxation and a law passed in 1934 (Banken, 2018, p. 406). Between 1933 and 1939, the number of stock market and limited liability firms fell by 68% and 61% respectively (data are from Reckendrees, 2015). It is also worth noting that income from these types of firms was taxed twice at high rates that were subject to additional war taxes: the "Kriegszuschlag" on the corporate tax on profits and then "Kriegszuschlag" on the distributed profits through the income tax. This "double taxation" was also in

place for the wealth tax, where first the corporations were taxed as a company and then the shareholders. The rate for the wealth tax was .5%[74] such that through changing the legal form taxation could be reduced substantially from close to 1% to .5%.

To gauge the significance of the extractive business taxation for wealth, we proceed in five steps: (i) provide an estimate of extractive business & corporate taxation, (ii) estimate counterfactual net wealth (W'), (iii) reconstruct household portfolios, (iv) implement corresponding household-specific shocks in order to generate $\{w_j^{TP}\}'$, and (v) estimate the counterfactual top 1% wealth share.

(i) Estimate of extractive business & corporate taxation

It is hard to account for the exact amount of this excessive taxation. As households and firms had to continue to pay the wealth taxes despite the heavy taxation of profits, the wealth tax itself provides a plausible yardstick. Let us assume that the firms had to pay half of the wealth tax from the substance and that the effective wealth tax ranged between 0.5% and 1%. Given six years of World War II, we can formulate three scenarios for the reduction of business and corporate wealth[75] through extractive taxation: (i) a lower bound scenario ($.5 \times .5\% \times 6 = 1.5\%$), (ii) the baseline scenario ($.5 \times .75\% \times 6 = 2.25\%$), and (iii) an upper bound scenario ($.5 \times 1\% \times 6 = 3\%$).

(ii) Estimate of counterfactual net wealth (W'):

Having constructed the relative reduction in business and corporate wealth between 1.5% and 3%, we now estimate the counterfactual total. As a first step, we estimate the amount affected by the extractive taxation. Wealth tax payers on the territory of the later Federal Republic held around 28b in corporate and business wealth in 1934 as column 1 in Table 50 shows. As a second step, we multiply this value with the respective estimates in the reduction of business and corporate wealth. In the third step, we deduct counterfactual total as the difference between the actual wealth total in 1934 and the respective values in column 4 of the Table 50.

(iii) Constructing portfolios at the top of the distribution

For 1934, the statisticians provide the portfolios within brackets ordered by wealth class (see Section DA 2.5). We impute a household-level dataset following the methodology discussed in Section DA 6.1.

(iv) Implementing household-specific shocks in order to generate $\{w_j^{TP}\}'$

With the imputed micro data at hand, we shock the household portfolios. Only business owners and owners of financial equity experience a shock with the respective values of

[74] This rate was applied to all those having to pay the tax from 1934 onwards. See §8, Vermögenssteuergesetz.

[75] Agriculture was spared from heavy taxation (Banken, 2018, p. 427) and we discuss the excessive taxation of real estate through the levy on the *Hauszinssteuer* below.

Table 50: **Magnitude and effect of excessive business/corporate taxation**

Wealth in business and equity (households with > 20k RM)		Scenario		Δ Top 1
		Tax rate	total amount	
b RMs	% of 1934 NI (1934 FRG borders)	%	1000s RM (1934)	
		1.5%	418,024	-0.4
27.8	63%	2.25%	627,036	**-0.6**
		3%	836,048	-0.8

Notes: Own calculations. See text and spreadsheet *Tabulated_Data_ConfiscatoryTaxation*.

wealth taxation in the three scenarios of losing 1.5%, 2.25% and 3% of their wealth in the respective assets (see Table 50).

(v) Estimating the change in the top 1% share

Finally, to estimate the share of the top 1% while implementing a plausible within-class distribution, we re-aggregate our individual level data into a tabulated dataset, add the information about the new estimated total, and run the *gpinter* algorithm. Comparing this counterfactual share to the one actually observed in 1934 (in post-war borders) yields the net effect of the extractive taxation. The corresponding estimates for the change in the top 1% share for the different scenarios are: -0.4 (lower bound), -0.6 (baseline/compromise), and -0.8 (upper bound).

DA 6.4.8.2 Extractive real estate taxation The tax on the "rents earned on houses" (*Hauszinssteuer*) had been around from the early Weimar years onwards and generated significant income for the states (Führer, 1995; Banken, 2018). The Nazi regime forced owners of real estate to pay a one-time levy equivalent to 10 times the annual payment of the tax on January 1, 1943 to improve war finances. According to archival material, the explicit goal of this one time levy was to mobilise enough cash for war expenses (Führer, 1995, p. 50).

Analogously to the previous section, we estimate the effect of the *Hauszinssteuer* in five steps: (i) provide an estimate of extractive business & corporate taxation, (ii) estimate counterfactual net wealth (W'), (iii) reconstruct household portfolios, (iv) implement corresponding household-specific shocks in order to generate $\{w_j^{TP}\}'$, and (v) estimate the counterfactual top 1% wealth share.

(i) Estimate of total real estate taxation

The *Hauszinssteuer* generated about 8.3b Reichsmark or 5.3% of the national income in 1942. Given the very low home ownership rate of about 23% in 1927 (Kohl, 2017)

and the fact that there were exemptions for owner-occupiers (Führer, 1995, p. 35), it is clear that this taxation must have hit the upper classes disproportionately hard.[76] It is not straightforward to convert the value of the tax to make it compatible with 1934. In 1942, price and rent controls make it hard to determine a market value of the real estate stock.[77] As an alternative, we express the amount of the tax in terms of national income in 1942 (Table 51) and then convert it into a 1934 Reichsmark value by applying the 1934 income.[78] The resulting total for the *Hauszinssteuer* is 2.16b RM (column 4).

Table 51: **Magnitude and effect of Hauszins tax**

Amount in...				Scenario	
b RMs (1942)	% of 1942 NI	NI (1934 FRG borders)	b RM (1934)	wealth tax payers pay..	Δ Top 1
				75%	-0.3
8.23	5.3%	40.36	2.16	87.5%	**-0.4**
				100%	-0.6

Notes: Own calculations. See text and accompanying excel sheets. Percentages do not necessarily sum to 100% because of rounding.

(ii) Estimate of counterfactual net wealth (W′):

The counterfactual net wealth is simply estimated by reducing the 1934 total net wealth by 2.16b RM.

(iii) Constructing portfolios at the top of the distribution

For 1934, the statisticians provide the portfolios within brackets ordered by wealth class (see Section DA 2.5). We impute a household-level dataset following the methodology discussed in Section DA 6.1.

(iv) Implementing household-specific shocks in order to generate $\{w_j^{TP}\}'$

With the imputed micro data at hand, we shock the household portfolios of those who owned real estate. We generate three scenarios on who is shouldering the total amount of the *Hauszinssteuer* among those paying taxes and those who do not pay taxes. Those paying wealth tax with a net worth larger than 20,000 RM[79] owned about 16.3 b RM in real estate assets in 1934. Our three scenarios assume that they paid between 75% and 100% of the total burden of the *Hauszinssteuer*. Therefore, in the lower bound scenario,

[76] Based on very indirect evidence, Banken (2018, p. 371) suggests otherwise but appears to be unaware of the low home ownership rates suggested by Kohl's data.

[77] In pricipal, this could be estimated based on our stock estimates and investment data.

[78] We do not include the 1933 voluntary "Ablösung" here. It was quantitatively unimportant amounting to not even 100m Reichsmark (Führer, 1995) and does not classify as extractive.

[79] We take this as a cutoff to exclude households that may or may not be exempted.

they lose 9.94% of these assets ($\frac{2.16}{16.3} \times .75$), in the second scenario 11.6%, and if they were to pay all of the levy 13.6% of their real estate assets.

(v) Estimating the change in the top 1% share

Finally, to estimate the share of the top 1% while implementing a plausible within-class distribution, we re-aggregate our individual level data into a tabulated dataset, add the information about the new estimated total, and run the *gpinter* algorithm. Comparing this counterfactual share to the one actually observed in 1934 (in post-war borders) yields the net effect of the extractive real estate taxation. The corresponding estimates for the change in the top 1% share for the different scenarios are: -0.3 (lower bound), -0.4 (baseline/compromise), and -0.6 (upper bound). While the total volume of real estate taxation was about three times larger than that of business taxation (Table 48), it had a less compressing effect on the top 1% share. The underlying reason is that business and corporate assets are heavily concentrated at the very top, whereas real estate assets are held by wider parts of the distribution.

DA 6.4.9 Capital levies in the aftermath of World War II

After World War II, Germany introduced a number of capital levies on wealthy individuals to redistribute wealth either directly through transfers or through social housing. The most prominent of these levies is the so-called *Lastenausgleich* in 1952. However, there were a significant number of wealth levies before this law. Wiegand (1992, p. chapter 5 & 6) provides the following overview over the measures:

1. *Pre-Lastenausgleich 1949-1952*

   - Taxation of gains from the currency reform relating to eradication of large parts of the debt (*Abgabe nach Hypothekensicherungsgestz/ Umstellungsgrundschulden*)

     This was a capital levy on house owners having mortgages. The currency reform had changed their nominal values of debt with the ratio of 10:1 and thus they had gained substantially through a reduction of their liabilities. At the same time, their assets were physical values and thus unaffected unless they were destroyed by the war. Based on justice consideration, the government levy aimed to reduce the 90% "gain" that indebted households had gained through the currency reform.

   - Emergency aid levy (*Soforthilfeabgabe*)
     - General emergency levy (*Allgemeine Soforthilfeabgabe*)
     - Special emergency levy (*Soforthilfesonderabgabe*)
       This was a levy on inventories of companies. It explicitly aimed at companies which hoarded their produce in the turmoil of the immediate post-war years.

2. *Lastenausgleich: 1952-1985*

   - Wealth levies to alleviate some injustice of the currency reform (*Hypothekengewinnabgabe/Kreditgewinnabgabe*)
   - The general wealth levy (*Lastenausgleich*)

     The *Lastenausgleich* was the main capital levy introduced in 1952. It was levied on both, companies and individuals. Beyond some allowances, it levied 50% on the wealth of the wealth owners. This debt was payable in quarterly instalments between 1952 and 1979. The debt (including the future payments) was deductible from the wealth tax in 1953. This allows us to exactly match the wealth levy placed on those holding wealth taxes.

Table 52 summarises the magnitude of the *Lastenausgleich* and the key parameters that we use for our counterfactual. Detailed calculations can be found on the following pages.

Table 52: **Wealth levies after World War II - summary**

Variable	Value		Comment
Reference year	1952		
Reference geography	Federal Republic		
Change of number of tax units	No		
Magnitude of wealth shock			
Shock to...	% of private wealth	% of national income	
...net wealth	-10%	-21%	For the disaggregation, see text
Modelling of shock			
Re-Ranking is modelled	No		Ranking does not change among the rich
Distribution of shock across distribution known or estimated	Mostly known, partly estimated		

We proceed as follows. We (i) estimate the total value of the pre-Lastenausgleich levies, (ii) calculate the total Lastenausgleich levies, (iii) discuss how we distribute the levied sums across the distribution, (iv) estimate counterfactual net private wealth W', (v) estimate the counterfactual top-1% share had the capital taxation after World War II not occurred. Spreadsheet *Tabulated_Data_Lastenausgleich_1953* provides all calculations and additional details.

(i) Value of pre-Lastenausgleich levies

Table 53 presents the overview of the revenue from the pre-*Lastenausgleich* levies, totalling about 6.4 b Marks. Being about 5% of national income (as averaged 1950-1952 from Piketty and Zucman (2014)), this is far from an insignificant amount.

Unfortunately, no statistical material appears to exist on how much of this total amount was payed by those assessed for the wealth tax in 1953. However, the material is sufficient to make realistic conjectures. The most important levy, the *Allgemeine*

Table 53: **Pre-Lastenausgleich wealth levies (in 1000s of Marks)**

Type of wealth levy	Umstellungs-grundschulden	Allgemeine Soforthilfeabgabe			Soforthilfe-Sonderabgabe
Comments		paid by 1952	to be paid		
			Households	Companies	
	1,172,700	4,692,400	27,481	76,555	408,200
Total	6,377,336				
Share of those assessed for wealth tax in 1000 Marks (assuming 86.5%)	5,517,202				

Sources: Wiegand (1992, p. 78) for all those that had been paid by 1952. The income from the *Allgemeine Soforthilfeabgabe* after 1952 is taken from the wealth tax statistics (Statistisches Bundesamt, 1960, p. 29 & 40) West Berlin and Saarland are excluded from these calculations. Spreadsheet *Tabulated_Data_Lastenausgleich_1953* provides the calculations and additional documentation.

Soforthilfeabgabe, levied 3% on business, agricultural and real estate assets. Its taxation threshold was at 3,000 Marks and included degressive allowances until 10,000 Marks (Wiegand, 1992, p. 69f). The value was assessed on the basis of the 1934 Reichsmark values and adjustments of that valuation could be asked for to account for war destruction (Wiegand, 1992, p. 68). At the same time the threshold for wealth taxation in 1953 was a mere 10,000 Marks.

To arrive at a reasonable value, we can estimate a lower and upper bound of the share of the tax paid by those assessed for the wealth tax in 1952. For the upper bound, we compare the total taxes paid between the lowest tax brackets of 1934 with that of the rest. In 1934, those with fortunes below 30,000 marks shouldered only about 2.5% of the total taxation burden even though they constituted 36% of all households assessed for the wealth tax (Statistisches Reichsamt, 1938a, p. 14 & 57). The corresponding 97.5% share for the taxpayers would certainly constitute an upper bound. A reasonable lower bound can be identified based on the share of the main *Lastenausgleich* levy for households, the *Vermögensabgabe*, in the total value of this levy. We estimate this to be 76% (see Table 55 below). As a compromise estimate, we simply take the mean of the lower (76%) and upper bound (97.5%). We employ the resulting 86.5% to split the total amount between those assessed for the wealth tax and those who were not.

(ii) Value of Lastenausgleich levies

The *Lastenausgleich* proper became law in August 1952. To finance the expenditures, the

German government instituted two smaller levies on gains associated with the currency reform (*Hypothekengewinnabgabe*, *Kreditgewinnabgabe*) and one main levy (*Vermögensabgabe*). The levies were payable in instalments over a time horizon of 30 years (Wiegand, 1992, p. 150). Unfortunately, except for companies and those households paying taxes, statistics on the net present value in 1952 could not be located. However, it is reasonably easy to approximate it by calculating the net present value of all future income flows in 1952. This is possible because Wiegand (1992, p. 168) provides all income by levy by year ($I_{L,t}$). Moreover, reasonable simplifications about the relevant interest rates r_L can be made based on his description of the levies: $r_{Vermoegensabgabe} = 5$, $r_{Hypothekengewinnabgabe} = 6$, $r_{Kreditgewinnabgabe} = 4$ (Wiegand, 1992, Chapter 6.2.1).[80]

$$NPV_L = \sum_{t}^{T} \frac{I_{L,t}}{(1+r_L)^t} \tag{42}$$

It is important to note that, while the levy was only enacted in 1952, interest on the value started to be accrued from April 1949, such that the (first) payments at the end of 1952 must be discounted with $(1+r_L)^4$. The corresponding results can be found in Table 54 below. The net present values correspond to the initial payments required as of 1952.

Table 54: **Net present value of Lastenausgleich levies (in millions of Marks)**

Year	Vermögensabgabe		Hypothekengewinnabgabe		Kreditgewinnabgabe		Period
	Income	NPV $r=5$	Income	NPV $r=6$	Income	NPV $r=4$	
1952	749	616	416	330	30	26	4
1953	1513	1185	482	360	46	38	5
1954	1605	1198	583	411	67	53	6
1955	1856	1319	799	531	99	75	7
1956	1645	1113	426	267	108	79	8
1957	1587	1023	344	204	109	77	9
1958	1654	1015	362	202	199	134	10
1959	1704	996	412	217	119	77	11
1960	1162	647	249	124	74	46	12
1961	1612	855	322	151	91	55	13

Table continues on the next page

[80]For each of the asset classes *Vermoegensabgabe*, there were specific rates: 6, 5, 4 for business and financial assets, real estate, and agricultural assets respectively (Wiegand, 1992, 149). For the *Hypothekengewinnabgabe*, the interest and amortisation payments depended on the initial conditions of the mortgage contract.

Table 54: **Net present value of Lastenausgleich levies (in millions of Marks) - continued**

Year	Vermögensabgabe		Hypothekengewinnabgabe		Kreditgewinnabgabe		Period
	Income	NPV $r = 5$	Income	NPV $r = 6$	Income	NPV $r = 4$	
1962	1652	834	354	157	87	50	14
1963	1467	706	280	117	78	43	15
1964	1560	715	318	125	78	42	16
1965	1325	578	255	95	79	41	17
1966	1266	526	191	67	74	37	18
1967	1300	514	193	64	72	34	19
1968	1278	482	202	63	99	45	20
1969	1241	445	187	55	65	29	21
1970	1347	460	174	48	60	25	22
1971	1215	396	170	45	54	22	23
1972	1175	364	149	37	55	21	24
1973	1103	326	139	32	55	21	25
1974	1167	328	126	28	6	2	26
1975	1128	302	112	23	1	0	27
1976	1222	312	95	19	3	1	28
1977	1255	305	88	16	0	0	29
1978	818	189	70	12	0	0	30
1979	212	47	52	9	0	0	31
1980	71	15	4	1	0	0	32
$\sum$		17,813		3,808		1,073	

Sources: See text, annual income series from Wiegand (1992, p. 168).

According to our estimates (Table 55), the levies of 1952 totalled approximately 17.8b Marks or 16% of national income in 1952 from Piketty and Zucman (2014).

Not all of these were shouldered by those paying the wealth tax, but significant amounts were. Of the *Hypothekengewinnabgabe*, the successor of the *Umstellungsgrundschulden*, we know that at least 25% were paid by individuals subjected to the wealth tax. This is certain, because the levy was deductible from the wealth tax payments. This also holds true for the "household" part for the *Vermögensabgabe*. Given that the allowance for the *Vermögensabgabe* was 5,000 Marks and a wealth tax declaration had to be submitted for wealth (following the fiscal wealth definitions) of as little as 10,000 Marks, it is not surprising that our calculated net present value of the total and those covered in the tax statistics match closely. This is all the more true, because the company part of this levy is well documented in the tax statistics as most limited liability companies, if not all, had to file wealth tax declarations. In a sense, this led to a form of double-taxation of

Table 55: **Lastenausgleich wealth levies (in 1000s of Marks)**

Type of wealth levy	Hypotheken-gewinnabgabe	Kreditgewinn-abgabe	Vermögensabgabe	
			Households‡	Companies
Estimated total amount	3,807,896	1,072,730	17,812,727	
Amount recorded in the wealth tax statistics 1953	728,652	†	6,917,216	8,075,118
Amount recorded in the wealth tax statistics 1953 for Berlin	219,964	†	207,956	370,843
Share documented in the tax statistics	≈ 25%	0%	≈ 87%	
Share paid by those assessed for the wealth tax in 1953 (in%)	≈ 25%	≈ 37%⊗	≈ 76%	≈ 37%⊗
Share paid by those assessed for the wealth tax in 1953 (in 1000 Marks) *(excluding Saarland and West Berlin)*	728,652	379,657	6,917,216	2,995,483

Sources: Estimated total amount: net present value of all payments (see Table 54); Amount recorded in the tax statistics and in Berlin: Statistisches Bundesamt (1960, p. 29 & 40); Share paid by those being assessed for wealth tax: see text, in particular for those marked with ⊗. †: not deductible and thus not in the wealth tax statistics.‡: includes business assets in personal liability companies.

shares in limited liability companies that would affect high-net worth households as first the company itself and then the personal assets in form shares in these companies were taxed. Because these levies on companies reduced the value of the shares in them held by the top-2%, they have to be considered when assessing the effects of the *Lastenausgleich* on the personal wealth distribution. Naturally, the top-2% in 1953 did not hold all the shares. Not least, this is true because some rather large German companies such as Volkswagen were, while they had the legal form of a *GmbH* (limited liability company), owned by the German government (Mockenhaupt, 2012, p. 39).

If so, what is a plausible lower bound of the share of the total German company shares held by the top 2% of the tax units? A reasonable estimate could be made if the total capital assets, which - for this wealth class - should be mainly shares in companies, are contrasted with the total fiscal tax value of companies. Both can be found in the wealth tax statistics for 1953 (Statistisches Bundesamt, 1960). The share, we estimate from these data are 37%, which we suspect to be at the lower end. The reason is that we take the

total of all companies and thus include certain companies such as building societies, for which exceptions existed in the law regarding the *Lastenausgleich*. Note that the fact that the real value was likely larger than our lower bound estimate will lead to *understating* the impact of the *Lastenausgleich* on the top-1% share.

Finally, the *Kreditgewinnabgabe* was levied on companies only, but it was not deductible from the wealth tax. We thus assume the same share held by the top 2% as for the *Vermögensabgabe*.

(iii) Distributing the levied sums across taxpayers

So far we have differentiated the part of the wealth levies that are paid by those assessed for the wealth tax versus those who are not assessed for the wealth tax. A remaining challenge is to distribute the payments made among those assessed for the wealth levy, i.e., counterfactual wealth among taxpayers $\{w_j^{TP}\}'$.

Conveniently, this is reasonably straightforward given the source material of the wealth tax (Statistisches Bundesamt, 1960), which lists the deductible wealth levies by wealth class for the *Lastenausgleich* levy. This allows us to locate the exact amounts payed by each class in the tabulated wealth tax data of 1953 (Statistisches Bundesamt, 1960) for the household part of the *Vermögensabgabe* and the *Hypothekengewinnabgabe*. Furthermore, as we know the distribution of capital assets among the tabulated wealth tax classes, it is straightforward to map the effects of the wealth levy on companies into the personal wealth distributions. We can simply redistribute the total according to the shares in capital assets by classes. We assume that the *Kreditgewinnabgabe* follows this distribution as it was payable by enterprises.

For the pre-*Lastenausgleich Soforthilfe* no tabulated data is available. Yet, we can make reasonable assumptions about how the amounts of this levy are distributed among those assessed for the wealth tax based on their portfolios. First, we distribute the *Umstellungsgrundschulden* according to the distribution of real estate assets. Secondly, we distribute the *Allgemeine Soforthilfe* payments according to the shares in total wealth. Finally, we distribute the quantitatively relatively insignificant *Soforthilfe-Sonderabgabe* according to the shares in the business wealth among those assessed for the wealth tax.

(iv) Calculating the counterfactual net private wealth

Finally, one might want to adjust the totals for the counterfactual that no wealth levies in the aftermath of World War II had taken place. Such adjustment may be necessary for three reasons. First, one might be worried that not all receipts were not re-distributed in the narrow sense of the word. Secondly, some of the wealth levies affected those not being assessed for the wealth tax. Third, the temporal structure of the payouts may require an adjustment of the wealth total.

Let us start by considering the redistributional aspect. If all wealth was re-distributed

to private households (and none of it nationalised), no adjustment would be necessary. All payments would be converted into personal wealth, just having changed the owner. Wiegand (1992, Chapter 5 & 6) discusses the expenditure side of the *Lastenausgleich* and its predecessors. The redistribution took various forms such as emergency aid, pensions, special loans for housing etc. While there were many different ways in which redistribution took place, all these measures effectively transferred wealth from the income side of the fund to individuals. We thus do not consider the redistributional aspect as a reason to adjust the total and this holds irrespectively of whether individuals are assessed for the wealth tax or not.

A related concern, however, is the temporal structure of the payments of the *Lastenausgleich*. Just like the levies associated with the *Lastenausgleich*, the total expenditure was not paid out in 1953 but rather over a few decades. With the enactment of the law, the capital owners on which the tax is levied, lose wealth. The future payments become a liability. At the same time, those who will receive the future transfers have a claim on this wealth. Yet, this wealth is not embedded in our personal wealth estimate in 1953 but should technically be considered a claim for a future payment by the fund administering the *Lastenausgleich*.

In particular, the total would be higher by the amount that, of the total sum, had not yet been re-distributed. Given that the government agency managing the *Lastenausgleich* also received large other contributions from other taxation sources (Wiegand, 1992, p. 361), it is impossible to make a clean estimate of how much of the wealth levies had been re-distributed. However, we know that 5b had been paid out in 1953 already (Wiegand, 1992, p. 357) and it is reasonable to assume that all the income from the pre-*Lastenausgleich* levies had been paid out (around 6.4b). This sum would be around 40% of the about 27b in wealth levies. We thus decide to add 60% of the total payments of the wealth tax levies for the counterfactual case in which the wealth levy had not occurred.

(v) Estimating the counterfactual top 1% share

Based on counterfactual net wealth W', the counterfactual wealth among taxpayers $\{w_j^{TP}\}'$, and the unaltered number of tax units ($N' = N$), we can estimate the counterfactual top 1% share using the *gpinter* algorithm. Comparing the world with the capital levies (our baseline scenario) with the counterfactual world (in which the capital levies are undone) reveals a net effect of the levies on the top 1% share of -3pp.

DA 7 Addtional data contruction

DA 7.1 Price-earnings ratio estimate

Shiller (2000) popularised the concept of price-earnings (PE) ratios for the United States. Shiller calculates the PE ratio based on various historical versions of the the S&P index, earnings data that accompanied it, and historical CPIs. Unfortunately, no comparable data exist for Germany. The leading German stock market index (DAX) was created in 1988 and backward imputations for the PE ratio of this index by commercial providers such as GFD and Datastream only go back until 1970. The scope of this research project did not allow to construct historical price-earning ratios based on firm-level data before this date. Such data would encompass the earnings per share and price per share of all companies included in Germany's lead index and historical reconstructions of this index. However, because dividends and retained earnings have been subject to much research, we are able to construct a historical price-earnings ratio on these estimates.[81]

In particular, we combine existing data on dividend returns (i.e. dividend/price ratios: DP) and estimates on how much actual earnings were paid out (i.e. earnings-dividend ratios- ED). We define the current price-earnings (PE)[82] ratio as:

$$PE = \frac{P}{E} \tag{43}$$

in which P is the market capitalisation and E are earnings. For Germany, there exist comprehensive data on the dividend-price ratio:

$$DP = \frac{D}{P} \tag{44}$$

where D are dividends. Except for small gaps, we are able to locate or construct estimates on the share of dividends in earnings that German companies paid out (in German: *Ausschüttungsquote*):

$$ED = \frac{E}{D} \tag{45}$$

This means that we can calculate the PE ratio as:

$$PE = (\frac{D}{P} \times \frac{E}{D})^{-1} \tag{46}$$

[81] We thank Felix Selgert for navigating the sources pre-1950 (see in particular Selgert, 2020).

[82] Shiller employs the cyclically adjusted PE ratio $CAPE$, which replaces current earnings with 10 year trailing average. Estimating $CAPE$ for Germany would require making adjustments for prices and structural breaks that would introduce further noise into the measure. We thus refrain from computing it.

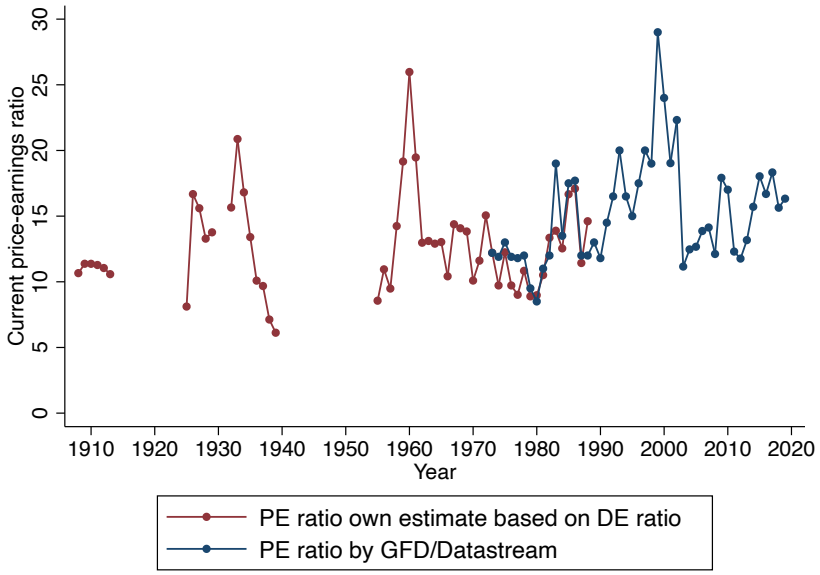
In practice, conservative German book-keeping rules make it tedious to even calculate earnings-dividend ratios. The earnings on the balance sheets (*Bilanzgewinn*) cannot be used because they are net of surpluses/losses brought forward and retained earnings (*Gewinnrücklage*). Instead, one has to use the earnings given in the so-called *Jahresabschluss*. At different points in time, however, adjustments of a varying degree have to be made because firms often created "silent reserves" (*Stille Reserven*) by understating their assets or overstating their liabilities. Table 56 discusses these adjustments and all sources.

Table 56: Data sources and adjustments - Price-Earnings ratio

Time period	Dividend-earnings ratio (DE)	Dividend-price ratio (E/D)	Price earnings ratio
1908-1914	The Statistische Reichsamt sampled a large number of joint stock market companies (listed and non-listed) for each year and published summary statistics for them in its annual yearbook "Statistische Jahrbuch für das Deutsche Reich". These contain estimates for the sums of dividends and earnings. The earnings have to be upward adjusted by 25% because of German accounting rules (see Hoffmann 1959 and Spoerer 1996, p. 53 for a discussion). After correcting the earnings upward, we calculate the ratio of dividends to corrected earnings. We ignore losses that some joint stock companies reported, not least because their inclusion would make little difference given their small size.	Data are from Gielen (2013).	$PE = (\frac{D}{P} \times \frac{E}{D})^{-1}$
1925-1939	Spoerer (1996, p. 110) reports adjusted dividend-earning ratios (based on tax data) for this period. No data are reported for 1930 and 1931.	Data are from Gielen (2013).	$PE = (\frac{D}{P} \times \frac{E}{D})^{-1}$
1955-1960	We employ the average ratio of reported to actual earnings from our estimate for the 1960s (based on Behm and Zimmermann, 1993, see below)) to adjust the earnings-to-dividend ratio.	Data are from Jordà et al. (2019)/JST database.	$PE = (\frac{D}{P} \times \frac{E}{D})^{-1}$
1961-1988	Behm and Zimmermann (1993) provide dividend and earnings data for the largest 32 German stock market firms. For earnings, they provide two series: published profits and net profits. The net profit series are from the German Financial Analyst Association (*Deutsche Vereinigung für Finanzanalyse und Analageberatung, DFVA*). The *DFVA* corrected the published earnings for transitory bookkeeping effects to provide profit numbers comparable across firms. The published profits are typically around 60-70% of the "true" profits. Because the original data was not printed in table form, we transcribed the profits and dividends from a plot on page 233.	Data are from Jordà et al. (2019)/JST database.	$PE = (\frac{D}{P} \times \frac{E}{D})^{-1}$
1973-2000		Data are from Jordà et al. (2019)/JST database.	Data are from Albrecht (2001), which itself is based on Datastream. The data represents the price-earning ratio for *DAX* firms. Data has been transcribed from figure.
2002-2019		Data are from Jordà et al. (2019)/JST database.	Data are from *Global Financial Database* and relate to the DAX.

Figure DA 7.1 shows our estimate for the price earnings ratio. In particular, it aims to demonstrate the validity of our approach by overlapping our estimates based on dividend-price and dividend-earnings data with those from financial service companies.

Figure DA 7.1: Price-earnings ratio Germany



Sources: Own estimate.

Historic plausibility of estimates

- Prewar period: a price-earning ratio of around 10 appears plausible. The cyclically-adjusted PE ratio by Shiller (2000) averages 12.9 between 1910 and 1914 such that our value of around 11 is comparable with the American levels.

- For the interwar period, our results reflect well the account by Spoerer (1996, 1998). In particular, he reports that retained earnings were particularly high under the Nazis due to financial repression and the wish of the regime to hide the revenues (because of rearmament). This is well-reflected in the collapse of the price-earnings ratio documented in the above figure.

- The upswing of the price-earnings ratio in the late 1950s and its collapse back to a level comparable to that of pre-World War I reflects extreme volatility at the German stock market. According to the (nominal) index by Gielen (2013), stock prices more than tripled from a value of 70 in 1957 to a value of 233 in 1961 before dropping back to 150 in 1965.

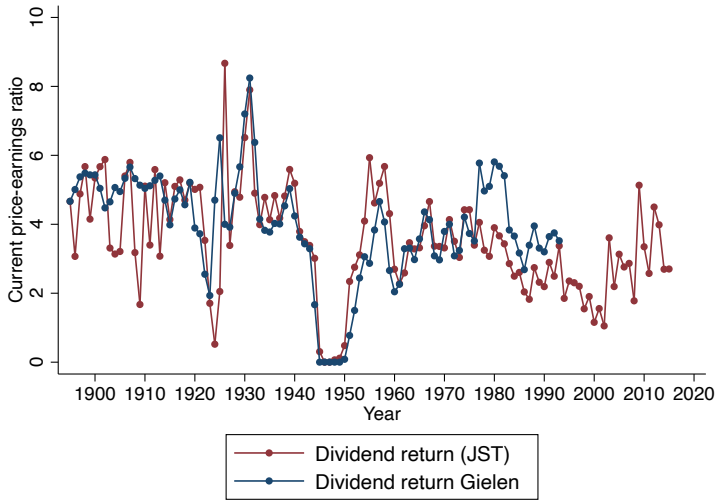
- The increase in price-earnings since the 1980s chimes well with the 'big-bang' angle on the evolution of stock markets by Kuvshinov and Zimmermann (forthcoming).

- Finally, the increase and crash in the late 1990s and early 2000s reflects the dotcom bubble.

Alternative dividend series

Figure DA 7.2 shows two alternative dividend-price ratios. We use Gielen's series until World War II and *JST* thereafter.

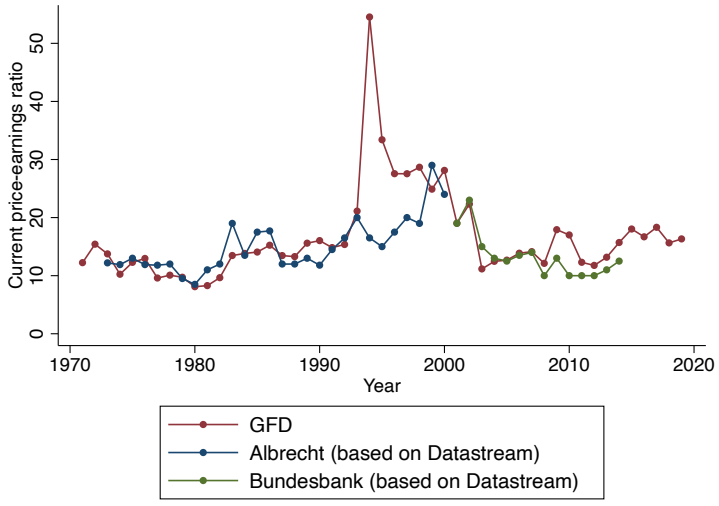
Figure DA 7.2: Alternative dividend series



Sources: Own estimate. For sources, see Table 56.

Alternative "modern" price-earning ratios

Figure DA 7.3: Alternative price-earning series

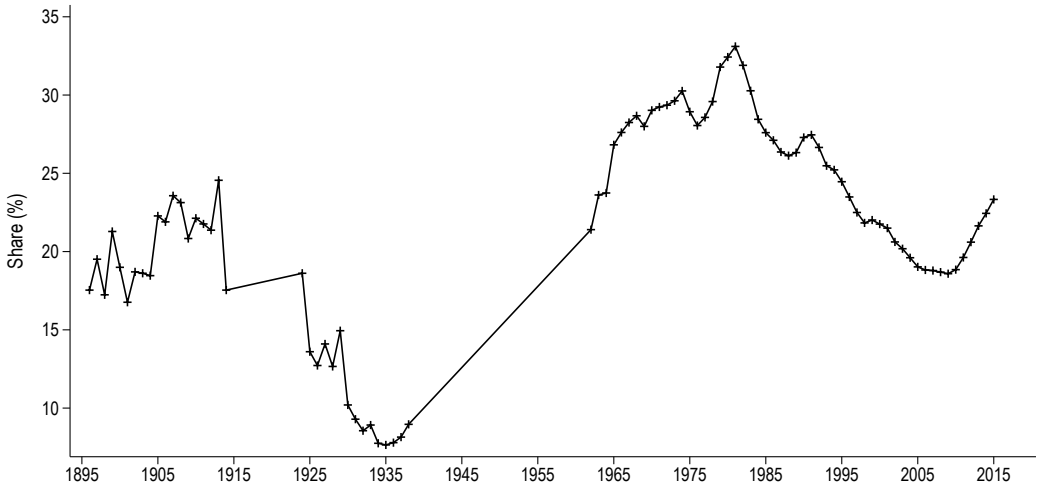


Sources: Own estimate. For sources, see Table 56. Bundesbank series from Bundesbank (2014).

DA 7.2 House price-rent ratio

To calculate the house price-rent ratio, we take the inverse of the rental yield. The data are from the macrohistory database (Jordà et al., 2017). Table DA 7.4 shows the resulting ratio over our whole sample.

Figure DA 7.4: House price-rent ratio



Sources: House price-rent ratio calculated as the inverse rental yield from the macrohistory database (Jordà et al., 2017).

DA 8 Bibliography

References

Abelshauser, W., 1975. Wirtschaft in Westdeutschland 1945 - 1948. Oldenbourg Wissenschaftsverlag.

Albrecht, P., 2001. Welche aktienperformance ist über die nächsten dekaden realistischerweise zu erwarten? eine fundamentalanalyse. Zeitschrift für Versicherungswesen : ZfV 52 (23), 803 – 812.
URL https://madoc.bib.uni-mannheim.de/10410/

Aly, G., 2005. Hitlers Volksstaat: Raub, Rassenkrieg und nationaler Sozialismus. FISCHER E-Books.
URL https://books.google.de/books?id=XgFrAgAAQBAJ

Aust, O., 1928. Volksvermögen und volkseinkommen. Finanz Archiv / Public Finance Analysis 45 (2), 60–68.
URL http://www.jstor.org/stable/40907788

Bach, S., Thiemann, A., Zucco, A., 2019. Looking for the missing rich: Tracing the top tail of the wealth distribution. International Tax and Public Finance 26, 1234–1258.

Banken, R., 2018. Hitlers Steuerstaat. De Gruyter Oldenbourg.

Banken, R., 2019. Durch Weltwirtschaftskrise und Rüstungsboom. Die Entwicklung der grossen Vermögen 1928-1940 in Deutschland. In: Gajek, E. M., Kurr, A., Seegers, L. (Eds.), Reichtum in Deutschland. Akteure, Räume und Lebenswelten im 20. Jahrhundert. Wallstein, pp. 289–312.

Barkai, A., 1988. Jüdische Minderheit und Industrialisierung: Demographie, Berufe, und Einkommem der Juden in Westdeutschland 1850-1914. Schriftenreihe wissenschaftlicher Abhandlungen des Leo Baeck Instituts. J.S.B. Mohr (P. Siebeck).

Baron, D., 1988. Die personelle Vermögensverteilung in der Bundesrepublik Deutschland und ihre Bestimmungsgründe. Peter Lang. Frankfurt.

Bartels, C., Bönke, T., Harnack, A., 2021. The Harmonized Income and Expenditure Survey (EVS+). mimeo.

Baten, J., Wagner, A., 2003. Autarchy, market disintegration, and health: the mortality and nutritional crisis in Nazi Germany, 1933–1937. Economics & Human Biology 1 (1), 1–28.

Behm, U., Zimmermann, H., 1993. The empirical relationship between dividends and earnings in germany. Zeitschrift für Wirtschafts- und Sozialwissenschaften 113, 225–254.

Benninghaus, C., 1999. Die anderen Jugendlichen: Arbeitermädchen in der Weimarer Republik. Reihe "Geschichte und Geschlechter". Campus. Frankfurt. New York.
URL https://books.google.de/books?id=zBw3fSJXvlEC

Bessel, R., 1993. Germany After the First World War. Clarendon paperbacks. Oxford University Press.

Beuck, W., 1925. Das Vermögensteuergesetz vom 10 August 1925. Für die Praxis erläutert. Industrieverlag Spaeth & Linde. Fachbuchhandlung für Steuerliteratur. Berlin.

Biedermann, E., 1918. Die Einkommens- und Vermögensverhältnisse der preussischen Bevölkerung im Zeitraum 1895–1914 und ihre Übertragunsmöglichkeit auf das deutsche Reich. Zeitschrift des Königlich Preussischen Statistischen Landesamts 58, 60–86.

Biedermann, G., 1935. Reichsbewertungsgesetz und Vermögensteuergesetz vom 16. oktober 1934, nebst den durchführungsbestimmungen und anderen nebenbestimmungen. Vol. 175. Deutsches druck-und verlagshaus gmbh.

Bönke, T., Schröder, C., Werdt, C., 2013. Compiling a harmonized database from Germany's 1978 to 2003 sample surveys of income and expenditure. AStA Wirtschafts- und Sozialstatistisches Archiv 7 (3), 135–168.

Bopf, B., 2003. Economic discrimination and confiscation: The case of jewish real estate. In: Confiscation of Jewish Property in Europe, 1933-1945. New Sources and Perspectives. Symposium Proceedings. United States Holocaust Memorial Museum. Center for Advanced Holocaust Studies.

Bresciani-Turroni, C., 1937. The economics of inflation. G. Allen & Unwin Limited.

Buck, L., 1914. Die Ermittlung des steuerpflichtigen Einkommens und Vermögens, zum Handgebrauch von Publikum und Behörden. C. Heymann, Berlin.

Bundesbank, D., 2014. Eigentümerstruktur am deutschen aktienmarkt: allgemeine tendenzen und veränderungen in der finanzkrise. Monatsbericht September, 19–34.

Cohen, A., 1931. Die Hauszinssteuer (Steuer zum Geldentwertungsausgleich, Gebäudeentschuldungssteuer). FinanzArchiv / Public Finance Analysis 48 (1), 124–156.

Cornelsen, D., Ruban, M. E., Teichmann, D., 1974. Kriegsschäden und Nachkriegsbelastung in der Bundesrepublik Deutschland und in der DDR. Deutsches Institut für Wirtschaftsforschung.

Davis, M., Heathcote, J., 2007. The price and quantity of residential land in the United States. Journal of Monetary Economics 54 (8), 2595–2620.

Delbrück, H., 1909. Volksvermögen. Preussische Jahrbücher 136 (1), 166–189.

Dell, F., 2008. L'Allemagne inégale: inégalités de revenus et de patrimoine en Allemagne, dynamique d'accumulation du capital et taxation de Bismarck à Schröder 1870-2005. Ph.D. thesis, Paris, EHESS.

Deutsche Bundesbank, 1976. Deutsches Geld- und Bankenwesen in Zahlen 1876-1975. Knapp. Frankfurt.

Deutsche Bundesbank, 2010. Financial Accounts for Germany 1991 to 2009. Special Statistical Publication (4).

Deutsches Reich, 1914. Deutsches gesetz über einen einmaligen ausserordentlichen wehrbeitrag. vom 3. juli 1913. FinanzArchiv / Public Finance Analysis 31 (1), 320–332.
URL http://www.jstor.org/stable/40907206

Deutsches Reich, 1926a. Deutsches reichsbewertungsgesetz. vom 10. august 1925. FinanzArchiv / Public Finance Analysis 43 (2), 160–190.
URL http://www.jstor.org/stable/40907613

Deutsches Reich, 1926b. Deutsches vermögensteuergesetz. vom 10. august 1925/31. märz 1926. FinanzArchiv / Public Finance Analysis 43 (1), 289–301.
URL http://www.jstor.org/stable/40906612

DiNardo, J., Fortin, N., Lemieux, T., 1996. Labor market institutions and the distribution of wages, 1973-1992: A semiparametric approach. Econometrica 64, 1001–1044.

Fremdling, R., 2016. Wirtschaftsstatistik 1933-1945. In: Ritschl, A. (Ed.), Das Reichswirtschaftsministerium in der NS-Zeit. De Gruyter. Oldenbourg, Ch. 5, pp. 233–218.

Führer, K. C., 1995. Betrogene Gewinner? Die deutschen Hausbesitzer und der Streit um den Gewinn aus Inflation und Währungsreform 1923-1943. VSWG: Vierteljahrschrift für Sozial- und Wirtschaftsgeschichte 82 (H. 1), 29–53.

Gall, L., 2009. Walther Rathenau: Portrait einer Epoche. C.H. Beck.
URL https://books.google.de/books?id=0COP6thIHDEC

Gielen, G., 2013. Können Aktienkurse noch steigen? Langfristige Trendanalyse des deutschen Aktienmarktes. Springer-Verlag.

Gribel, C., 1926. Gesetz über die Aufwertung von Hypotheken und anderen Ansprüchen (Aufwertungsgesetz): vom 16. Juli 1925 unter besonderer Berücksichtigung der Rechtsprechung des Kammergerichtes erläutert. Springer Berlin Heidelberg.
URL https://books.google.de/books?id=bvFEBAAAQBAJ

Grünig, F., 1958. Versuch einer Volksvermögensrechnung der Deutschen Bundesrepublik: Beitrag zur Konferenz der International Association for Research in Income and Wealth in Oosterbeek (Niederlande); vom 19. bis 25. August 1957. Duncker & Humblot.

Hauser, R., 2011. Zwei deutsche Lastenausgleiche: eine kritische Würdigung. Vierteljahrshefte zur Wirtschaftsforschung 80 (4), 103–122.

Helfferich, D. V., 1914a. Volkswohlstand 1888–1913, 4th Edition. Stilke. Berlin.

Helfferich, K., 1914b. Deutschlands Volkswohlstand 1888–1913, 4th Edition. Stilke. Berlin.

Helfferich, K., 1925. Volksvermögen, Volkeinkommen und Steuerlast - Einst und Jetzt. Weltpolitik & Weltwirtschaft 1.

Hoffmann, W., 1965. Das Wachstum der deutschen Wirtschaft seit der Mitte des 19. Jahrhunderts. Enzyklopädie der Rechts- und Staatswissenschaft. Springer. Berlin Heidelberg New York.
URL https://books.google.de/books?id=koiZBwAAQBAJ

Hoffmann, W. G., 1959. Die unveteilten gewinne der kapitalgesellschaften in deutschland 1871-1957. Zeitschrift für die gesamte Staatswissenschaft / Journal of Institutional and Theoretical Economics 115 (2), 271–291.
URL http://www.jstor.org/stable/40748536

Hoffmann, W. G., Müller, J. H., 1959[2005]. The german national income in selected german states between 1851 and 1913. Tech. rep.

Holtfrerich, C.-L., 1980. Die deutsche Inflation 1914-1923: Ursachen und Folgen in internationaler Perspektive. Walter de Gruyter.

Huber, K., Lindenthal, V., Waldinger, F., forthcoming. Discrimination, managers, and firm performance: Evidence from "aryanizations" in Nazi Germany. Journal of Political Economy.

Jaggi, E., 1945. Methodik und technik der ertragswertschätzung landwirtschaftlicher betriebe und grundstücke: unter spezieller berücksichtigung der verwendbarkeit der einheitsbewertung für schweizerische verhältnisse. Ph.D. thesis, ETH Zurich.

Jordà, Ò., Knoll, K., Kuvshinov, D., Schularick, M., Taylor, A. M., 04 2019. The Rate of Return on Everything, 1870-2015. The Quarterly Journal of Economics 134 (3), 1225–1298.

Jordà, O., Schularick, M., Taylor, A. M., 2017. Macrofinancial history and the new business cycle facts. In: Eichenbaum, M., Parker, J. A. (Eds.), NBER Macroeconomics Annual 2016. Vol. 31. Chicago: University of Chicago Press.

Junz, H. B., 2001. Where did all the money go? Helen B. Junz.

Kirner, W., 1968. Zeitreihen für das Anlagevermögen der Wirtschaftsbereiche in der Bundesrepublik Deutschland. Deutsches Institut für Wirtschaftsforschung, Berlin.

Knoll, K., Schularick, M., Steger, T., 2017. No price like home: Global house prices, 1870-2012. American Economic Review 107 (2), 331–53.

Kohl, S., 2017. Homeownership, renting and society: Historical and comparative perspectives. Routledge.

Köhler, I., 2005. Die "Arisierung" der Privatbanken im Dritten Reich: Verdrängung, Ausschaltung und die Frage der Wiedergutmachung. Schriftenreihe zur Zeitschrift für Unternehmensgeschichte. Beck.
URL https://books.google.de/books?id=Kyvvx7pxsIIC

Köhler, S., 1994. Bewertung des Waldes im Rahmen der gesamtwirtschaftlichen Vermögensrechnung. Metzler-Poeschel.

Königlich Preussisches Statistisches Landesamt, 1899. Statistik der preussischen Einkommen- und Ergänzungssteuer-Veranlagung für das Jahr 1899/1901. Verlag des Königlichen Statistischen Landesamtes. Berlin.

Königlich Preussisches Statistisches Landesamt, 1905. Statistik der preussischen Einkommen- und Ergänzungssteuer-Veranlagung für das Jahr 1905/1907. Verlag des Königlichen Statistischen Landesamtes. Berlin.

Königliches Statistisches Bureau, 1897. Statistik der preußischen Einkommen- und Ergänzungssteuer-Veranlagung. Verlag des Königlichen Statistischen Bureaus.

Königliches Statistisches Bureau, 1906. Statistisches Jahrbuch für den Preussischen Staat 1905. Verlag des Königlichen Statistischen Landesamts.

Königliches Statistisches Bureau, 1909. Statistisches Jahrbuch für den Preussischen Staat 1908. Verlag des Königlichen Statistischen Landesamts.

Königliches Statistisches Bureau, 1912. Statistisches Jahrbuch für den Preussischen Staat 1911. Verlag des Königlichen Statistischen Landesamts.

Königliches Statistisches Bureau, 1915. Statistisches Jahrbuch für den Preussischen Staat 1914. Verlag des Königlichen Statistischen Landesamts.

Königliches Statistisches Bureau, 1918. Statistisches Jahrbuch für den Preussischen Staat 1917. Verlag des Königlichen Statistischen Landesamts.

Krelle, W., Schunck, J., Siebke, J., 1968. Überbetriebliche Ertragsbeteiligung der Arbeitnehmer. Vol. 2. Mohr Siebeck.

Krengel, R., 1958. Anlagevermögen, produktion und beschäftigung in der industrie im gebiet der bundesrepublik von 1924 bis 1956. Deutsches Institut für Wirtschaftsforschung. Sonderhefte, Neue Folge, Reihe A: Forschung 42.

Kuhn, M., Schularick, M., Steins, U., 2020. Income and wealth inequality in America, 1949–2016. Journal of Political Economy 128 (9), 3469–3519.

Kühnert, F., 1907. Das kapitalvermögen der selbstständigen landwirte in preussen. Zeitschrift des preussischen statistischen Landesamts .

Kuvshinov, D., Zimmermann, K., forthcoming. The big bang: Stock market capitalization in the long run. Journal of Financial Economics.

Löffler, H., 2005. Der markt für grössere waldgrundstücke: eine empirische studie für deutschland und österreich. Ph.D. thesis, LMU Munich.

Martin, R., 1913. Jahrbuch des Vermögens und Einkommens der Millionäre im Königreich Preußen. Berlin.

May, R. E., 1909. Volksvermögen. Preussische Jahrbücher 136 (4), 95–148.

Mockenhaupt, S., 2012. VW-Gesetz und Goldene Aktien: Zur Kapitalverkehrs- und Niederlassungsfreiheit nach dem VW-Urteil des EuGH. Diplomica Verlag.
URL https://books.google.de/books?id=deJmuPxeyVsC

Müller, H. W., 1971. Zur frage des vermögens der landwirtschaft. German Journal of Agricultural Economics/Agrarwirtschaft 20 (10), 327–331.

Ogden, R. E., Thomas, D. R., Warusawitharana, M., 2016. Corporate Equities by Issuer in the Financial Accounts of the United States. FEDS Notes. Washington: Board of Governors of the Federal Reserve System, March 29, 2016.

Oltmer, J., 2013. Migration im 19. und 20. Jahrhundert. Enzyklopädie deutscher Geschichte. De Gruyter.

Overmans, R., 2009. Deutsche militärische Verluste im Zweiten Weltkrieg. Beiträge zur Militärgeschichte. De Gruyter.

Pfister, U., 08 2019. The Crafts-Harley view of German industrialization: an independent estimate of the income side of net national product, 1851-1913. European Review of Economic History 24 (3), 502–521.
URL https://doi.org/10.1093/ereh/hez009

Piketty, T., Zucman, G., 2014. Capital is Back: Wealth-Income Ratios in Rich Countries, 1700-2010. Quarterly Journal of Economics 129 (3), 1255–1310.

Pohl, H., 2001. Die rheinischen Sparkassen: Entwicklung und Bedeutung für Wirtschaft und Gesellschaft von den Anfängen bis 1990. Eine Veröffentlichung des Rheinischen Sparkassen- und Giroverbandes. F. Steiner.
URL https://books.google.de/books?id=YLHqyBg_XB8C

Preussisches Abgeordnetenhaus, 1893. Preussischer gesetzentwurf vom 2. november 1892 wegen einer ergänzungssteuer. Finanzarchiv 10, 370–410.

Reckendrees, A., 2015. Unternehmen, industrie und handwerk. In: Rahlf, T. (Ed.), Deutschland in Daten: Zeitreihen zur Historischen Statistik. Bundeszentrale für politische Bildung, pp. 250–265.

Reichling, G., 1958. Die Heimatvertriebenen im Spiegel der Statistik. Duncker & Humblot.
URL https://books.google.de/books?id=S8Fi5zZolxIC

Ritschl, A., 2019. Financial destruction: confiscatory taxation of Jewish property and income in Nazi Germany. LSE Economic History Working Papers (297).

Rössler, R., Troll, M., Langner, J., 1983. Bewertungsgesetz und Vermögensteuergesetz: Kommentar, 13th edition. Vahlen.

Rothkegel, W., 1910. Die Kaufpreise für ländliche Besitzungen im Königreich Preussen von 1895 bis 1906. Duncker & Humblot.

Sablotny, H., 1977. Gesamtwirtschaftliche Vermögensrechnung. Campus Verlag.

Saez, E., Zucman, G., 2016. Wealth inequality in the United States since 1913: Evidence from capitalized income tax data. The Quarterly Journal of Economics 131 (2), 519–578.

Schörry, O., 1949. Das deutsche volksvermögen. FinanzArchiv/Public Finance Analysis (H. 2), 386–397.

Selgert, F., 2020. Macht und Kontrolle im Unternehmen: Die politische Ökonomie des Aktionärsschutzes im Deutschen Reich, 1870–1945. Vol. 240. Vandenhoeck & Ruprecht.

Shiller, R. J., 2000. Irrational Exuberance. Princeton University Press.

Spoerer, M., 1996. Von Scheingewinnen zum Rüstungsboom Die Eigenkapitalrendite der deutschen Industrieaktiengesellschaften 1925-1941. Franz Steiner Verlag.
URL https://elibrary.steiner-verlag.de/book/99.105010/9783515119009

Spoerer, M., 1998. Window-dressing in german inter-war balance sheets. Accounting, Business & Financial History 8 (3), 351–369.

Spoerer, M., 2005. Rezension zu: Aly, götz: Hitlers volksstaat. raub, rassenkrieg und nationaler sozialismus. frankfurt am main 2005. H-Soz-Kult.

Statistisches Bundesamt, 1952. Der neue preisindex für die lebenshaltung. Wirtschaft und Statistik 4 (11), 439–455.

Statistisches Bundesamt, 1953. Statistisches Taschenbuch über die Heimatvertriebenen in der Bundesrepublik Deutschland und in West-Berlin. Statistisches Bundesamt. Wiesbaden.

Statistisches Bundesamt, 1955. Die auf den Grundbesitz 21.6.1948 festgestellten Einheitswerte des Grundbesitzes. Statistisches Bundesamt. Wiesbaden.

Statistisches Bundesamt (Ed.), 1956. Statistisches Jahrbuch für die Bundesrepublik Deutschland 1956. Kohlhammer. Stuttgart.

Statistisches Bundesamt (Ed.), 1959. Statistisches Jahrbuch für die Bundesrepublik Deutschland 1959. Kohlhammer. Stuttgart.

Statistisches Bundesamt, 1960. Hauptveranlagung der Vermögenssteuer auf den 1.1.1953. Kohlhammer. Wiesbaden.

Statistisches Reichsamt, 1911. Statistisches Jahrbuch für das Deutsche Reich 1910. Hobbing. Berlin.

Statistisches Reichsamt, 1915. Statistisches Jahrbuch für das deutsche Reich 1915. Statistisches Reichsamt.

Statistisches Reichsamt, 1916. Statistisches Jahrbuch für das Deutsche Reich 1916. Hobbing. Berlin.

Statistisches Reichsamt, 1919. Wehrbeitragstatistik. Vierteljahreshefte zur Statistik des Deutschen Reichs - Zweites Ergänzungsheft (28).

Statistisches Reichsamt, 1921. Statistisches Jahrbuch für das Deutsche Reich 1920. Hobbing. Berlin.

Statistisches Reichsamt, 1927a. Statistisches Jahrbuch für das Deutsche Reich 1926. Hobbing. Berlin.

Statistisches Reichsamt, 1928. Statistisches Jahrbuch für das Deutsche Reich 1928. Hobbing. Berlin.

Statistisches Reichsamt, 1929. Statistik der Vermögensteuerveranlagung 1925. Vol. 357 of Statistik des Deutschen Reiches. Reimar Hobbing. Berlin.

Statistisches Reichsamt, 1930a. Statistisches Jahrbuch für das Deutsche Reich 1929. Hobbing. Berlin.

Statistisches Reichsamt, 1930b. Statistisches Jahrbuch für das Deutsche Reich 1930. Hobbing. Berlin.

Statistisches Reichsamt, 1931a. Statistik der Einheitswerte für den zweiten Hauptfeststellungszeitraum 1928–1930. Statistik des Deutschen Reiches 392.

Statistisches Reichsamt, 1931b. Statistik der Vermögensteuerveranlagung 1927. Vol. 379 of Statistik des Deutschen Reiches. Reimar Hobbing. Berlin.

Statistisches Reichsamt, 1931c. Statistik der Vermögensteuerveranlagung 1928. Vol. 390 of Statistik des Deutschen Reiches. Reimar Hobbing. Berlin.

Statistisches Reichsamt, 1932. Statistisches Jahrbuch für das Deutsche Reich. Hobbing. Berlin.

Statistisches Reichsamt, 1933. Die bevölkerung des deutschen reichs nach den ergebnissen der volkszählung 1933. Statistik des Deutschen Reichs 451 (2).

Statistisches Reichsamt, 1935. Statistisches Jahrbuch für das Deutsche Reich 1934. Hobbing. Berlin.

Statistisches Reichsamt, 1936. Statistisches Handbuch der Weltwirtschaft. Berlin: Verlag für Sozialpolitik, Wirtschaft und Statistik.

Statistisches Reichsamt, 1937. Statistisches Handbuch der Weltwirtschaft. Verlag für Sozialpolitik, Wirtschaft und Statistik. Berlin.

Statistisches Reichsamt, 1938a. Die Hauptveranlagung der Vermögensbesteuer nach dem Stand vom 1.1.1935. Vol. 519 of Statistik des Deutschen Reiches. Paul Schmidt. Berlin.

Statistisches Reichsamt, 1938b. Die Hauptveranlagung der Vermögensbesteuer nach dem Stand vom 1.1.1935. Vol. 519 of Statistik des Deutschen Reiches. Paul Schmidt. Berlin.

Statistisches Reichsamt, 1938c. Statistisches Jahrbuch für das Deutsche Reich 1937. Hobbing. Berlin.

Statistisches Reichsamt, 1939a. Die aktiengesellscahften im jahre 1938. Wirtschaft und Statistik 19 (6).

Statistisches Reichsamt, 1939b. Die gesellschaften mit beschränkter haftung ende 1938. Wirtschaft und Statistik 19 (7).

Statistisches Reichsamt, 1939c. Die Hauptfeststellung der Einheitswerte nach dem Stand vom 1. Januar 1935. Statistik des Deutschen Reiches 526.

Steinmann-Bucher, A., 1916. Deutschlands volksvermögen im krieg. Finanzwirtschaftlichen Zeitfragen.

Stiftung Familienunternehmen (Ed.), 2019. Die volkswirtschaftliche Bedeutung der Familienunternehmen, 5th Edition. ZEW - Leibniz-Zentrum für Europäische Wirtschaftsforschung Mannheim and Institut für Mittelstandsforschung Mannheim.

Tooze, A., 2005. Economics, ideology and cohesion in the third reich: A critique of goetz aly's hitlers volksstaat. Dapim. Studies on the Shoah 20 (2006) - English Version at Website of Adam Tooze 2017-232.

Vermeulen, P., 2018. How fat is the top tail of the wealth distribution. Review of Income and Wealth 64 (2), 357–387.

Wagner, A., 1904. Weitere statistische untersuchungen über die verteilung des volkseinkommens in preussen. Zeitschrift des Königlich Preussischen Statistischen Bureaus 44.

Wehler, H.-U., 2003. Deutsche Gesellschaftsgeschichte, 1914-1949. Vol. 4 of Deutsche Gesellschaftsgeschichte. C.H. Beck.
URL https://books.google.de/books?id=rxv1V-UyW9YC

Wiegand, L., 1992. Der Lastenausgleich in der Bundesrepublik Deutschland, 1949 bis 1985. Vol. 1271. Peter Lang.