Wealth and Its Distribution in Germany, 1895-2021

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Abstract

German history over the past 125 years has been turbulent. Marked by two world wars, revolutions and major regime changes, as well as a hyperinflation and three currency reforms, expropriations and territorial divisions, it comprises extreme shocks to study the role of historical events, taxation, asset price changes, portfolio heterogeneity in affecting the wealth distribution in the long run. Combining tax and archival data, household surveys, historical national accounts, and rich lists, we document that the top 1% wealth share has fallen by half, from close to 50% in 1895 to 26% today. Nearly all of this decline was the result of changes that occurred between 1914 and 1952. Using a novel decomposition framework, we show that collapsing equity prices after World War I and in the Great Depression as well as taxation in the aftermath of World War II stand out as great equalizers in 20th century German history. After unification in 1990, two trends have left their mark on the German wealth distribution. Households at the top made substantial capital gains from rising business wealth while the middle-class had large capital gains in the housing market. The wealth share of the bottom 50% has halved since 1990. Our findings speak to the importance of historical shocks to the valuation of existing wealth and taxation in driving the evolution of the wealth distribution over the long run. In addition, our data revisions reveal that Germany's current wealth-income ratio is about 120 percentage points higher than previously thought.

JEL Classification: D31, E01, E21, H2, N3

Keywords: Wealth inequality; portfolio heterogeneity; saving; wealth taxation.

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1 Introduction

Understanding the dynamics of the wealth distribution has become an active research field in macroeconomics and public finance. The question of what factors account for the observed skewness in the wealth distribution goes back to Pareto himself (Benhabib & Bisin 2018). Recent studies have pointed to the role of returns on wealth and portfolio heterogeneity as well as taxation as important drivers of wealth dynamics (Fagereng et al. 2020, Gabaix et al. 2016, Greenwald et al. 2021, Jakobsen et al. 2019, Jones 2015, Kuhn et al. 2020). Economic history has an important role to play to inform these debates – not only by bringing new long-run data to the table, but also by studying major shifts in historical wealth distributions. Studying such shifts can yield new insights into the importance of different factors driving the evolution of the wealth distribution.

In this paper, we aim to write the economic history of the distribution of wealth for a country whose modern economic and political history has been extraordinarily turbulent: Germany. German history in the 20th century was marked by five different forms of government – the Kaiserreich, the Weimar Republic, the Nazi Regime, the Federal Republic, and the German Democratic Republic. On top of this come three currency conversions, the effects of two world wars, substantial changes in its borders, and in the composition of its population. The latter is marked by the expulsion and murder of the German Jewry as well as the influx of German refugees from Eastern Europe after World War II. More recently, German reunification in 1990 provided another quasi-natural experiment, allowing us to study the effects of the integration of an egalitarian socialist economy into one of the most advanced capitalist economies. Presenting the first comprehensive study of long-run wealth inequality in Germany spanning the entire period from the late 19th century until today, the paper makes three main contributions.[1]

First, we construct new long-run series for German marketable wealth and its distribution since 1895 from historical sources, bringing the German data up to international standards for past and present. Our estimates for aggregate wealth in unified Germany address well-known shortcomings of the official balance sheet data (which are also present in the wealth-income ratios by Piketty & Zucman 2014). We correct the valuation of Germany's large number of private limited companies and quasi-corporations, as well as the valuation of housing assets to reflect the rapid growth in real estate prices since 2010. Our corrected wealth-income ratio is about 120% percentage points higher than the official balance sheets imply and thus similar to those of the UK and the US. Germany is considerably richer than official statistics show. With respect to historical wealth distribution data, we add Germany to the small group of four countries for which century-

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[1] While this approach helps us understand the role of historical contingencies and the mechanism behind major shifts in the wealth distribution in Germany over time, the shocks themselves are highly context specific and cannot be easily extrapolated to other contexts. Nonetheless, they allow for a better historical understanding of the proximate causes of shifts in the wealth distribution and their quantitative importance.

long series with fairly consistent coverage exist.[2]

The second main contribution consists in proposing a novel decomposition framework, through which researchers can study sudden changes in the evolution of inequality. In the absence of fully-fledged general equilibrium models for wealth dynamics, we adapt an older approach—creating historically plausible counterfactuals (Fogel 1964)—to study distributions. For instance, to account for the effect of border changes after World War I on the German wealth distribution, we calculate hypothetical wealth shares applying postwar borders to prewar data. Comparing the top 1% wealth share calculated for 1913 in the borders of 1920 to the actual top 1% wealth share in 1913 allows us to approximate the influence that border changes had on changes in the wealth distribution. We construct such historical hypotheticals for all the observed time periods in which major shifts in the wealth distribution occurred. More precisely, we look at World War I, the 1923 hyperinflation episode, the Nazi regime, the destruction during World War II, and the wealth taxation after the war aimed at sharing the burden of post-war reconstruction. In contrast to previous long-run wealth studies, the novel framework allows us to gauge the relative importance of multiple contemporaneous shocks and, hence, attribute changes in the wealth distribution to specific policies and shocks. In particular, the results suggest that Germany-specific factors such as the destruction in World War II mattered, but that much of the shifts in the wealth distribution in the 20th century can be explained by broader cross-country trends: shifts in taxation and asset price changes in response to the World Wars and the Great Depression.

In a third contribution, we connect the German case to the ongoing debate about differential savings rates and capital gains across the distribution (Bach et al. 2018, Fagereng et al. 2019, Mian et al. 2021). Zooming in on the evolution of the German wealth distribution since reunification, we use survey data and revised macroeconomic wealth aggregates to study the effects of heterogeneity in portfolios and savings across the distribution. Unification brought together a poorer and relatively egalitarian society with one of the most advanced OECD economies. We show that differences in portfolio composition played a large role for the evolution of wealth in unified Germany.

We find that over the long-run, the concentration of wealth in the hands of the German top 1% has fallen by almost half, from close to 50% in 1895 to 26% today. Almost all of the decline in the top 1% wealth share occurred in less than 40 years, between World War I and the early years of the Federal Republic after World War II. Since the early 1950s, the top 1% share has remained within a narrow range. However, this stability at the surface masks substantial movement in the overall distribution of wealth, especially in recent decades. Since reunification in 1990, the upper half of the wealth distribution effectively doubled its wealth.

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[2]Long-run series for France cover 1914-2014 (Piketty et al. 2006, Garbinti et al. 2021), for Sweden 1873-2012 (Roine & Waldenström 2009, Lundberg & Waldenström 2018), for the United Kingdom 1895-2013 (Alvaredo et al. 2018), and for the United States 1913-2020 (Saez & Zucman 2016, 2020, Smith et al. 2023). Roine & Waldenström (2015) document additional long-run series with larger gaps. Series covering shorter periods exist for China 1978-2015 (Piketty et al. 2019), Italy 1995-2016 (Acciari et al. 2021), Russia 1995-2015 (Novokmet et al. 2018), South Africa 1993-2017 (Chatterjee et al. 2021), and Spain 1985-2014 (Martínez-Toledano 2020).

Asset valuations have played an important role. Households at the top of the distribution made substantial capital gains from rising business equity. At the same time, the middle-class witnessed large capital gains in housing so that the gap between top and middle-class wealth holders increased only moderately. However, real wealth of the average household in the bottom 50% stagnated, and the bottom 50% share in total wealth nearly halved from almost 5% in 1993 to 3% in 2021. This is because the portfolio of households in the lower half of the distribution consists mainly of deposits and life insurance assets that did not appreciate in value. In the process, the gap between the "haves" and the "have-nots" has widened considerably: in 1993, the average wealth of households in the top 10% of the wealth distribution was 62 times higher than in the bottom half. By 2018, the gap has grown to 116 times. This polarization of wealth between the upper and lower half of the distribution in the past 30 years is missed by standard inequality measures such as the Gini coefficient that mainly track wealth shifts within the upper half of the distribution. Figure 1 demonstrates the decline and relative stability of the top 1% wealth share at the same time as the bottom 50% wealth share collapsed.

Figure 1: Wealth share of the top 1% and bottom 50%, Germany, 1895-2021
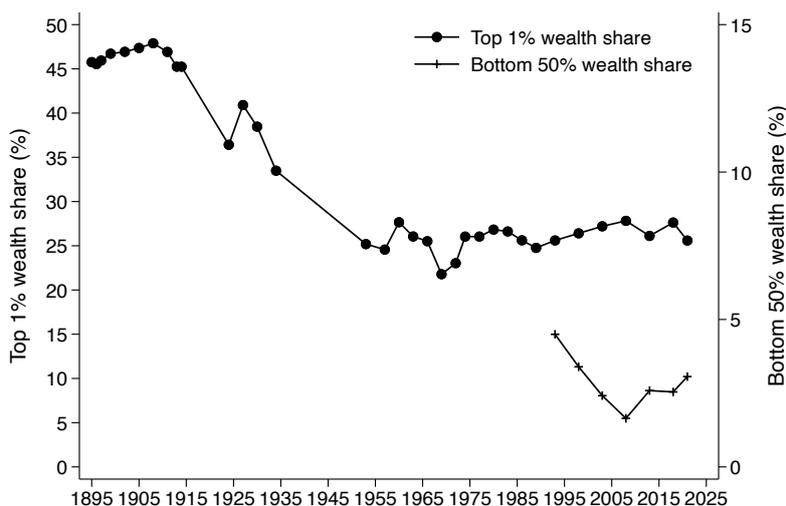
Note: Own estimates based on wealth tax until 1989, EVS-TU 1993-2018 extended to 2021 using HFCS-TU change 2017-2021.

The most pronounced contractions in German wealth inequality occurred in the interwar period as well as during and after World War II. The top 1% wealth share fell by more than 11pp. between 1914 and 1934, and by another 8pp. during World War II and its aftermath. What factors were responsible for the equalization? Collapsing asset valuations played a central role during World War I, the hyperinflation, and the Great Depression. These events compressed the market value of business wealth holdings at the top while the capital stock remained largely intact. By contrast, the destruction and taxation of capital explain most of the decline in inequality in and after World War II. The "Lastenausgleich" taxed German households whose wealth had survived the war and those that had profited from the eradication of debts in the currency reform of 1948. Apart from a small allowance, the wealth levy constituted a quasi-flat 50% tax on the net

wealth of households in 1948. Our estimates suggest that the wealth tax alone reduced the top 1% wealth share by 2.8pp., while war destruction and the dismantling of plants accounted for another 3pp. of the drop in the top 1% wealth share during and after World War II. These findings mesh nicely with recent studies that underscore the importance of asset returns and portfolio structure for wealth inequality dynamics (Garbinti et al. 2018, Fagereng et al. 2019, 2020, Bach et al. 2020, Kuhn et al. 2020). This being said, we also show that saving rates remained comparatively high for Germany's middle class (in comparison to France or the United States) and that they increase in wealth and income levels – a finding that speaks to ongoing debates about the relationship between savings rates across the wealth and income distributions (Saez & Zucman 2016, Fagereng et al. 2019, Garbinti et al. 2021, Mian et al. 2021).

More generally, the findings in our paper also point to a deeper puzzle. Our analysis of the observed big shifts in the German wealth distribution over the past 125 years highlights the importance of country-specific shocks – wars and destruction, wealth taxation, inflation – in triggering the most significant shifts in wealth shares. However, when we compare long-run trends in German wealth inequality to other advanced economies, the overall path looks strikingly similar. Other advanced economies also saw sharp reductions in top-wealth shares around the mid of the 20th century and a substantial reduction of top wealth shares relative to the levels around the year 1900. Put differently, despite its uniquely turbulent history, Germany's trajectory does not look all that different to other countries in Europe and the U.S. with regard to long-run trends in the wealth distribution. We argue that this finding underscores the importance of common political and technological shocks and trends shaping the wealth distribution in advanced economies over the long-run. Germany is a case in point, but other countries made similar experiences. For instance, the Great Depression was a global event that depressed business asset valuations in all economies for decades to come. The two world wars stand out as periods when taxation triggered large shifts in the wealth distribution *across* countries. This is because different economies responded to war in similar ways by raising taxes and increasing redistribution. In that sense, our study of the extreme case of Germany points to a greater theme of correlated shocks and policy responses across the major economies that have aligned cross-country wealth histories to a surprising degree over the past century.

The paper is structured as follows. We first describe our data and estimation methods for both aggregate wealth and its distribution in Section 2. In Section 3, we present the long-run trends, compare our results to previous results in the literature, and look at Germany in international comparison. Section 4 zooms in on the major historical episodes that have shifted the German wealth distribution, as well as their underlying forces. In Section 5, we study wealth inequality dynamics in unified Germany where the greater data availability allows us to study wealth growth, capital gains, and savings across the entire wealth distribution. Section 6 concludes.

2 Data

Our definition of wealth and its valuation closely adhere to the international standards described in Piketty & Zucman (2014). Wealth is defined as the value of assets owned by households net of debt. Assets include financial assets, such as savings deposits or life insurances, real assets, such as houses and farmland, and business assets. Following the existing literature, we exclude consumer durables, hard-to-assess items like works of art, as well as non-tradable future claims on public and employer-based pension systems for methodological consistency with cross-country work. While employer-based pensions only marginally affect wealth inequality estimates (Frick et al. 2010), including pensions would reduce the top percentile's individual wealth share from ca. 30% to ca. 20% (Bartels et al. 2023).

In line with other studies on long-run wealth inequality, we also exclude offshore financial wealth held in tax havens from our headline figures. Based on recent work (Alstadsæter et al. 2018, *EU Tax Observatory*) and the standard assumption that none of it is declared, we produce an estimate for such wealth held by Germans between 1950 and 2021. We find that it continues to be non-negligible (around 8-10% of national income according to our preferred estimates), but that integrating it into the estimation of top percentile's wealth share has no qualitative effect on the documented trends and only moderate effects on its level (around 0.2%-2.5%, depending on the period and estimate; see Appendix A.6).

Table 1: Main data sources

Period	Aggregate	Distribution	Data Appendix
1895-1914	Wealth tax and wealth levy, contemporary estimates, statistical yearbooks	Wealth tax (Prussia), Wealth levy 1913 (German Empire)	Section DA 1
1924-1934	Wealth censuses, statistical yearbooks	Wealth tax (German Reich)	Section DA 2
1953-1989	Financial Accounts, National Accounts	Wealth tax (FRG)	Section DA 3
1993-2021	Financial Accounts, Household Balance Sheets, Corporate and personal income tax	EVS+, SOEP, HFCS, Manager Magazin rich-list	Section DA 4

Table 1 shows our main data sources for aggregate private wealth and its distribution. For 1895 to 1989, we collected and digitized historical data to construct a series of aggregate household wealth as well as federal and regional wealth tax data and a one-off wealth levy in 1913 capturing wealth at the top of the distribution. For the post-1990 period, the data sources become broader so that we can study wealth dynamics across the entire distribution. Household surveys like EVS, SOEP, and HFCS record micro data on German household wealth every few years. At the same time, substantial data shortcomings exist with respect to the coverage of top wealth and aggregate household wealth as recorded in official household balance sheets (HBS). Therefore, we present revised estimates for aggregate household wealth and top-correct survey data

using household wealth aggregates and rich lists. Focusing on the most recent period, the following sections discuss the particular challenges of the data construction in more depth. The Data Appendix discusses similar challenges for the historic data and documents the consistency of aggregates and distributional data over time.

2.1 Revising aggregate household wealth

Although Household Balance Sheets (HBS) for both fixed and financial assets owned by private households are published annually by the Federal Statistical Office (Destatis) since 1992,[3] substantial challenges remain with respect to aggregate wealth data. First, housing wealth appears to be mismeasured as current estimates do not reflect market price changes over time. Second, business wealth in enterprises other than public limited companies is likely underestimated. We will see that, in both cases, the mismeasurement reflects path-dependent peculiarities of German statistics and accounting rules that do not distinguish clearly between reporting of book and market values. One should note that business wealth and real estate wealth together constitute more than 60% of household wealth with the remainder being held as financial assets in the form of shares in public limited companies, deposits, securities and insurances. Our approach in both cases is to update the German concepts to international standards and value both at market prices. In the following, we present improved estimates of aggregate real estate and business wealth.

Real estate wealth   Real estate wealth is the most important form of wealth for most households. In 2021, about 55% of total gross wealth is residential real estate (according to HBS). The valuation of housing wealth is challenging, particularly because of the changing value of land. Many European countries, like France and the United Kingdom, compute a total value of housing wealth based on market prices. In German data, housing structures and the underlying land are estimated separately. 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 based on a single value of land for each federal state. The value for land is likely heavily downward biased, because the land price estimates are for available plots of construction land that are geographically remote from prime locations.

The left-hand graph of Figure 2 shows that the official housing wealth estimate increases rather smoothly over time, failing to capture the housing boom since 2010 that is visible in surveys and in house price data (see Data Appendix Figures DA 4.1 - DA 4.3). We use the housing aggregate recorded in the HFCS survey 2011 and extend the series applying the method by Davis & Heathcote (2007). This method decomposes the aggregate value of the housing stock into buildings and land. The price of land is inferred from data on house prices and buildings costs. Our new estimate puts the total value of residential real estate in Germany

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[3]While households' financial assets estimated by the German central bank (*Bundesbank*) are published annually since 1960, estimations of fixed assets are only available from 1992 onwards.

to 12 trillion Euros, or about 400% of national income, at the lower end of international comparisons. This being said, our estimate is more than 2 trillion Euros higher than what the official HBS data suggest.

Figure 2: Aggregate real estate and business wealth: HBS vs. revised estimates, 1991-2021
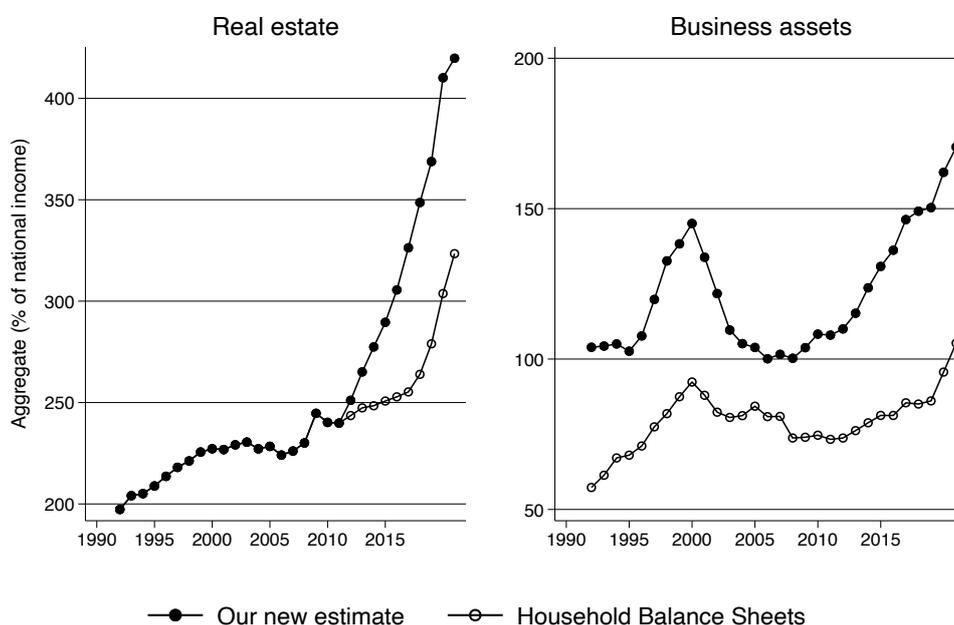
Sources: See Data Appendix DA 4. *Note:* The figures compare the official HBS numbers for real estate and business equity with our estimates for the respective asset types. Business assets include shareholdings in both corporate and non-corporate firms.

Business wealth   Business wealth is the sum of equity in (1) public limited companies, (2) private limited companies and quasi-corporations,[4] and (3) unincorporated businesses. In 2021, the official HBS denotes (1) ca. 1,500 billion Euros for public limited companies,[5] (2) 270 billion Euros for private limited companies and quasi-corporations, and (3) 1,300 billion Euros for unincorporated businesses. Hence, business wealth sums to a total of ca. 3,000 billion Euros according to the official HBS. We stick to the HBS numbers for (1) public limited companies and (3) unincorporated businesses, which we consider to be accurate.

However, the estimation of wealth in private limited companies and quasi-corporations (2) is more difficult, but particularly important in the case of Germany since a substantial part of the business sector – especially the successful "Mittelstand" comprising more than 90% of the firms – is privately held. The estimate of 270 billion Euros for (2) seems implausibly low given that the richest 1,000 families (ca. 0.01% of German households) hold a total wealth of 1,000 billion Euros according to the *Manager Magazin* rich list of 2021, mostly invested in privately-held corporations and quasi-corporations.

Our revision of German business wealth in private limited companies and quasi-corporations applies international valuation methods for non-listed corporate business wealth. In essence, we follow the procedures of the U.S. Federal Reserve to compute the market value of closely held corporate equity in the

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

[5]This includes listed and non-listed shares in public limited companies and investment funds.

Financial Accounts of the United States (Ogden et al. 2016). We multiply the earnings of such businesses recorded in tax data with the ratio of market value to earnings from publicly traded companies, applying discounts of 25% and 50% for private limited companies and quasi-corporations, respectively, to reflect the lack of liquidity of closely held shares.[6] The European System of Accounts advises a similar strategy (Eurostat 2013, p. 178). 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. Our estimation procedures by legal form are outlined in detail in Data Appendix DA 4.

Adding up these different components (public limited companies, private limited companies, quasi-corporations and unincorporated businesses) yields an estimate for total business wealth owned by German households of approximately 5,000 billion Euros in 2021, or to more than 170% of national income. The right-hand graph of Figure 2 contrasts our new estimate with business wealth according to HBS. Our estimated business wealth is 1.6 times higher as the HBS' figure. We benchmark our revised estimate against other data sources. First, according to the official balance sheets for institutional sectors, the German non-financial corporate sector's net worth was 4,000 billion Euros in 2021 (this number excludes unincorporated businesses). Given that (a) 90% of German firms are family-owned, (b) that foreign or public holdings are of overall limited quantitative importance, and (c) that the financial corporate sector is not even included here, our estimate of about 3,700 billion corporate and quasi-corporate business wealth held by German households is still conservative. Second, US business wealth (both corporate and non-corporate) is about 30% of total private wealth (Saez & Zucman 2016). Revising upwards the German business share from 15% (official HBS) to 25% (our revised estimate) brings Germany in line with international magnitudes.

Broader implications of upward revisions of real estate and business wealth Our revisions speak to a puzzle in comparative work on wealth-income ratios: So far, the German aggregate wealth-income ratio was thought to be substantially lower than in other OECD countries with researchers unable to provide an economic explanation or to pinpoint the methodological problem in the official Household Balance Sheets (Piketty & Zucman 2014, p. 1275). Our two revisions—accounting properly for the price surge in real estate and moving to a valuation of non-listed business wealth that reflects market values—lift the aggregate wealth-income ratio by 120% on average for the period 2013-2021 relative to the official Household Balance Sheets, resulting in a total wealth-income ratio of close to 700% for recent years. The supposed differences in private wealth accumulation were in fact due to non-market valuations in the official German numbers.[7]

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[6] The choice of our discount is based on private company discounts estimated in the corporate finance literature. For example, Koeplin et al. (2000) estimate a discount of 18% to 31% for domestic firms.

[7] Since the publication of our first working paper Albers et al. (2022), the German Central Bank has acknowledged the previous under-reporting and integrated corresponding corrections for business wealth for their distributional wealth accounts (Bundesbank 2022).

What are the implications of these data revisions for the debate about the differences between Anglo-Saxon versus Continental European capitalism for the level of wealth-income ratios? Piketty & Zucman (2014, p. 1281) relate the larger value of Tobin's Q ($\frac{\text{market value}}{\text{book value}}$) of the corporate sector in Anglo-Saxon countries vis-à-vis France and Germany to the 'stakeholder effect', i.e. that shareholders have less power compared to other stakeholders in the latter than in the former.[8] Our revisions to the numerator of Tobin's Q, the market value of the German corporate sector, imply an upward correction of Tobin's Q from $\bar{q}^{GER^{PZ}}_{1991-2010} = 50\%$ to $\bar{q}^{GER^{NEW}}_{1991-2010} = 58\%$ (see Appendix Figure A.2 for a graphical comparison). In the international context, this means that Germany's Tobin's Q is closer to the French one ($\bar{q}^{FRA}_{1991-2010} = 74\%$) than previously thought, but that a substantial gap to the Anglo-Saxon countries ($q^{US}_{1991-2010} = 99\%$; $q^{UK}_{1991-2010} = 113\%$; $q^{CAN}_{1991-2010} = 85\%$) remains.

In principle, this result reaffirms the differences between Anglo-Saxon and Continental European countries (Piketty & Zucman 2014). However, the German case points to a complementary explanation beyond the stakeholder effect and pertains to the importance of non-listed vs. listed firms. The private limited company, *GmbH*, is a particularly popular legal type. Following international conventions, we impute the wealth of such companies by using observed public price-earnings ratios and apply a discount of 25% to account for the lack of liquidity of shares in such companies (similar to Ogden et al. 2016, for the US). Given that large differences in the market capitalization exist across countries, a corollary is that the lack of liquidity of non-listed corporations introduces a systematic difference in the level of corporate wealth between countries with a high level of market capitalization (Anglo-Saxon countries) and those with a relatively low level such as Germany even absent of a stakeholder effect and imperfect national balance sheets.[9] Differentiating the liquidity and stakeholder effects goes beyond the scope of this paper, but is a promising avenue for future research.

2.2   Data for the distribution of wealth

Wealth tax data   Wealth tax data constitute our main source for the distribution of wealth. These data are available for Germany for 100 years (1895-1995). In 1995, the German Federal Constitutional Court ruled that unequal tax treatment of different forms of wealth was unconstitutional.[10] Upon this decision, the German government chose to suspend the wealth tax rather than to reform the legislation. Before, depending on the period, between 2% (post-war period) and 14% (pre-World War I) of all tax units had had to declare their wealth to the authorities.

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[8]In principle, the national Tobin's Q should be around unity. As Piketty & Zucman (2014) point out, an alternative explanation is that either the overestimation of book values or the underestimation of market values in the national balance sheets lead to a Tobin's Q below unity in European countries.

[9]Higher market capitalization (as percent of GDP) is associated with a higher Tobin's Q, as shown by Appendix Figure A.2.

[10]Real estate wealth had been fully assessed for the last time in 1964 at cadastral values (*Einheitswerte*). These were systematically lower than the market valuation of other asset types.

For the period 1895-1914, we use wealth tax data from Prussia. For 1913, we can estimate wealth concentration in the German Reich as a whole drawing on the *Wehrbeitrag* – a one-time wealth tax levied to fund Germany's military build-up at the eve of World War I. This levy also allows us to benchmark the German Empire's wealth distribution against that of Prussia, which encompassed about 60% of Germany's population (Data Appendix DA 1.3). Concluding that the structure and distribution of wealth in Prussia are likely representative for Germany as a whole, we extrapolate the German benchmark estimate for 1913 backwards until 1895 employing the Prussian data. For the years 1924 to 1934, we can draw on a new federal wealth tax that equally applied to all German states. For post-war West-Germany, wealth tax data are available from 1953 until 1995.[11]

Survey data   We use all three German household surveys that document information on household wealth. The Income and Expenditure Survey (*Einkommens- und Verbrauchsstichprobe (EVS)*) was initiated in West Germany in 1962/3 and includes questions on household wealth since 1978.[12] We use the harmonized EVS+, which is constructed by Bönke et al. (2013) and Bartels et al. (2020). It provides consistently defined income, expenditure, and wealth variables (see Data Appendix DA 4 for more details on the data harmonization procedures). The Socio-Economic Panel (SOEP) includes a wealth questionnaire in 2002, 2007, 2012, and 2017. The European Central Bank's Household Finance and Consumption Survey (HFCS) was first released in 2011 and continued in 2014, 2017 and 2021.

Survey data are known to have some shortcomings for inequality measurement. First, survey data only capture a fraction of total business and financial assets (mostly held by the top) while capturing most of total real estate wealth (mostly held by the middle class). Appendix Figure A.1 reports the respective coverage in the German case. To close this gap, we uprate all survey data to macroeconomic aggregates (see Section 2.3). Second, the EVS data do not record business assets, but business assets represent a substantial share of the portfolio of the wealthy. This creates a downward bias for inequality measures as the German business sector mostly consists of closely held family firms, i.e., not publicly traded firms at the stock exchange. We impute business wealth in EVS using distributional information from SOEP, making its coverage consistent with SOEP and HFCS data. Finally, surveys are known to miss the very wealthy at the top of the distribution, thus creating a downward bias for income and wealth inequality measures (Bartels & Metzing 2019, Bartels & Waldenström 2022).[13] Assuming wealth at the top to follow a Pareto distribution, Vermeulen (2018) and

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[11]After 1989 large exemptions for business wealth were introduced, which makes the two last wealth tax statistics from 1993 and 1995 of limited use for the study of top wealth shares. We use wealth tax statistics up to 1989.

[12]According to the statistical office, the microdata of the EVS 1962/3, 1969, and 1973 have been destroyed and, thus, are no longer available for research. See Statistisches Bundesamt (2013) for further details on the survey's methods and implementation.

[13]German household survey data provide substantially lower top wealth thresholds than suggested by the list of the *Manager Magazin*, although with varying gaps. Appendix Table A.1 shows that net wealth of the top 0.01% is at least 5 million Euros according to EVS, but above 12 or 13 million according to SOEP and HFCS, respectively, and more than 100 million according to the MM-list in 2018. EVS does not record business wealth, which is a central reason for the overall lower wealth values in EVS.

Bach et al. (2019) impute the 'missing rich' in HFCS data using information from rich lists. We connect our paper to these papers using rich lists to complement the missing rich at the top.

Lists of large wealth holders   Since 2000, the German business magazine *Manager Magazin* (MM) has annually published a list of rich individuals and families. Journalistic wealth rankings, like the MM-list, come with a number of uncertainties. First, net wealth is estimated based on a variety of data sources and the methods employed to bring these data sources together are not documented for the public. Hence, it is impossible to reconstruct and check these lists against alternative data sources, methods, and assumptions. Second, net wealth might be overestimated because liabilities are often underestimated. However, many privately held firms in Germany are family-owned, often for generations, and equity-to-asset ratios tend to be high.[14] Lastly, many entries of the MM-list refer to a large family and it is unclear how many households a single family represents. Based on the work by Bach et al. (2019, p. 8), we assume that, on average, each entry represents about four households.[15] From this assumption it follows that ca. 0.01% or 0.005% of German households are listed in the MM-list in 2018 or 2021, respectively.

2.3   Estimating the distribution of wealth

Our principal measure of inequality is a quantile's share in overall wealth, e.g., the wealth share of the top 1%, top 10%, 50-90%, or the bottom 50%. We estimate wealth shares using the generalized Pareto interpolation method developed by Blanchet et al. (2022).[16] For the 1924-1989 period , we draw on wealth tax tabulations to measure the distribution of wealth. We adjust the fiscal values in these tabulations to market values by leveraging our own aggregate wealth estimates. Dividing total market wealth by total fiscal wealth for each asset type, we compute asset-specific uprate factors, which we then apply to the wealth tax tabulations (for further details, see Data Appendices DA 1-DA 3). For the 1993-2021 period, where we draw on survey data to measure the distribution of wealth, we have to adjust the survey data to account for the underrepresentation of top wealth households (top-correction) and undercoverage of business and financial assets (uprating).

The top-correction and uprating procedure for the 1993-2021 period involves several steps. First, we start with unadjusted survey data and compute each percentile's share $s_{p,a}$ in total wealth of asset a as

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[14]Comparing tax data of deceased persons with their fortunes documented in the *Forbes* list, Raub et al. (2010) find that net worth was overestimated by approximately 50 percent, primarily due to assessment difficulties, fiscal distinctions, and poor assessment of liabilities. However, one should note that few German firms are listed at the stock exchange and most German firms have a low level of indebtedness. On average, the equity ratio of the German *Mittelstand* was 30% in 2016 (Gerstenberger 2018). Thus, the critique of Raub et al. (2010) may not apply to Germany.

[15]Bach et al. (2019) collected publicly available information on the number of shareholders per rich list entry as well as information from the editors of the list and estimate that each entry represents about four households.

[16]Pareto interpolation is traditionally applied in the literature on long-run series of top income and wealth shares. See Bartels (2019) for an exposition of this method for the estimation of top income shares on the basis of German income tax data.

$$s_{p,a} = w_{p,a} / \sum_{p=0}^{p=99} w_{p,a} \qquad (1)$$

where $w_{p,a}$ is total wealth of percentile p in asset category a. Note that, at this stage, total wealth is the total recorded in survey data. For EVS, we apply the business wealth distribution, i.e. $s_{p,business}$, recorded in SOEP.[17]

Second, we top-correct the distribution. We increase the asset-specific shares $s_{top1,a}$ of the top percentile by adding the asset-specific share held by the top 0.01%, which is recorded in the MM-list, and reduce asset-specific shares of the bottom 99 percentiles proportionately.[18] We also top-correct the top percentile's share $s_{top1,a}$ held in total real estate and in total financial assets, because HFCS data (oversampling wealthy households) and wealth tax data show substantially higher shares of the total held by the top percentile.[19]

In a third step, we uprate the distribution similarly as in US Distributional Financial Accounts (Batty et al. 2019). We multiply the top-corrected percentile shares $s_{p,a}^{tc}$ obtained from the survey data with the macroeconomic aggregate of the respective asset type. We do the same for debt. By applying the survey data plus the MM-list top-correction to the macroeconomic aggregates, we implicitly assume that the uprating factor is constant across the distribution.[20]

Fourth, we compute total net wealth tnw_p and average wealth of each percentile. Each percentile's total net wealth is then given as

$$tnw_p = \sum^{a} s_{p,a}^{tc} \cdot T_a \qquad (2)$$

where T_a denotes the macroeconomic aggregate of asset category a. Lastly, we use the generalized

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[17] We compute each percentile's share of business wealth in SOEP, $s_{p,business}$ of the nearest survey year (e.g., SOEP 2017 for EVS 2018) and then transfer every percentile's share to its respective counterpart in the EVS net wealth distribution (see Data Appendix DA 4.4 for discussion and additional Figures).

[18] We choose to replace wealth above the 99th percentile for three reasons. (1) Looking at the wealth thresholds presented in Table A.1, we can be reasonably confident that survey data are representative up to the 99th percentile. (2) The *income* share of the top 1% is typically underestimated by survey data when comparing survey and income tax data, while the income share of the P90-99 matches quite closely (Bartels & Metzing 2019). (3) The top percentile of the income and wealth distribution consists of business owners while the middle class up to the 99th percentile largely draws on labor income and is mostly invested in owner-occupied housing (Bartels 2019). Housing is well-captured by survey data, while only a small share of aggregate business wealth is captured in surveys (see Appendix Figure A.1). One could argue that we should choose a lower cutoff than the 99th percentile given that EVS probably under-represents top wealth even more than SOEP and HFCS (see Appendix Table A.1). By choosing a comparably high cut-off above which we replace top wealth, our estimates represent a lower bound of wealth inequality.

[19] More precisely, we use the estimate from HFCS 2011 and 2014 and adjust the top percentile's share in total real estate upwards by 5% in EVS, SOEP and HFCS 2017 and 2021. We draw on wealth tax data for the top percentile's share in total financial assets and adjust survey data upwards by 5%. We reduce the share of the bottom 99% proportionately.

[20] One could argue that our uprating factor should increase moving to the top of the distribution, because under-reporting of wealth and under-representation of the wealthy is likely more prevalent at the top. Then, we would have to modify the asset-specific percentile shares, i.e., increase those of higher wealth classes and reduce those of lower wealth classes. However, our proportional strategy aims to apply the most conservative assumption so that our estimates will represent a lower bound of wealth inequality.

Pareto interpolation method developed by Blanchet et al. (2022) to estimate wealth shares and the Gini co-efficient based on the top-corrected and uprated percentile distribution. The generalized Pareto interpolation method draws on average wealth and the wealth threshold for a number of fractiles. In our case, the interpolation relies on 101 fractiles consisting of 99 percentiles and the top percentile being split into two fractiles: ca. top 0.01% recorded in the MM-list and the ca. 99-99.99% recorded in the survey data. The generalized Pareto interpolation ensures a smooth distribution below and above the MM-list threshold. We refer to uprated and top-corrected survey data as EVS-TU, HFCS-TU, and SOEP-TU, respectively.

2.4 The importance of consistent wealth valuation across data and over time

The challenge of creating consistent long-run wealth inequality series requires researchers to make critical choices. Section 2.2 and 2.3 document these choices for our case: (1) uprating fiscal values to market values for the period 1924-1989, as well as (2) uprating and (3) top-correcting survey data for the period 1993-2021. In this subsection, we show how these choices affect the series and how combining inconsistent series leads to severe misinterpretations.

### Figure 3: Consistent and inconsistent estimates of wealth distributions
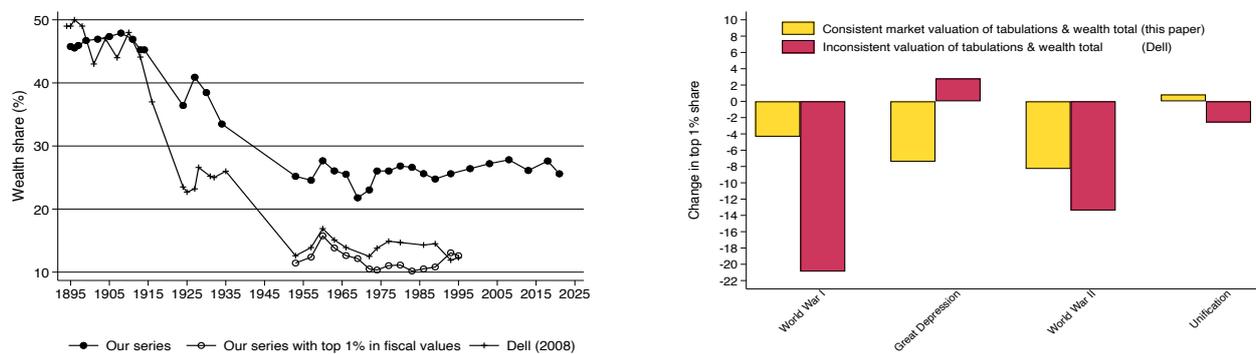
(a) Top 1% wealth share (Our estimate vs. Dell 2008)   (b) Changes of Top-1% share around break points

Notes: Figure (a) and (b) based on own calculations. Comparison data are from Dell (2008). Dates associated with breaks: World War I (1913-1927); Great Depression (1927-1934); World War II (1934-1952); Unification (1989-1993).

Consistently applying market prices to both distributional data and wealth aggregates has important implications for levels and changes in long-run top 1% wealth share series. The left panel of Figure 3 shows that using fiscal values for top 1% wealth, but market values for total wealth, as done by Dell (2008), produces around 10pp. lower top 1% wealth shares than our series which uses market values for both. Perhaps even more worrying than these significant level differences are potential misinterpretations of larger shifts in the German wealth distribution. The right panel of Figure 3 illustrates this by comparing the changes of the two series around important break points. According to Dell's series, World War I was the most important shock, the Great Depression in- rather than decreased the top 1% share, and unification led to a decrease in wealth

concentration. As will become apparent throughout the paper, none of these conjectures is plausible. The use of inconsistent distributional and aggregate series by Dell (2008) is an extreme case. However, using fiscal values for both aggregates and distributional data as in the 1934-1980 series by Baron (1988) can also produce misleading estimates.[21] These comparisons highlight the importance of carefully checking, and potentially revising, previous distributional wealth data and wealth aggregates.[22]

Figure 4: Uprating, top-correction and measures of wealth inequality, 1993-2018
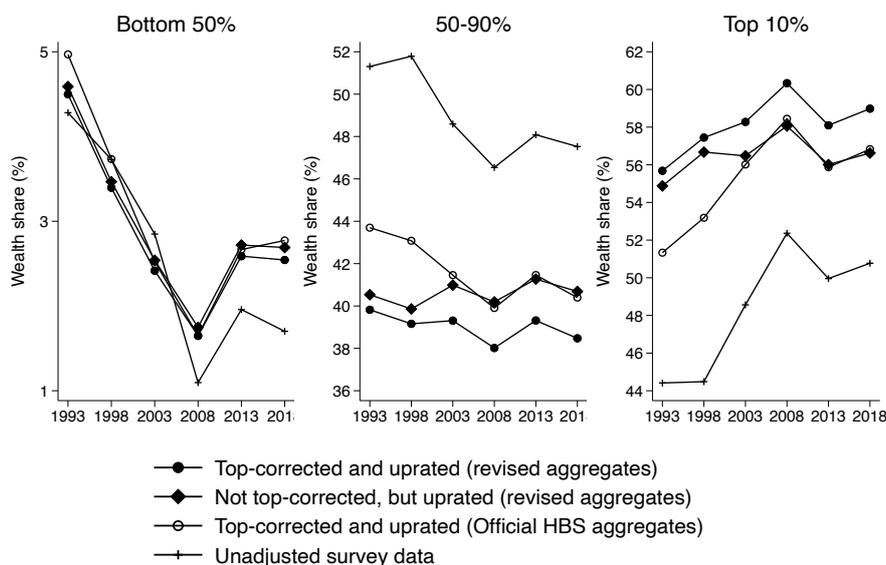
Source: EVS-TU, Official and revised HBS.

How do uprating and top-correction alter the wealth inequality measures for the period 1993-2018? Figure 4 employs our estimates at various levels of adjustment to show the importance of the consistency of survey and aggregate wealth data as well as the top-correction. Relative to the uncorrected survey data, our final estimate of the top decile's wealth is between 8 to 12pp. higher, the bottom 50%'s share between 0 and 1pp. higher, and the share of those between the 50-90th percentile correspondingly smaller. The bulk of these differences originate from our choice to uprate the survey data. The bottom 50%'s share increases slightly as this group under-reports their financial wealth held in current accounts. Survey data only capture a fraction of total business and other financial assets, mostly held by the top, while capturing most of total real estate wealth, mostly held by the middle class (see Appendix Figure A.1). The impact of the top-correction on inequality measures—i.e., adding the assets held by the top 0.01% as recorded in the MM-list, and decreasing the shares of the bottom classes correspondingly—is meaningful (up to 2pp.) but smaller.

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[21] Evaluating wealth according to fiscal definitions creates a series that is more sensitive to stock market cycles, because tax-assessed (=fiscal) values of stocks were in market prices, while tax-assessed values of agricultural, business, and real estate assets were generally lower than market values. As a case in point, Appendix Figure A.5b documents an explosion of the top 1% share in Baron's series around 1960 when the German stock market boomed. In contrast, our series consistently applies market values such that the increase in the top 1% is more muted and year-to-year comparisons are more sensible.

[22] To further illustrate this point, Appendix Figure A.5c compares our final series to a series using our distributional data while employing the wealth total from Piketty & Zucman (2014). We elaborate on the difference between our and their wealth-income ratio in Section 3.1.

Taken together, uprating and top-correction lead to substantial revisions in the level of wealth shares. Unlike for the interpretation of German wealth inequality until the 1990s based on Dell's top 1% series, we conclude that wealth inequality *trends* since the 1990s remain broadly unaffected by our uprating and top-correction choices. Yet, it is clear that *level* differences in the top decile's share in the range of 10pp. have implications for policy choices concerning taxation and retirement savings.

3 The long-run evolution and distribution of wealth in Germany

In this section, we present our main results on the evolution of wealth and its distribution in Germany from 1895 to 2021 and discuss them in the international context. We start with the aggregate wealth-income ratio before studying wealth shares and their evolution over time.

3.1 The wealth-income ratio in Germany, 1895-2021

Figure 5a tracks the development of the (private) wealth-income ratio for the 1895 to 2021 period. German household net wealth to national income declined from 500% at the turn-of-the-century to 200% after the shocks of the world wars and the Great Depression and then quite steadily increased throughout the post-war period. The temporary decline of the wealth-income ratio after 1990 reflects that the increase in private wealth due to the unification of East and West Germany was much lower than the increase in income. In 2021, the wealth-income ratio reached 700%.

Figure 5: Wealth-income ratio and its composition in Germany, 1895-2021
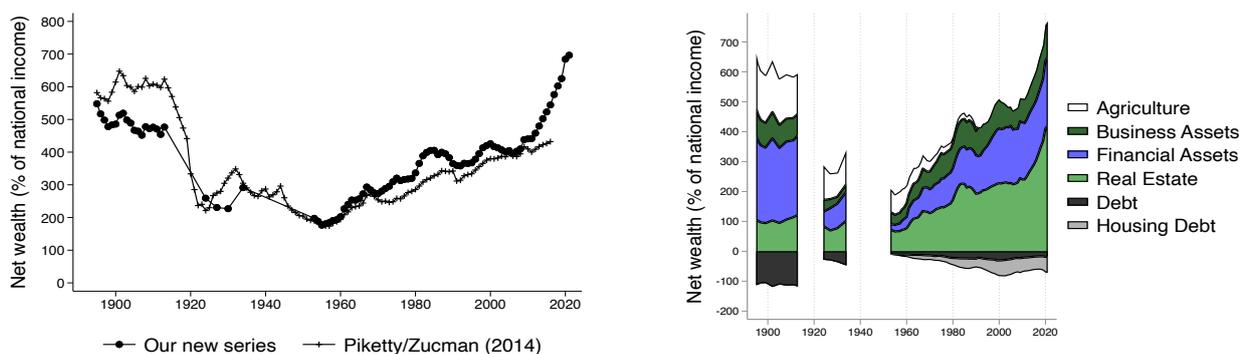
(a) Wealth-income ratio

(b) Wealth composition

Source: See Data Appendix and Piketty & Zucman (2014). National income is from `WID.world`.
*Notes:* In Figure (b), financial assets include corporate business assets because we cannot distinguish between financial asset types in the pre- and interwar periods (e.g., savings, bonds, stocks). After 1990, business assets include agricultural assets.

Even though we diverge significantly from their methodology before 1950 and use additional data sources since 1950, our results confirm the qualitative finding by Piketty & Zucman (2014) of a U-shaped wealth-income ratio. However, our estimate differs substantially in quantitative terms for two episodes. First, Piketty & Zucman rely on the official balance sheets for the most recent period. These neither capture

the house price surge nor unlisted corporate assets properly (Section 2.1) and hence their series indicates a much lower wealth-income ratio. Second, the difference between our estimate and theirs for the pre-World War I period is substantial (600% vs. 500%, see Figure 5a). Virtually all of this difference is due to the valuation of agricultural land and farm assets. In our data appendix, we show how the series underlying Piketty & Zucman (2014), while being a standard reference in German economic history, does not square with any other contemporary estimates and sources while our estimates do. The revision of the pre-World War I ratio is important in that it casts doubts about the stark difference in wealth-income ratios between the Old and New World emphasized by Piketty & Zucman (see also Waldenström 2021, 2024, for a critique).

The structure of wealth drastically changed over the 20th century, as shown in Figure 5b. Before World War I, agricultural and financial assets were the predominant type of wealth in the portfolios of German households. Real estate amounted to less than one-fifth of total household wealth. Between 1913 and 1927, the wealth-income ratio halved. As there had been no physical war destruction during WWI in Germany, the decrease in the wealth-income ratio reflects the capital stock's revaluation and inflation-induced losses on nominal assets. Savings lost 85% of their value and equity lost 57% which chimes with the decline of financial assets' share in national income from around 270% in 1913 to 75% in 1927 (ca. -72%).[23] Since the 1950s, real estate continuously gained importance and now represents half of total household wealth.

Figure 6: The role of the asset valuations
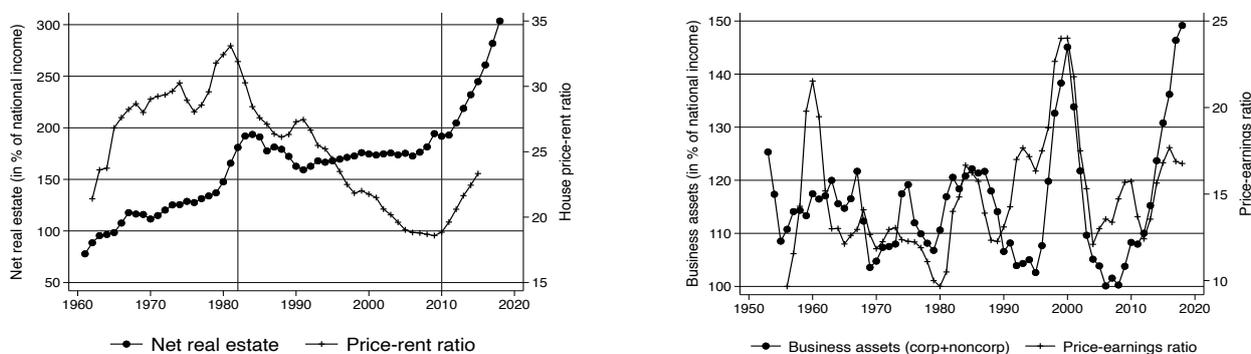
(a) Real estate

(b) Corporate and non-corporate business wealth

Source: Estimates for real estate and corporate and non-corporate wealth are our own. National income is from `WID.world`. For the construction of the price-earnings ratio and of the house price-rent ratio (inverse rental yield), see Data Appendices DA 8.1 and DA 8.2, respectively.

Valuation swings are key to understanding the fluctuations of the wealth-income ratio (Piketty & Zucman 2014, Artola Blanco et al. 2020). Figure 6a plots the real estate wealth-income ratio against the house price-rent ratio. During the 1960s and 1970s, demand for owner-occupied housing and, thus, prices were high despite substantial building activity and increasing home-ownership rates (Kohl 2017). At the same

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[23]The proportional decline of real estate and business assets in national income is ca. -35% and ca. -60%, which is also in line with valuation changes induced by hyperinflation and war (see Section 4.2 and DA 7.2.4, Table 28).

time, the government subsidized social housing and regulated rents (Tomann 1990). The period beginning in the 1980s coincided with a policy-shift, indeed a deregulation of the rental market. Prices stagnated and rents increased moderately (Knoll et al. 2017, Jordà et al. 2019). The resulting fall in the price-rent ratio coincides with stagnant housing wealth. This trend has reversed with increasingly higher real estate valuations and growing housing wealth in the aftermath of the Great Recession, also driven by the sharp decline in interest rates. Figure 6b plots the corporate and non-corporate business wealth-income ratio against the price-earnings ratio. It shows that years with a high valuation of business wealth are also characterized by high price-earnings ratios. Compared to real estate, the evolution of business assets and their valuation is more volatile.

3.2 Wealth concentration in Germany, 1895-2021

Figure 7 shows the long-run trajectory of the top 1% wealth share in Germany. It highlights the important role that shifts during the wars and in their aftermath have played for the evolution of the wealth distribution. Effectively, the top 1% wealth share dropped by half during the 30-year-period from the beginning of World War I until the end of World War II. Until unification, it hovered around 25%, with some ups and downs throughout the post-war period. Since unification, the top 1% share has increased moderately to 26-28% (in 2021 and 2018, respectively) and yet remained fairly stable in light of the historical magnitude of changes. While the wealth-income ratio has returned to its pre-World War I levels, the top 1% wealth share is currently only slightly higher than its post-war average.

Figure 7: Top 1% wealth share in Germany, 1895-2021
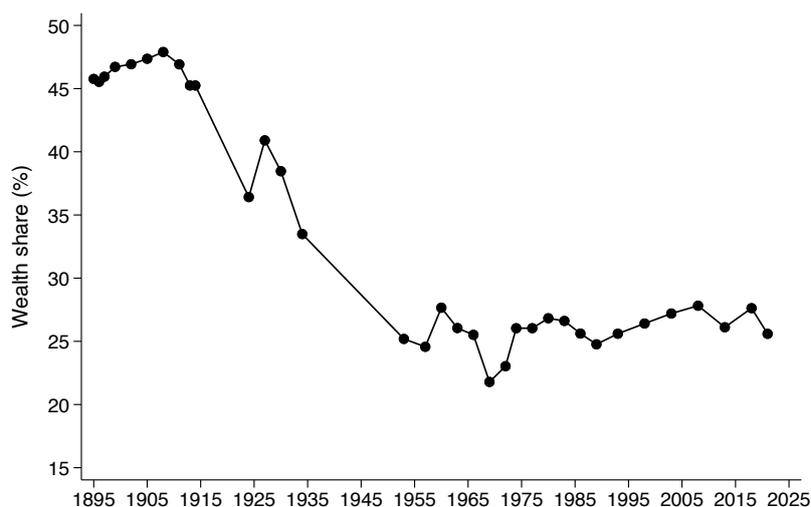
Notes: Own estimates based on wealth tax until 1989, EVS-TU 1993-2018 extended to 2021 using HFCS-TU change 2017-2021. Top 0.1% and 0.01% wealth shares are displayed in Appendix Figures A.3 and A.4.

What were historical factors and policies associated with the shocks in the first half the century, those for the post-war stagnation, and the recent moderate rise in wealth inequality? Three shocks led to a drastic

decline in wealth concentration between 1913 and the early years of the Federal Republic. Section 4 provides a detailed decomposition of these shifts. In a nutshell, World War I and the Great Depression depressed the top 1% share mainly through the revaluation of existing capital. In contrast, destruction and taxation of wealth played a more important role for the break after World War II.

In the post-war boom period, the wealth distribution remained, by and large, stable with housing wealth accumulation playing an important role outside the very top.[24] Three wealth formation laws between 1961 and 1970 introduced new policies to support wealth formation of lower wealth groups.[25] The home-owning share of the population increased from 27% in 1950, to 34% in 1968, and to almost 40% in the 1980s (Kohl 2017). Housing wealth increased from less than 100% to ca. 200% of national income (Figure 5b).

Three processes shaped the evolution of wealth inequality in Germany from the 1990s onwards. First, the income share of the bottom 50% dropped from more than 30% in the 1960s to less than 25% in the 1980s. This limited the bottom group's ability to keep up with the savings accumulation of the middle 40% (P50-90). The income share of the middle class remained stable, while that of the top decile continued to grow (Bartels 2019). Second, the home ownership rate barely grew and remained at ca. 40%. Third, the gap between capital returns and GDP per capita income growth, which had remained relatively small over the post-war decades, started to widen (Jordà et al. 2019). Taken together, these developments meant that the bottom 50% increasingly lost out in relative terms while the middle and the top benefited from increasing capital returns and rising asset prices. As a result, we observe an increase in wealth inequality in Germany since the 1990s, which we analyze in more detail in Section 5.

3.3 Germany in international perspective

How does the evolution of wealth and its concentration in Germany compare to other countries? In this part, we compare our estimates of the evolution of the German wealth-income ratio and the top percentile's share to the corresponding measures in France, Sweden, the United Kingdom, and the United States. Despite Germany's particular history, similarities with other countries do exist.

Figure 8a demonstrates that all countries in the sample experienced a sharp drop in the private wealth-income ratio between the eve of World War I and 1950. Together with the subsequent recovery, this created a U-shape pattern in various countries (Piketty & Zucman 2014, Waldenström 2017). In 2021, wealth-income ratios stood at 700% in Germany versus 550% in Sweden, 660% in the United States, 660% in France, and 700% in the United Kingdom.

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[24] The middle class's post-war housing wealth accumulation is also documented for Sweden and the United States (Roine & Waldenström 2009, Saez & Zucman 2016).

[25] Other measures included subsidies for owner-occupied housing since 1952, loans for business and education, as well as capital-forming benefits since 1961 (*vermögenswirksame Leistungen*). See Tomann (1990) and Bönke & Brinkmann (2017) for more details on wealth formation policies in Germany.

Figure 8: Germany in international comparison
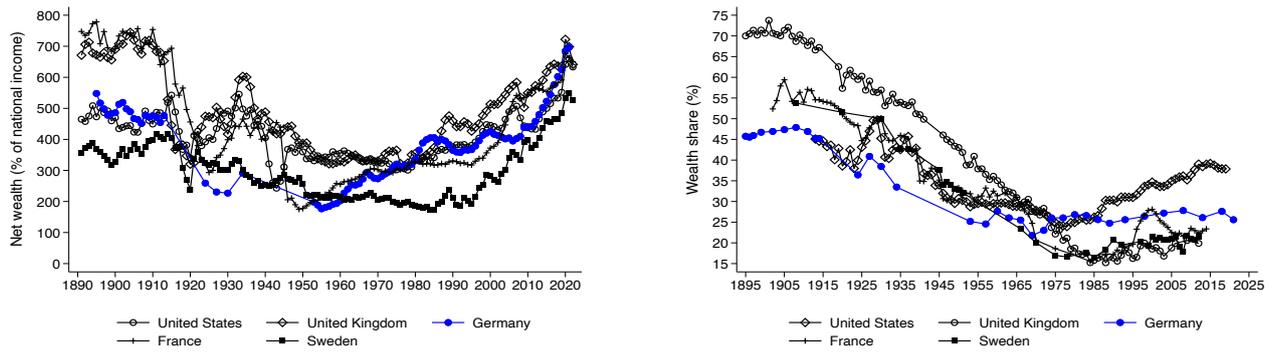
(a) Wealth-income ratio   (b) Top 1% wealth share

Source: Private wealth-income ratios except for Germany are from `WID.world`. Top 1% wealth shares for France are from Piketty et al. (2006) and Garbinti et al. (2021), for Sweden from Roine & Waldenström (2009) and Lundberg & Waldenström (2018), for the United Kingdom from Alvaredo et al. (2018) and for the United States from Saez & Zucman (2016) and Saez & Zucman (2020).

Moving from the wealth-income ratio to wealth concentration, Figure 8b illustrates that the evolution of the top percentile's share in private wealth follows the comparison group closely. All countries start at high levels of wealth concentration, which drop after World War I. The Great Depression affected the top 1% share more in the United States and Germany than in France and the United Kingdom, which is consistent with our knowledge of the relative depth of the Depression. After the sharp decline following World War II, wealth concentration exhibited a moderate downward or roughly stable trend during the Golden Age in all countries. Subsequently, there is a small to modest increase of wealth concentration since the 1980s observable in the European countries, and a more pronounced one in the United States. While country-specific *levels* of wealth concentration remain debated because of different definitions of wealth, differences in the unit of observation (households vs. tax units vs. adults), and assumptions about return heterogeneity (see, e.g., Kopczuk 2016, Saez & Zucman 2016, and Smith et al. 2023 for the US), these long-run *trends* seem to be broadly comparable across countries, independent of data and method.[26]

Three factors affect the strong international co-movement. First, fundamental economic mechanisms govern the accumulation and distribution of wealth (see e.g. Piketty 2014). Key parameters such as savings (s), economic growth (g), and return on capital (r) are similar across countries and generate similar inequal-

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[26]The capitalization method tends to produce higher *levels* of top wealth shares than results from wealth tax data (Lundberg & Waldenström 2018) or from estate tax data (Garbinti et al. 2021, Saez & Zucman 2016). The approach chosen to measure wealth concentration in a given country and at a given point in time is typically presaged by the available data sources, each carrying their own advantages and disadvantages. Wealth tax data, estate tax data, and income tax data are the three main administrative data sources used in the above-cited studies. Studies using wealth tax data are scarce due to the small number of countries taxing wealth on a broadly defined scale. Examples are Roine & Waldenström (2009) for Sweden and this study for Germany. Examples for the estate multiplier method applied to estate tax data are Kopczuk & Saez (2004) for the United States, Piketty et al. (2006) for France, Acciari et al. (2021) for Italy, and Alvaredo et al. (2018) for the United Kingdom. Capitalizing incomes from income tax data is the most recent approach for the long-run study of wealth inequality, revived by Saez & Zucman (2016). Country studies include Garbinti et al. (2021) for France, Martínez-Toledano (2020) for Spain, Lundberg & Waldenström (2018) for Sweden and Saez & Zucman (2016) for the United States.

ity patterns for countries at comparable levels of economic development. Second, policy trends and secular developments affect the wealth distribution. These include the expansion of home ownership in Western economies after World War II (Zucman 2019, p. 126) and the gradual reversal of the high-taxation regime and the liberalization of capital markets since the 1980s (Jordà et al. 2019). The third factor are globally correlated economic and policy shocks (see e.g. Roine & Waldenström 2015). Figure 8b points to their relevance in suddenly shifting top 1% shares. The revaluation in equity markets through globally-transmitted crises such as the Great Depression (Temin 1993), heavy capital taxation in the wake of wars (Scheve & Stasavage 2010, 2012), and the ensuing post-war inflations appear to have reduced wealth concentration across countries.

In the next section, we introduce a framework to study factors generating sudden shifts in the wealth distribution and apply it to the German case. Given the similarity of trends and shocks—despite substantial heterogeneity in the individual countries' experiences and policies—we believe that our exercise does not just shed light on the factors behind Germany's wealth inequality ruptures, but that the insights likely apply to other countries as well.

4 Accounting for large shifts in the wealth distribution

In most developed countries, substantial shifts in the wealth distribution occurred at three moments in time: around World War I, during the Great Depression, and around World War II. These shifts provide historical experiments, that allow us to study the mechanisms behind changes of the wealth distribution. All three events had profound effects on asset prices. Additionally, the wars, World War II in particular, were associated with tax increases and direct effects of war, including a large influx of displaced people and, in many countries, substantial destruction of the capital stock. To gauge the relative importance of these factors, asset prices and taxation in particular, we introduce a general accounting framework adapting Fogel's (1964) seminal work to the study of inequality. We then apply this framework to the German case, in which said three events reduced the top 1% share by more than 20 percentage points.

4.1 Framework

Central to the older approach of Fogel (1964) is the idea to build historically plausible counterfactuals. Fogel himself was interested in the effect of railways on U.S. growth, the counterfactual being a larger canal network and no railways. In a nutshell, Fogel's idea was that the difference between the historically realized national income and a plausible counterfactual development path would allow him to approximate the effects of railways on economic growth. More generally stated, consider the function $f(x)$ that maps a state vector x onto the measure of interest. Let x describe the observed state and x' describe the counterfactual state. Then, γ reflects the difference between the realized state $f(x)$ and the counterfactual state $f(x')$ in such framework. Importantly, 'counterfactuals' in the sense of Fogel have a historical connotation: They fo-

cus on modeling some key aspects that could, a priori, have large effects. In contrast to general equilibrium models, the approach remains partial in that it neither captures second and third round effects nor has an underlying theoretical structure (see Donaldson & Hornbeck 2016, for a description of his methods and a comparison to a modern general equilibrium framework). To avoid confusion, we use the term 'historical hypothetical' or simply 'hypothetical' instead of 'counterfactual' henceforth.

With this limitation in mind, we adapt this framework to the analysis of top wealth shares. Total wealth W is held by N households, each possessing wealth $w_i, i = 1, ..., N$. $Q(p) = F(w)^{-1}$ is the quantile function, representing the inverse of the empirical cumulative distribution function $F(w)$ and returning the wealth thresholds w_p of percentile p. $S(p) = S\left(\frac{\sum_{i=1}^{N} \mathbf{1}_{w_i < Q(p)}}{N}\right) = 1 - \frac{\sum_{i=1}^{N} w_i \mathbf{1}_{w_i \geq Q(p)}}{W}$ defines percentile p's cumulative wealth share on the Lorenz curve. In practice, historical inequality research faces data limitations in that we only have information about the wealth of N^{TP} taxpaying households, $\{w_j^{TP}\}_{j=1,...,N^{TP}}$, at the top of the distribution. By definition, the households paying a wealth tax are the richest such that applying the indicator function to N^{TP} instead of all N households is a warranted simplification when computing top 1% wealth shares. Equation 3 defines the top share T(.99) accordingly:

$$T(.99) = 1 - S\left(\frac{\sum_{i=1}^{N} \mathbf{1}_{w_i < Q(.99)}}{N}\right) = \frac{\sum_{j=1}^{N^{TP}} w_j^{TP} \cdot \mathbf{1}_{w_j^{TP} \geq Q(.99)}}{W} \tag{3}$$

Equation 3 is a useful representation of the top 1% wealth share when operating in data-scarce historical settings. It highlights that to calculate a top 1% share it suffices (i) to know the total number of households N, (ii) to know the total net wealth W, and (iii) to have wealth tax data on at least $\frac{N^{TP}}{N} \geq 1\%$ of households. Thus, $T(.99) = f(N, W, \{w_j^{TP}\})$ summarizes the information necessary to estimate the top 1% share.

To estimate the effect γ of an event of interest on the top 1% share, we construct the corresponding historically plausible hypothetical values $N', W', \{w_j^{TP}\}'$ and estimate the hypothetical top 1% share via $f(N', W', \{w_j^{TP}\}')$. Contrary to Fogel's case, we do not always rely on *ex-post* comparisons. It is often more plausible to shock an existing distribution in t_0 with the event that will occur in t_1. For example, we construct a hypothetical top 1% wealth share in Weimar borders based on 1913 data and compare it to the Empire's top wealth share in 1913 to gauge the importance of the border change caused by World War I. In such *ex-ante* cases, the effect of interest is given as:

$$\gamma^{\text{ex ante}} = f(N', W', \{w_j^{TP}\}') - f(N, W, \{w_j^{TP}\}) \tag{4}$$

In cases in which we construct the hypothetical 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:

$$\gamma^{\text{ex post}} = f(N, W, \{w_j^{TP}\}) - f(N', W', \{w_j^{TP}\}') \tag{5}$$

Independent of whether we construct an *ex-ante* or *ex-post* hypothetical, the challenge is to find plausible values for N', W', and $\{w_j^{TP}\}'$. Constructing them for the number of households (N') and aggregate net wealth (W') is typically straightforward. For events such as the influx of expellees at the bottom of the distribution, in which the wealth and ranking of the taxpayers remains unchanged ($\{w_j^{TP}\}' = \{w_j^{TP}\}$), these parameters suffice to construct a hypothetical wealth distribution. Other events, like the Great Depression, lead to diverging asset prices and change the wealth ranking among those paying wealth taxes depending on their portfolio composition ($\{w_j^{TP}\}' \neq \{w_j^{TP}\}$). To model such changes, we expand the tabulated wealth tax data into a household-level dataset by combining two insights and a modest set of assumptions.

First, households at the top of the wealth distribution diversify their portfolios very little in terms of asset classes. For example, rural landowners held almost exclusively agricultural assets and entrepreneurs held business or financial assets (depending on the company's legal status). Second, these types of wealth holders correspond to the asset classification in the tabulated tax data. By assuming that households within a given wealth bracket hold the same net wealth—a simplifying but, given the granularity of the historical German wealth data, uncritical assumption—we can back out the number of each type of wealth holder for each wealth class. After distributing the debt among the rural and urban landowners and the saving deposits equally among all rich households within a given wealth bracket, we arrive at a household dataset. The set of assumptions, of course, is only valid when the focus of the analysis is the very top of the distribution and the tax tabulations are sufficiently granular. Both conditions are met in our case as we discuss in ample detail, along with validations, in Data Appendix DA 7.1. We show, for example, that our prediction for the 'wealth holder type' of the richest 300 Germans at the eve of World War I accords with corresponding data from a contemporary rich list (Martin 1912).[27] With corresponding household-level datasets at hand, we gauge the impact of asset price shocks such as the ones associated with World War I and the Great Depression by applying observed asset price changes to the households' portfolios (generating $\{w_j^{TP}\}'$).

A caveat of our framework is its ignorance of general equilibrium effects. The severity of this omission depends on the specific case in question. For example, there are few reasons to believe that interest rates and investment would have been substantially different in a Germany in the borders of the Federal Republic in 1934 from its actual realization in Weimar borders. However, when analyzing the effect of capital levies after World War II, ignoring general equilibrium effects may be potentially less innocuous. Given the scarcity of capital in the post-war period, the levy surely affected investment levels and, thus, indirectly wealth accumu-

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[27] See also Data Appendix DA 7.2.4 for this specific validation. To be clear, we do not claim that industrialists such as the Krupp family did not own a family residence (real estate). We posit, however, that such other assets were so small relative to the net worth of their companies (business assets) that including them would not affect our analysis.

lation and concentration in the later part of the 1950s. The effect we measure, however, only captures the immediate redistributive effects.

4.2   World War I and its aftermath: Revaluing the capital stock

Our first historical experiment is the revaluation of the capital stock during World War I. The war depressed asset prices around the world and led to inflation in most European countries (Kuvshinov & Zimmermann 2022, Lopez & Mitchener 2020). These two factors changed the relative prices of assets and, hence, the distribution of wealth.

The most obvious way in which the war affected relative asset prices was through the hyperinflation that followed it (Holtfrerich 1980). Debt was often paid back with worthless paper mark during the hyperinflation and only reinstated at 20% (Lewinsohn 1926). Savings and non-equity financial assets lost around 85% of their value. Historically less well-appreciated is the diverging price evolution of other assets, which we compare between 1913 and 1927. Real estate prices dropped by 20% due to a mix of regulation and later heavy taxation (Führer 1995). Business and financial equity assets dropped by 57% due to the economic insecurity, lack of investment during the war, and economic turmoil. In contrast, agricultural land prices rose by approximately 15% owing to increasing relative prices of agricultural products (Lewinsohn 1926, p. 165). These asset price developments affected the wealth distribution along an urban-rural divide rather than a class divide.

Table 2: World War I and the wealth distribution

Event	Sources, details & sensitivity	Shocked variables	Reference year	Most affected part of distribution	Δ Wealth in terms of national income	Δ Wealth in terms of private wealth	Δ Tax units	Δ Top 1% share
**Revaluation of capital stock**
Asset prices & hyperinflation	DA 7.2.4	W, w_j^{TP}	1913	whole	$-142\,pp$	$-30\,pp$	-	$-2.4\,pp$
**Battlefield deaths, borders, and displacement**
Territorial change	DA 7.2.1	N, W, w_j^{TP}	1913	whole	$-24\,pp$	$-5\,pp$	-8.7%	$-0.3\,pp$
Expellees	DA 7.2.2	N, W	1913	bottom	$+1\,pp$	$+0.2\,pp$	$+1.7\%$	$+0.1\,pp$
Fallen soldiers	DA 7.2.3	N	1913	bottom & middle	-	-	-3.5%	$-0.5\,pp$
Sum of partial effects ($\sum \Delta$ Top 1%)								$-3.0\,pp$
Total observed change in top 1% share (1913-1927)								$-4.4\,pp$

Backed by the historical evidence on limited portfolio-diversification among the super-rich, we construct household-level portfolio data for 1913 based on the tax tabulations. We then apply the observed price changes between 1913 and 1927 to these portfolios and the wealth total, constructing $\{w_j^{TP}\}'$ and W' respectively. Relative to the baseline, i.e. the relative prices and top 1% share in 1913, our quantification suggests that the diverging asset prices and hyperinflation shrank the top 1% share by 2.4 percentage points: The inequality-decreasing effects of declining equity and bond prices alongside the eradication of debt domi-

nated the inequality-increasing effects of the eradication of savings. Table 2 reports that the effects of the capital stock's revaluation were important not only relative to the actual observed changes, but also relative to three other potential factors: Battlefield deaths, borders, and displacement (for details, see the respective appendices).

4.3   The Great Depression and the drop in asset prices

Our second historical experiment, the Great Depression, focuses on yet another revaluation of the capital stock. This shock was profoundly different from the one associated with WW I since it was directed towards the richest households' main assets: listed and unlisted business wealth. Indeed, falling equity prices and valuations associated with the Great Depression serve as the main explanation for the sudden decline in wealth concentration around the world (e.g. Kopczuk & Saez 2004, for the U.S.).

Table 3: The Great Depression and the wealth distribution

Event	Sources, details & sensitivity	Shocked variables	Reference year	Most affected part of distribution	Δ Wealth in terms of national income	private wealth	Δ Tax units	Δ Top 1% share
Bankruptcies	DA 7.3.1	W, w_j^{TP}	1927	Upper class	$-14\,pp$	$-6\,pp$	-	$-2.2\,pp$
Asset prices	DA 7.3.2	W, w_j^{TP}	1927	Upper class	$-58\,pp$	$-25\,pp$	-	$-4.9\,pp$
Sum of partial effects ($\sum \Delta$ Top 1%)								$-7.1\,pp$
Total observed change in top 1% share (1927-1934)								$-7.4\,pp$

Between 1927 and 1934, German nominal stock prices dropped by 43% on average, whereas real estate and farm values fell by 20% and 8%, respectively. German bond prices decreased by a mere 4% and the value of cash and savings remained unchanged. Since business and financial assets were concentrated at the top, the heterogeneity of these asset price changes decreased the top percentile's wealth share. We proceed analogously to the hyperinflation exercise to gauge the extent of this decrease. We impute a household-level dataset containing 5 types of wealth holders for 1927, shock these with the price changes, generate hypothetical total wealth accordingly, and calculate the hypothetical top 1% share. Relative to the baseline distribution in 1927, the top 1% share dropped by almost 5 percentage points. This corresponds to about two-thirds of the observed fall between 1927 and 1934 (Table 3) and more than twice as large as the fall implied by a corresponding exercise simulating the effect of bankruptcies (see DA 7.3.1 for details on the calculation).

The asset price shock associated with the Great Depression had a much larger impact on the top 1% share than the one associated with the hyperinflation. While the latter hit the wealth distribution along the rural-urban divide, the Great Depression's asset price shock—with equities dropping most—was biased against the rich. Relative to the effect of equity prices, the role of bankruptcies in moving the top 1% was limited. Since the German case biases towards finding a large role for them—more companies were held in illiquid legal forms than elsewhere—this insight likely carries over to the experience of other countries.

4.4 World War II: Capital destruction and taxation

The quantification exercises for World War I and the Great Depression ascribe much of the respective sudden shifts of the top 1% share to asset price changes. Summarizing nine quantification exercises, Table 4 suggests that the underlying drivers for the shift associated with World War II were different: Three factors—the persecution of German Jews, capital destruction, and taxation—jointly account for 7.7pp of the observed 8.3pp shift.

Table 4: World War II and the wealth distribution

Event	Sources, details & sensitivity	Shocked variables	Reference year	Most affected part of distribution	Δ Wealth in terms of national income	private wealth	Δ Tax units	Δ Top 1% share
Battlefield deaths, borders, and displacement								
Territorial change	DA 7.4.2	N, W, w_j^{TP}	1934	Whole	$-94\,pp$	$-32\,pp$	-35%	$+0.0\,pp$
Expellees	DA 7.4.3	N, W	1952	Bottom	$+5\,pp$	$+2\,pp$	$+12\%$	$+0.8\,pp$
Fallen soldiers	DA 7.4.4	N	1934	Lower & middle	-	-	-7%	$-0.8\,pp$
Persecution under the Nazi regime								
Persecution of German Jews	DA 7.4.1	N, W, w_j^{TP}	1934	Whole	$-9\,pp$	$-3\,pp$	-0.8%	$-1.0\,pp$
Destruction of capital								
Bombing	DA 7.4.5	W, w_j^{TP}	1934	Middle & top	$-47\,pp$	$-17\,pp$	-	$-2.2\,pp$
Asset seizures	DA 7.4.6	W, w_j^{TP}	1934	Top	$-3\,pp$	$-2\,pp$	-	$-0.8\,pp$
War and post-war taxation of capital								
War taxation (business)	DA 7.4.8	W, w_j^{TP}	1934	Top	$-2\,pp$	$-1\,pp$	-	$-0.6\,pp$
War levy on real estate	DA 7.4.8	W, w_j^{TP}	1934	Upper middle & top	$-5\,pp$	$-2\,pp$	-	$-0.4\,pp$
Post-war wealth levies	DA 7.4.9	W, w_j^{TP}	1952	Upper middle & top	$-21\,pp$	$-10\,pp$	-	$-2.8\,pp$
Revaluation of capital								
Asset prices & currency reform	DA 7.4.7	W, w_j^{TP}	1934	Bottom & top	†	†	-	$+0.2\,pp$
Sum of partial effects ($\sum$ Δ Top 1%)								$-7.7\,pp$
Total observed change in top 1% share (1934-1952)								$-8.3\,pp$

Notes: †: not reported because of a lack of comparability due to currency reform.

First, we focus on the effects of the persecution of the German Jewry. While the economic status of the German Jewry was by no means as elevated as Nazi propaganda wanted people to believe, it would be equally wrong to say that it corresponded to the average of the population (Barkai 1988). Jews were strongly represented in professions of high economic and social status, such as lawyers, doctors, university professors, and managers (Huber et al. 2021) and traditionally lived mostly in richer urban areas, in particular in Berlin (Barkai 1988, Chapter 4). Encompassing many forms of expropriation, from extractive taxation in the form of wealth levies to plain private robbery (Ritschl 2020), their persecution likely shifted wealth shares. Based on rich previous work (Barkai 1988, Junz 2002, Fremdling 2016, Ritschl 2020), we reconstruct the number of Jewish German tax units living on territory of the later Federal Republic (0.8% of all households), their net wealth (3.1% of total net wealth), and the distribution among taxpayers. We use these to construct hypothetical values $N', W', \{w_j^{TP}\}'$ and estimate a hypothetical top 1% share in 1934. Assuming that all persecution, murder, and expropriation happened in 1934, our results suggest a reduction of the top 1% wealth share by

one percentage point relative to the baseline of the actual distribution in 1934 (Table 4).

The second important factor for the shift in the top 1% share was the destruction of capital, which took two forms: the physical destruction, in particular through air raids, and the dismantling of war-related industries after the war. Physical war destruction reduced total net private wealth by 17% (Table 4). The first wave of air raids mainly targeted industrial plants and transportation systems, whereas city centers became the main target in the second phase (Brakman et al. 2004, p.204). Hence, most of the destruction pertained to real estate (64%), followed by business and financial equity (34%), and virtually none to agricultural (2%) assets. To account for the destruction's heterogeneity across asset classes, we impute a household-level dataset of the taxpayers from the wealth tax tabulations. Table 4 shows that, relative to the 1934 wealth distribution in the borders of the Federal Republic, the top 1% share decreased by around 2.2 percentage points. In spite of its large magnitude in terms of total net private wealth, the upper middle class bias in destruction—real estate was most affected—limited its effect on the top 1% share. In contrast to the bombings, the seizure and dismantling of plants and businesses in war-related industries shortly after the end of the war affected predominantly firm and equity owners. Based on a variety of sources (Cornelsen et al. 1974, Abelshauser 1975), we estimate the loss in business assets (both corporate and non-corporate). We then again exploit the imputed household dataset for 1934 and shock holdings of such assets as well as the corresponding wealth total. Our results suggest that the dismantling of the West German industry reduced the top 1% wealth share by around 0.8 percentage points (Table 4). Summing the two partial effects, our estimates suggest that capital destruction accounts for 3pp of the shift in the top 1% share.

The third important factor was the taxation of capital. During the war, the Nazi regime taxed profits excessively and also instituted a levy on homeowners. Through higher corporate tax rates, special war excess taxation, and by changing accounting rules, the Nazi regime substantially increased the tax burden for businesses, extracting up to 80% of the profits (see Banken 2018). House owners had paid the *Hauszinssteuer* ever since the hyperinflation, a tax aiming at undoing some of their windfall gains due to the eradication of the debts (Führer 1995). The Nazis forced a one-time 'redemption' at January 1, 1943 by asking for 10 times the annual amount. To gauge the effect of these taxes on the top 1% share, we impute a household-level data set as for the previous exercises. We shock total wealth and the portfolios of holders of the respective asset types with the corresponding taxes. Combined, the two types of extractive Nazi taxation reduced the top 1% share by about one percentage point (Table 4). Even though the change in net private wealth associated with the real estate levy was four times as large, the war taxation on businesses did more to reduce the top 1% shares since it targeted the top rather than the middle of the distribution.

The most substantial capital taxation was instituted after the war. It encapsulated a series of smaller emergency levies and a substantial levy in 1952, all of which are typically subsumed under the label *Laste-*

nausgleich (see Wiegand 1992, for a detailed overview). The name of this legislation – the "equalization of burdens act" – captures the spirit of this policy quite well. On the expenditure side, refugees and West-Germans whose assets were destroyed in the war received partial compensation for their lost assets and other benefits. On the income side, the *Lastenausgleich* taxed those whose fortunes either survived or increased during the war, for instance, through the eradication of debts due to the currency reform in 1948. A small allowance aside,[28] the main wealth levy constituted a quasi-flat 50% tax on the net wealth of households and companies as assessed in 1948. Instead of paying the full amount in 1952, households and companies made quarterly amortization payments including interest through 1979.[29] This *modus operandi* made the levy bearable for those paying it and allows us, virtually without assumptions, to assess the impact of the levy on the most wealthy. From the accounting perspective of the households paying the *Lastenausgleich*, future payments became a debt in 1952 and were deductible from 1953 wealth tax (and reported in the tabluated tax data). Undoing the deduction and accounting for some smaller levies, we generate the hypothetical net wealth among wealth tax payers $\{w_j^{TP}\}'$ and net private household wealth W'. Our comparison with the actual distribution in 1952 suggests that the postwar wealth levies reduced the top 1% wealth share by 2.8 percentage points.

In contrast to the persecution of the German Jewry, destruction of the capital stock, and taxation, our analytical framework suggests a limited importance of other (assessed) factors. Territorial changes did not really matter ($+0.0$) and the effect of the battlefield deaths (-0.8) and expellees ($+0.8$) on the top percentile's wealth share approximately cancel out (Table 4). The estimated effect of the changes in relative asset prices—both through the fall of equity vis-à-vis farm and real estate prices as well as the depreciation of savings in the wake of the currency reform of 1948 (Wiegand 1992)—is 0.2 percentage points, suggesting that the revaluation of existing capital associated with the shocks of World War II played a less important role for top 1 shares than for the previous two breaks.

4.5   Unification in 1990

The final historical experiment remains of considerable importance for contemporary German society. In 1990, the unification of East and West Germany amalgamated a socialist and a capitalist economy, thus combining two distinct wealth distributions. The long-run top 1% trend for Germany does not reveal a significant break—the top 1% share increases by 1.6pp. between 1989 and 1993 (see Figure 7). In the following, we evalu-

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[28] The allowance of 5,000 Marks, roughly corresponding to the average annual gross income of industrial workers in 1955 (Statistisches Bundesamt 1956), was made for those households owning less than 25,000 Marks. See §29 Gesetz über den Lastenausgleich, 14. August 1952. The allowance for companies was 3,000 Marks. It is estimated that a total of 1.5 million taxable subjects (households and companies) paid the levy (Wiegand 1992, p. 167).

[29] The combined annual payment amounted to 4-6% of the initial amount of 1948, depending on the asset type (Albers 1989, p. 288). It gave the levy the character of a wealth tax on the initially assessed net wealth in 1948 and implied that it could be paid from the returns to private wealth rather than its substance.

ate the unification effect contrasting the East and West German wealth distribution recorded in EVS in 1993, which is the first available data on the East German wealth distribution.

Table 5: Unification and the wealth distribution

Event	Sources, details & sensitivity	Shocked variables	Reference year	Most affected part of distribution	Δ Wealth in terms of national income	private wealth	Δ Tax units	Δ Top 1% share
Unifying East and West Germany	W, N, w_j^{TP}	1993	Whole	+30 pp	+8 pp	+27%	+2.0 pp
Total observed change in top 1% share (1989-1993)								+0.8 pp

East German households had accumulated several forms of private wealth during the years of the GDR. First, East German households had relatively high saving rates, not least because consumption opportunities were restricted.[30] Second, while the socialist regime pursued a complete nationalization of the housing stock, private household owned 42% of the housing stock in 1990 (Deutscher Bundestag 1995). Finally, private business with less than 10 employees continued to exist even after the general socialization of private business in 1972 (Solga 1995). Unification increased wealth concentration in Germany (see Figure A.7). The mechanics behind this are as follows: Unification increased the German population by 20% so that the size of top percentile group also increased by 20%. East German households were on average much poorer so that they entered the lower part of the wealth distribution. Rich West German households that were previously just below the cutoff of the *West German* top percentile now moved up into the enlarged *German* top percentile. These West German households were much richer than the East German households entering the bottom 99% of the German wealth distribution. In sum, total net wealth in Germany increased by 8% through unification, but net wealth held by the top percentile increased by 20% (see Figure A.7). In consequence, the top 1% share increased by 2pp. in unified relative to West Germany (Table 5).

5   Wealth dynamics since unification: 1990-2021

From 1990 onwards, household survey data allow us to study the wealth distribution across the population in unified Germany in more detail. We begin by studying the evolution of relative shares as well as wealth growth across the distribution. We then quantify the role of asset prices and savings for wealth growth in the middle and top parts of the distribution.

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[30] The East/West German average wealth-ratio was higher for savings than for total average wealth: In 1993, the overall average wealth in East Germany was roughly one-third of West German average wealth. Average savings deposits in East Germany in 1993 amounted to two-thirds of the West German average. The return on savings deposits was fixed at 3.25% in 1971 and remained unchanged thereafter (Deutscher Bundestag 1995)

5.1 Wealth and wealth growth across the distribution

Figure 9 contrasts wealth inequality measures from EVS, SOEP, and HFCS survey data, which we top-corrected and uprated to macroeconomic aggregates according to our procedures outlined in Section 2.3. It shows the Gini coefficient as well as the wealth shares of the bottom 50%, the middle 40%, and the top 10%.

Figure 9: Measures of wealth inequality by survey, 1993-2021
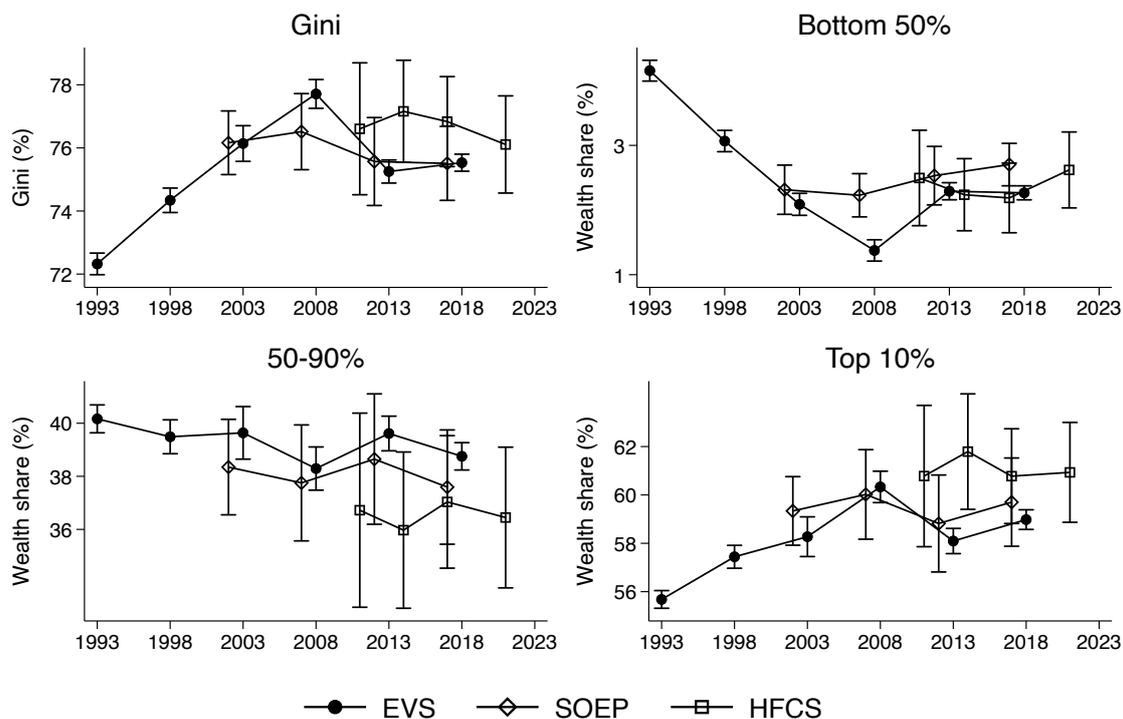
Source: EVS-TU, HFCS-TU and SOEP-TU.
Notes: Revised Household Balance Sheets according to our preferred estimates, i.e., capitalized business incomes from corporate and income tax data and price-adjusted real estate.

These four measures of relative wealth inequality indicate an increase between 1993 and 2008. This result corroborates earlier studies by Fuchs-Schündeln et al. (2010, using EVS) and Grabka & Halbmeier (2019, using SOEP and HFCS).[31] Between 1993 and 2021, the Gini coefficient increased from 72% to 76% and the wealth share of the top decile increased from 56% to 59%. On the other hand, the bottom 50% of the distribution increasingly fell behind with respect to wealth. Their share in total German wealth fell by nearly half from almost 5% in 1993 to 3% in 2021. In other words, the bottom 50% own an even smaller share of total wealth than they did 25 years ago.

We also estimated wealth distributions by capitalizing incomes recorded in personal income tax files following Saez & Zucman (2016).[32] The resulting wealth shares are similar to the survey-based estimates,

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[31]The decline in HFCS top wealth shares between 2014 and 2017 in HFCS data seems to be a measurement problem of the HFCS data rather than an economic result. According to (Deutsche Bundesbank 2019, p. 23): "In the wave 2017 it appears, in particular, that business assets in the top tail of the distribution were under-recorded. In addition, fewer very wealthy households participated in the survey compared with the survey waves in 2010 and 2014."

[32]To implement the capitalization method in Germany, we build on the income distribution constructed for the Distributional

particularly since 2008. Notably, the top 10% wealth share of ca. 60% and the bottom 50% share of ca. 3% lie within the confidence intervals of the survey-based estimates; the top 10% share is at the upper end of the survey-based estimates, while the middle 40% is at the lower end (see Appendix Figure A.8). However, the lack of home ownership information in German income tax data makes the capitalization-based series very sensitive to how one predicts the ownership and value of the home. While we think that the capitalization method is a helpful robustness check for the current levels, the survey-based distribution is our preferred series for Germany.[33]

Overall, we find similar levels and trends of inequality across the survey data. 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. HFCS estimates show slightly higher concentration at the top, but confidence intervals are large given that the HFCS sample is much smaller than SOEP or EVS. Our inequality results are somewhat lower than those from other studies that correct top wealth via Pareto-imputation, but do not uprate to macroeconomic aggregates (Grabka & Westermeier 2015, Vermeulen 2018, Bach et al. 2019).[34]

Relative wealth inequality measures, however, hide the heterogeneity of changes within the wealth distribution. The first heterogeneity pertains the question on how the growth in German wealth—15 trillion Euros since 1993—has been distributed across the distribution. The Gini and top shares depend strongly on changes within the richer half of German households owning sizable wealth. Looking at the distribution of growth offers a different perspective on wealth inequality. Recent studies on global inequality highlight

National Accounts (DINA) series for Germany in Bach et al. (2023), which is a combined distribution of income tax returns and SOEP survey respondents representing non-filers and provide us with the following incomes that we can capitalize: rental income to tenant-occupied housing, dividends to corporate assets, dividend, partnership, and sole proprietorship to business assets, interest income to fixed-income assets (deposits and bonds). For assets that do not generate taxable income such as owner-occupied housing, life insurance, private pension wealth, non-interest bearing deposits and current accounts, we match the distribution observed in survey data. Appendix Section DA 4.8 outlines how we adapt the capitalization method to the German data context in detail.

[33]Overall, capitalization-based estimates and survey-based estimates reveal similar levels of inequality in Germany, particularly in the most recent years. However, the capitalization method is less suited to track changes over time. The biggest challenge is the lack of home ownership information in German income tax data. In the US income tax, Saez & Zucman (2016) observe the property tax paid which is both an indication of home ownership and of the value of the house. Owner-occupied housing is the largest portfolio item of the middle class and, hence, both ownership and value of the house are decisive for the estimated ranking in the wealth distribution. We estimate the likelihood of home ownership in the income tax data with a logit model based on SOEP data using income fractile, age, federal state, gender, marital status and income types as covariates and then estimate the value of the house with an OLS model. The difference in trends between capitalization-based series and survey-based series are probably explained by two reasons: First, the prediction method generates a greater expansion of home ownership since the 1990s for the middle class than for the top of the wealth distribution so that the capitalization-based series shows an increase in the wealth share of the middle 40% (P50-P90) in contrast to a rather stable evolution in the survey-based series. Second, applying homogeneous capitalization factors as in Saez & Zucman (2016) generates a larger business business asset share in the bottom half (mostly small sole proprietors), which increases in the 1990s and, hence, flattens the bottom 50% share over time compared to a declining bottom 50% share in the survey-based series.

[34]These obtain a top percentile's wealth share of more than 30% for 2011, while our EVS-based estimates are about 28% and 26% for 2008 and 2013, respectively, and our HFCS-based estimate is 28% for 2011.

differential growth rates across the global income distribution.[35] While relative inequality has been the more prominent concept in applied work by economists, it is absolute inequality that many people see in their daily lives and that motivates their concerns about distributive justice (Ravallion et al. 2004, p.23).

Figure 10: Wealth growth by group, 1993-2018
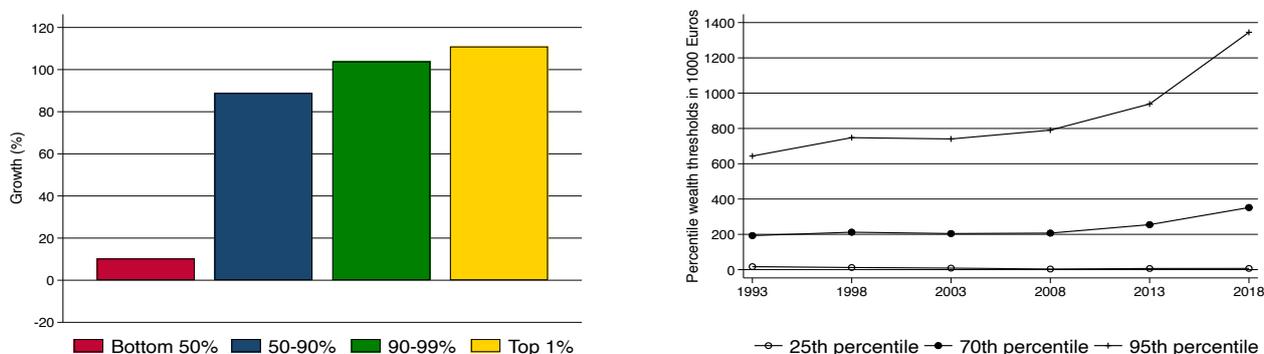
(a) Average wealth growth, 1993-2018

(b) Percentile thresholds

Source: EVS-TU.

Since unification, average wealth nearly doubled for the 50-90% and more than doubled for the top 10%, while average wealth remained nearly stable for the bottom 50% (see Figure 10a).[36] These trends are mirrored in the trajectory of median wealth for the different groups displayed in Figure 10b. The median wealth of the 50-90% (70th percentile) increased from about 200,000 Euros in 1993 to almost 400,000 Euros in 2018. Median wealth of the top 10% (95th percentile) increased from about 600,000 Euros in 1993 to almost 1.4 Mio. Euros in 2018. The overall pattern of small wealth growth for the bottom half and substantial wealth growth for the upper half is robust to the general trend of decreasing household size and aging in Germany.[37]

The German wealth distribution, however, hides very heterogeneous levels and wealth growth rates between East and West German households. Figure 11 shows average wealth growth of the bottom 50%, 50-90%, 90-99% and top 1% in East and West Germany. The richest percentile of East German households increased their average wealth from one to three million Euros or 200%, while the West German top percentile

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[35]Among the most prominent of them is the work by Lakner & Milanovic (2016): Their *elephant curve* points at the enormous income gains at the top of the global income distribution.

[36]It is often argued that the bottom 50% mostly consists of young people who eventually move up the wealth distribution accumulating wealth over the lifecycle. Appendix Figure A.12 shows that this is not the case for Germany: In the bottom half of the wealth distribution, roughly one half is older than 50 years, almost one third is older than 60 years. Only one in five household heads in the bottom half is less than 30 years old.

[37]In order to isolate the effects of smaller households and aging, we employ 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. The resulting difference in growth rates is displayed in Figure A.14. If the distribution of household size and age had remained stable since 1993, we would have observed slightly higher wealth growth for the middle class and, even more so, for the bottom 50%. Yet, the overall picture of highly unequal wealth growth remains unchanged. See Data Appendix Section DA 4.7 for details on the implementation of the method.

Figure 11: Wealth growth of the bottom, middle and top by region, 1993-2018
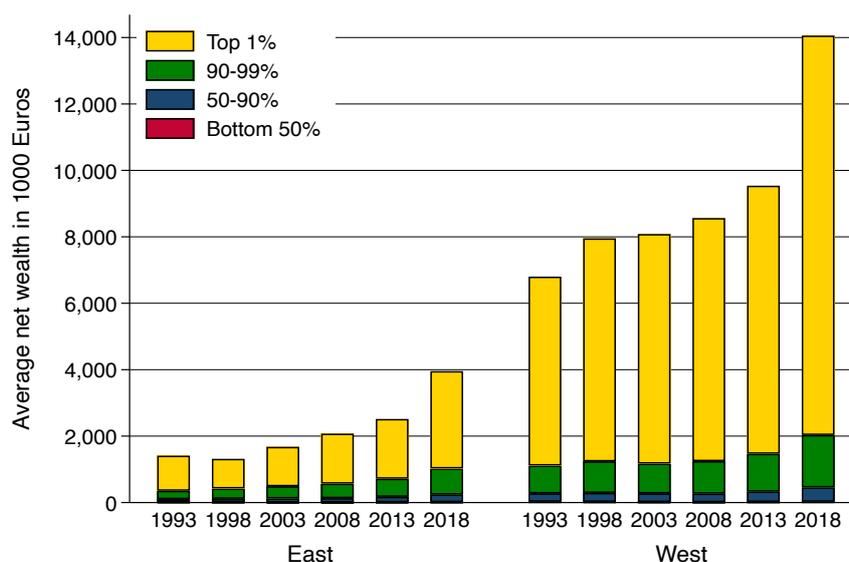
Source: EVS-TU.
Notes: Average net wealth in 2015 Euros by wealth group. Wealth groups conditional on region of the household.

increased their average wealth from six million to twelve million Euros, approximately 110%. The upper class (90-99%) in East Germany increased their average wealth from 250,000 to 800,000 Euros or 200%, while the West German upper class increased their average wealth from 840,000 to 1.6 million Euros, approximately by 90%. Middle class (50-90%) average wealth in East Germany grew from 90,000 to 230,000, or 160%, while middle class wealth in West Germany grew from 250,000 to 430,000 Euros, about 74%. The bottom 50% experienced near zero growth rates, both in East and West Germany. In a nutshell, while there has been some convergence beyond the bottom 50% in wealth levels, large discrepancies in private wealth between East and West Germany persist more than three decades after unification.[38]

In sum, the dynamics since unification are characterized by a widening absolute gap between the "have" and 'have-nots." East German households exhibited faster growth in average wealth levels than their Western counterparts, but since their initial level was so low, the gap is persistent and large. Finally, relative measures of wealth inequality showed an increase until 2008 and a subsequent decrease, while staying relatively stable overall between 1993 and today. We now turn the role of asset prices and savings for these trends.

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[38]A plausible explanation for this persistence are differences in portfolio structure. Savings deposits and other financial assets like life insurances are comparatively more important in East German portfolios and, correspondingly, housing and business assets are relatively less important in their portfolio. In consequence, the share of the absolute wealth increase attributable to these two fast-growing asset classes is smaller in the East vis-à-vis the West (Appendix Figure A.9).

5.2 Capital gains vs. savings

Capital gains create differential wealth growth, because portfolios systematically and persistently differ across the wealth distribution. The bottom 50% is mostly invested in savings deposits and other financial assets such as life insurances. Housing represents the most important asset for the German middle class (50-90%) and upper middle class with a portfolio share of almost 60% or 55%, respectively. Business assets become the dominating asset class when moving to the top percentile of the German wealth distribution and represent 50% of its wealth. Note that only 7% are held as shares in public liability companies, while the remainder is held as private liability companies, quasi-corporate, and non-corporate businesses (Appendix Figure A.11).

What share of the wealth accumulation of the above groups is explained by rising asset prices? For this exercise, we decompose wealth accumulation over time using the law of motion adapted from Saez & Zucman (2016) and Kuhn et al. (2020) and then compute the contribution of capital gains from asset price changes. We assume homogeneous price changes (see Data Appendix DA 4.6 for a detailed description of the method). 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]

Figure 12 shows the contribution of asset price changes to wealth growth by wealth group. The left-hand graph covers the full period from 1993 and 2018 and the right-hand graph zooms into the period from 2008 and 2018, when Germany saw a rapid increase in house prices. 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%. We refrain from showing the bottom 50%, because their near zero wealth growth is largely explained by decreased savings deposits and smaller consumer debt. Three results are worth noting.

First, rising equity prices account for most of top wealth gains between 1993 and 2018 (see left-hand graph of Figure 12). Wealth of the top percentile increased by 130% over this period. Almost 60% can be explained by rising equity prices. Stock prices of firms listed in the CDAX sharply increased in the second half of the 1990s. Between 1990 and 2018, stock prices increased almost fourfold in real terms. Capital gains from equity are of minor importance for the middle class as they rather invest their savings in deposits and other financial assets like life insurances, which do not generate capital gains.[40] Second, the middle class benefited more from rising house prices between 2008 and 2018 than top wealth holders, contributing almost half of

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[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. See Appendix Table A.2 for a wealth mobility matrix.

[40]As the German Bundesbank (Deutsche Bundesbank 2019, p.14) notes, German households show a strong preference for liquid and low-risk assets, which is reflected by significant inflows into savings deposits and cash as well as into claims against insurers and pension funds. For example, in 2018, 213 bn Euros held in cash by private households compared to 311 bn Euros held in listed shares. Even against the background of low interest rates since 2014, shares and investment shares have only gradually gained importance.

Figure 12: Wealth growth from asset price changes, 1993-2018 and 2008-2018
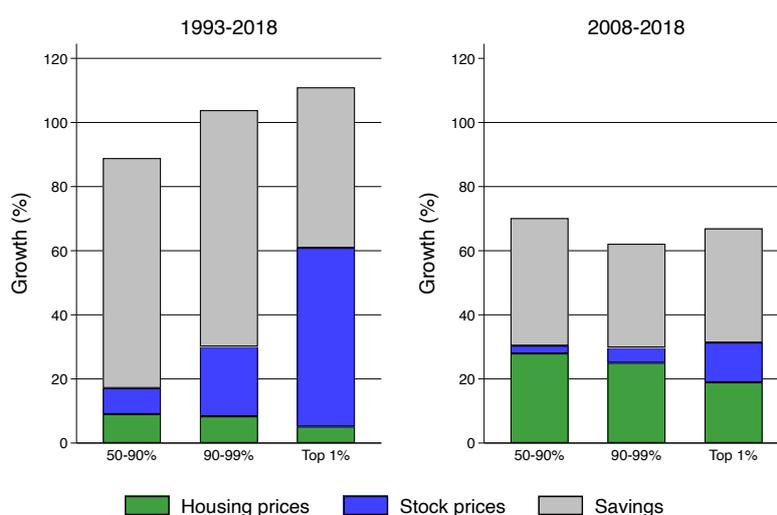
Source: EVS-TU. *Notes:* Growth from housing prices and stock prices computed using Bulwiengesa house price index and CDAX performance index following Equation 18. Grey shaded areas are synthetic savings.

middle class wealth growth between 2008 and 2018 (right-hand graph of Figure 12).

Third, high saving rates of the middle class moderated wealth inequality in Germany. As shown by the grey-shaded areas in Figure 12, more than two-thirds of middle class wealth growth between 1993 and 2018 is from savings. Thus, the middle class compensated smaller capital gains from the lack of business investments with higher savings. Between 2008 and 2018, wealth growth rates are similar across wealth groups and the level of wealth inequality remains stable. However, middle class savings could not match the large equity gains of the top during the 1990s, meaning that wealth inequality increased during the 1990s. Given that West German households are more invested in housing and equity, they gained more from rising asset prices than their East German counterparts (see Appendix Figure A.10). Fuchs-Schündeln (2008) also documents exceptionally high financial saving rates in East Germany in the 1990s, which converged with the West German average toward the end of the 1990s. Note that our assumption of homogeneous asset price changes might understate the inequality of capital gains if price gains increase with wealth.[41]

The degree of saving rates heterogeneity across wealth levels is identified as a key factor for wealth inequality dynamics (Saez & Zucman 2016, Benhabib et al. 2019): the higher the relative saving rate at the top, the more skewed is the wealth distribution. Figure 13 contrasts saving rates by wealth group for France, Germany, Spain, and the United States, demonstrating that the saving rate of the German middle class is high in international comparison. While the German and Spanish middle class (50-90%) save 10% of disposable income, the French middle class (50-90%) saves about 3%, and the US middle class saves virtually nothing.

To further illustrate the importance of middle class savings for the stabilization of the German wealth

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[41]For example, Fagereng et al. (2020) and Fagereng et al. (2019) show that returns and capital gains increase with wealth using Norwegian administrative panel data.

Figure 13: Saving rates by wealth group in international comparison
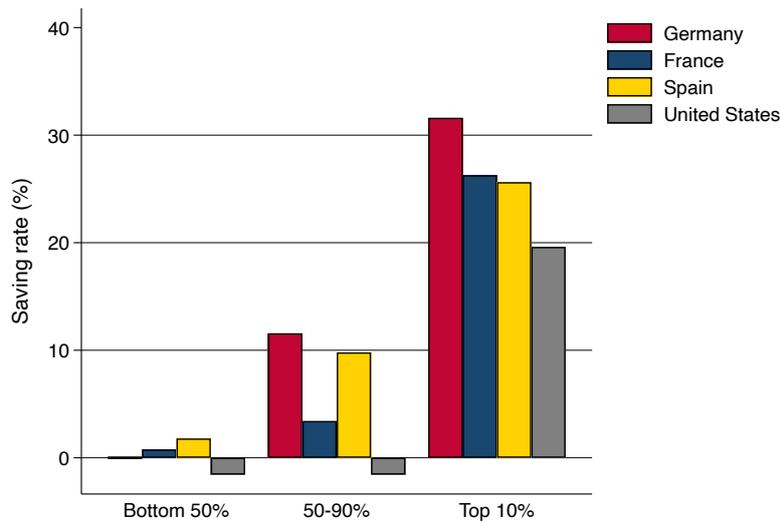
distribution, we compute counterfactual changes in the wealth share assuming German wealth groups would have saved like their US counterparts. More precisely, our US counterfactual simulates that the middle class (50-90%) would have saved nothing, the 90-99% only half of what they did, and the top 1% more than 30% (what they did in both Germany and the US). Appendix Figure A.13 shows that the wealth share of the 50-90% would have declined by 8pp., the 90-99% would have gained about 1pp., and the top 1% would have gained more than 7pp.. Strong savings by the middle class turns out as an important factor for keeping wealth concentration in Germany in check.

Figure 14: Saving rates by wealth decile based on surveyed savings
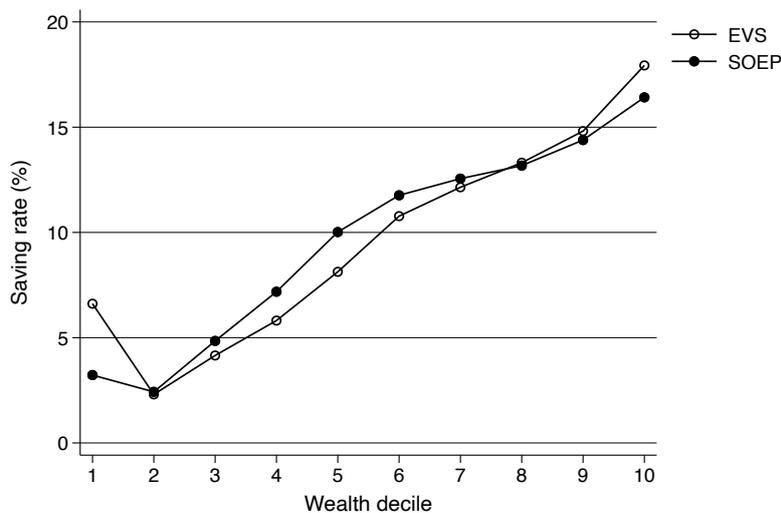
Do saving rates in Germany increase with wealth? The results from the studies displayed in Figure 13 clearly confirm such a pattern.[42] By contrast, Fagereng et al. (2019) show that saving rates in Norway are flat across the wealth distribution and that capital gains drive wealth inequality dynamics. Note that saving rates shown in Figure 13 are based on the law of motion adapted from Saez & Zucman (2016), where savings are computed as a residual. To shed light on this controversy, we assess the saving rate in Germany in two complementary ways: First, we use active savings regularly recorded by the SOEP questionnaire. Second, we use EVS information on consumption and disposable income to calculate savings. Figure 14, presenting saving rates by wealth decile based on SOEP and EVS, shows that the heterogeneity of saving rates in Figure 13 is well in line with saving rates recorded by survey data: The bottom three deciles save between 5% and 10% of their disposable income. The saving rate then quite steadily increases and reaches 15-20% for the top decile. It is an open question for future research to what extent cross-country differences in saving rate heterogeneity are related to country-specific features of the income distribution, investment behavior, and industry structure.

The recent increase of wealth inequality in unified Germany is moderate in historical comparison, but driven by the same factor as the major shifts in the first half of the 20th century: asset prices. Capital gains from rising equity valuations for top wealth holders were counterbalanced by large middle-class capital gains from housing. Taken together with their strong savings, the middle class could keep up with the rich such that the gap between these two groups increased only moderately. Yet, the gap between the top and the bottom half widened substantially. On the one hand, the bottom half's portfolios consisting of deposits and life insurances were largely by-passed by rising asset prices. On the other hand, the large differences in savings across the wealth distribution (both relatively to income and in absolute terms) compress bottom wealth and lift up middle-class wealth in Germany. Given the heterogeneity of portfolios and saving rates, we might expect wealth inequality to further expand in Germany.

6 Conclusion

By drawing on a wide range of data, this study provides the first comprehensive analysis of the evolution of wealth and its distribution in Germany from 1895 to 2021. Taking a long-run perspective is important for two reasons. First, the historical perspective allows us to gauge the significance and size of much-debated changes in the distribution of wealth in recent decades. Second, studying the movements in wealth inequality in the past leads to a better understanding of the factors driving the wealth distribution today.

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[42] Mian et al. (2021) show increasing saving rates with income using SCF-data and demonstrate that heterogeneity in saving rates together with increasing top income shares exerted downward pressure on the natural rate of interest. Bach et al. (2018, Table 1) show that the saving rate in Sweden, defined as saving from labor income divided by net worth, is a decreasing function of net worth on average. As the above cited studies, including this paper, divide savings by disposable income, their results are not comparable.

A central insight is that in Germany, as in other countries, changes in the valuation of existing assets played a major role for changes in the wealth distribution over extended periods. Household portfolios differ across the distribution such that relative price changes in equity and real estate markets revalue the entire stock of assets, thereby affecting the overall wealth distribution in quantitatively important ways. The equalizing collapse of business valuations during the Great Depression is a case in point, as is the recent real estate boom that lifted the fortunes of house owners.

German history also offers important insights on how policies can affect the wealth distribution. In particular, the substantial wealth tax associated with the "Lastenausgleich" after World War II played a large role in equalizing the wealth distribution. With the "Lastenausgleich," Germany became one of the most equal countries before her post-war economic miracle took off. For the past 70 years, the top 1% wealth share has fluctuated around its postwar level. Since unification, the concentration of wealth at the very top has risen only moderately. The main reason for the stability is that the middle-class made substantial gains in real estate wealth, thus mitigating concentration at the very top. However, a substantial part of the population does not own assets, and, hence, did not profit from rising stock or house prices altogether.

Between 1993 and 2021, the gap between the "haves" and the "have-nots" has widened significantly. In the lower half of the distribution, wealth has barely grown at all while both the top 10% and the 50-90% of households roughly doubled their wealth. As a consequence, a household in the top 10% of the wealth distribution is now 116 times richer, on average, than a household in the bottom half. 30 years ago, the gap was 62 times.

Finally, our study highlights the importance of high quality data to study trends in the distribution of wealth (and income). Germany lags behind in the quality of micro data and with respect to plausible estimates of aggregate household wealth. The improved estimates of business and housing wealth that we present in this paper result in a wealth-income ratio that is 120 percentage points higher than when estimated with the official data. Germany is considerably richer than official statistics show.

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A   Appendix Tables & Figures

A.1   Tables

Table A.1: Wealth thresholds in surveys and the MM-list 2017/2018

Quantile	SOEP	HFCS	EVS	MM-list
		Unadjusted		
P 50	60,000	59,500	46,126	
P 90	455,000	539,000	444,589	
P 95	681,300	860,000	647,081	
P 99	1.6 Mio.	2.4 Mio.	1.3 Mio.	
P 99.9	5 Mio	7 Mio.	2.9 Mio.	
P 99.99	13 Mio.	12 Mio.	5.5 Mio.	100 Mio.
		Uprated and top-corrected		
P 50	123,945	108,578	121,859	
P 90	755,640	821,524	893,592	
P 95	1.2 Mio.	1.2 Mio.	1.4 Mio	
P 99	3.1 Mio.	3.5 Mio.	3.7 Mio.	
P 99.9	20 Mio.	17 Mio.	16 Mio.	
P 99.99	88 Mio.	90 Mio.	90 Mio.	100 Mio.

Note: SOEP data from 2017, EVS data from 2018, HFCS data from 2017. Current Euros.

Table A.2: Wealth transition matrix

	after 5 years			after 10 years			after 15 years		
	B 50%	50-90%	T 10%	B 50%	50-90%	T 10%	B 50%	50-90%	T 10%
Bottom 50%	78	21	1	75	24	1	68	30	2
50-90%	18	74	8	23	68	9	26	65	9
Top 10%	3	32	65	4	36	61	6	38	56

Source: SOEP-TU.
Note: Wealth group changes in % with respect to wealth group in 2002.

A.2 Figures

Figure A.1: Aggregate household wealth and household survey data
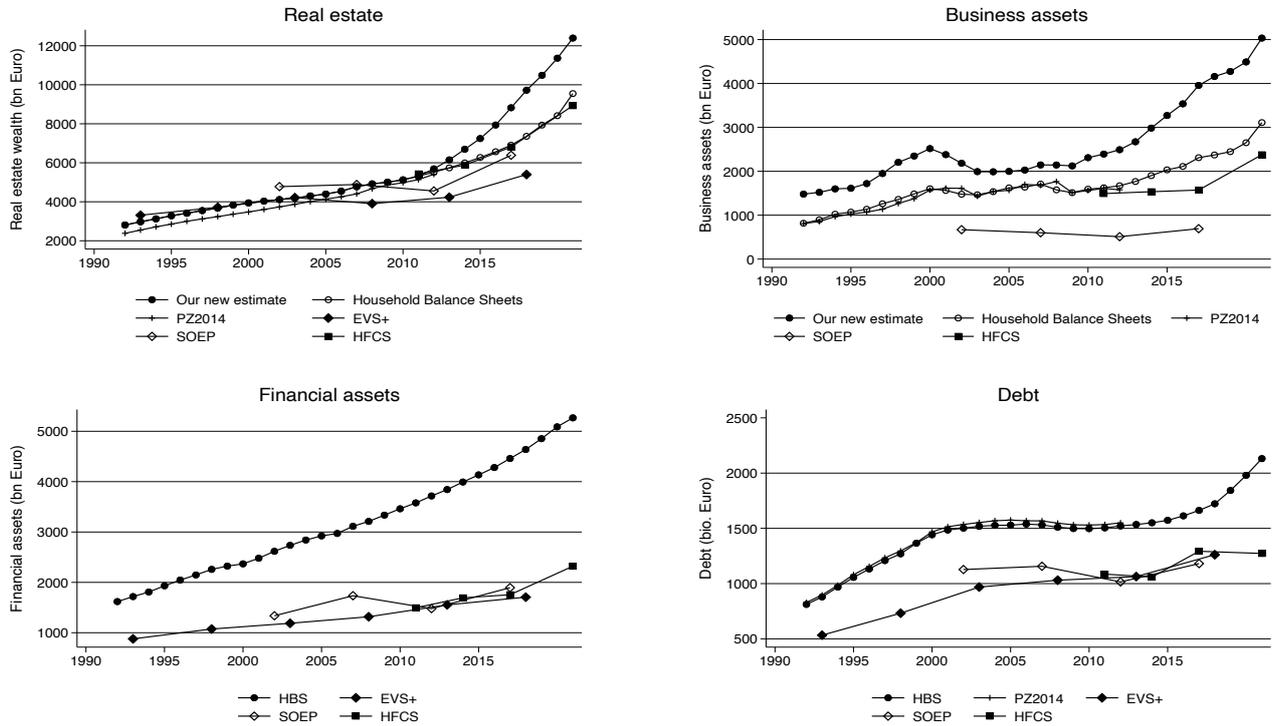
Sources: Offical HBS, EVS+, HFCS, SOEP, PZ2014 denotes Piketty & Zucman (2014). *Notes:* Business assets include shareholdings in both corporate and non-corporate firms.

Figure A.2: Tobin's Q
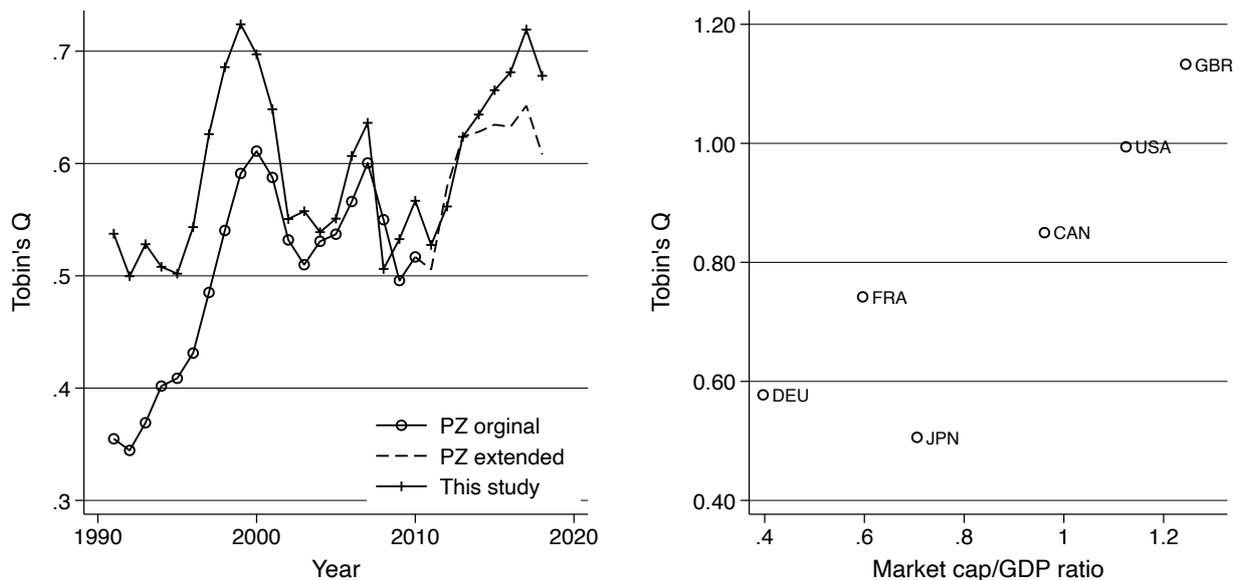
(a) Existing versus revised series

(b) Tobin's Q and Market Capitalization

Notes: The left graph shows how the revised estimates of closely-held shares in companies affect Tobin's Q relative to 'PZ original'—the existing estimates by Piketty & Zucman (2014). Additionally, we have extended the PZ series with the official balance sheet data ('PZ extended'). Graph b) plots the average of Tobin's Q against the average market capitalization for the period 1991-2010 (data sources: Tobin's Q by Piketty & Zucman 2014; market capitalization by Kuvshinov & Zimmermann 2022).

Figure A.3: Top 0.1% wealth share in Germany, 1895-2018
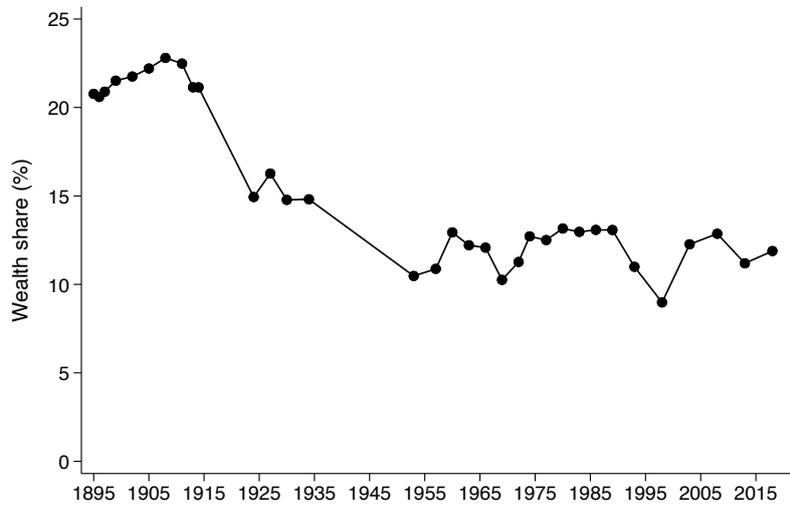
Figure A.4: Top 0.01% wealth share in Germany, 1895-1989

Figure A.5: Total wealth, fiscal values and the top 1% wealth share
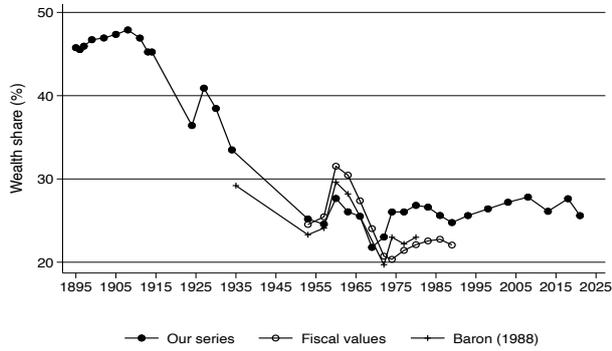
(a) Using fiscal values as in Baron (1988)
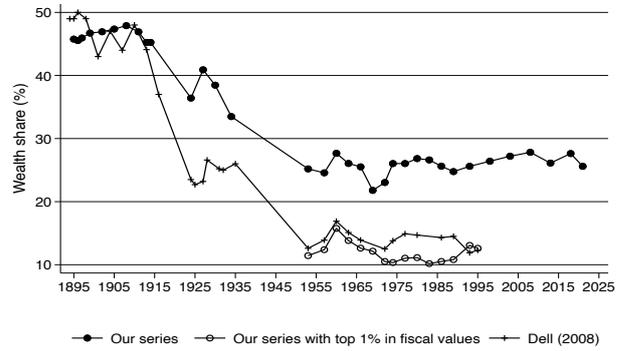
(b) Using fiscal values for top 1% as in Dell (2008)
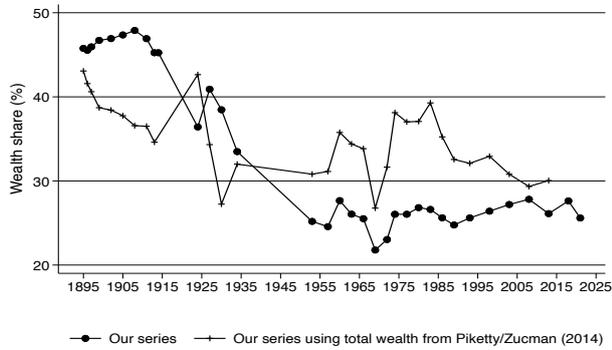
(c) Using aggregates from Piketty & Zucman (2014)

Sources: Own estimates based on wealth tax until 1989 and EVS-TU 1993-2018 as well as Baron (1988), Dell (2008), and Piketty & Zucman (2014).

Figure A.6: Top 1% wealth share including offshore wealth
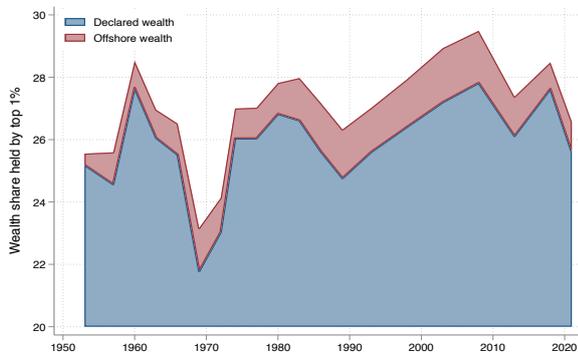
(a) Preferred estimate
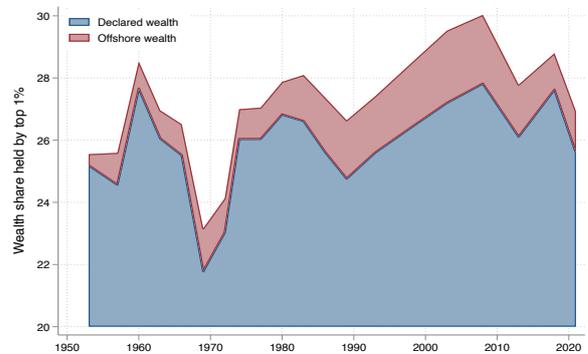
(b) Upper bound (Alstadsæter et al scenario)

Source: The estimate of offshore wealth is based on the methodology by Alstadsæter et al. (2018) and data provided by the *Tax Observatory*. See Data Appendix DA 5 for a detailed discussion of the series.

Figure A.7: Total wealth and top 1% shares in West and Unified Germany, 1993

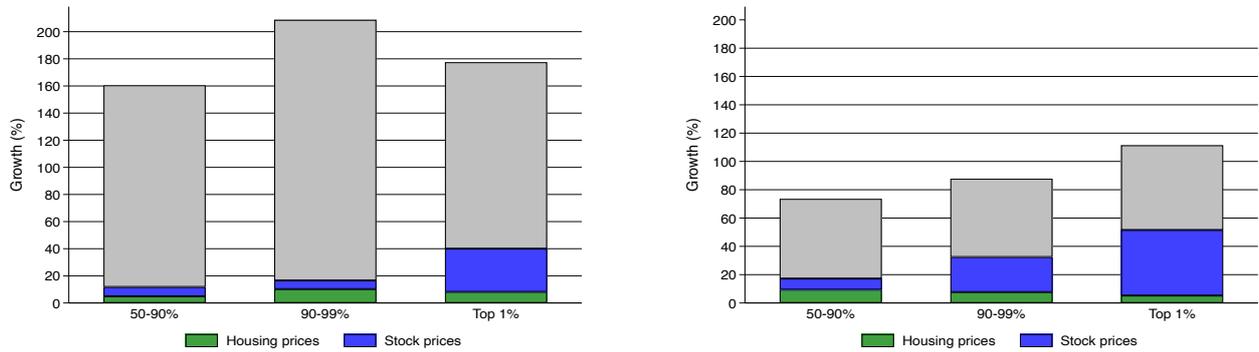## Figure A.8: Measures of wealth inequality by data source, 1993-2021

Figure A.9: Composition of wealth growth, 1993-2018
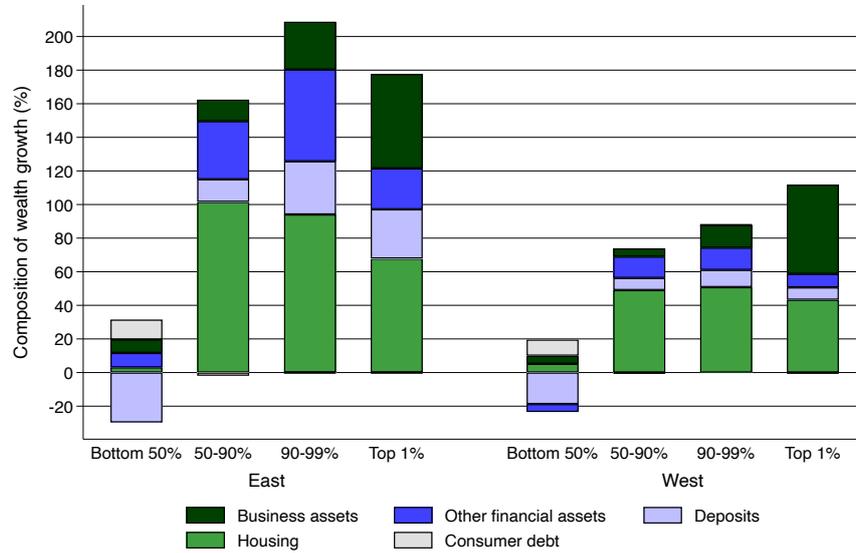
Source: EVS-TU.

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.

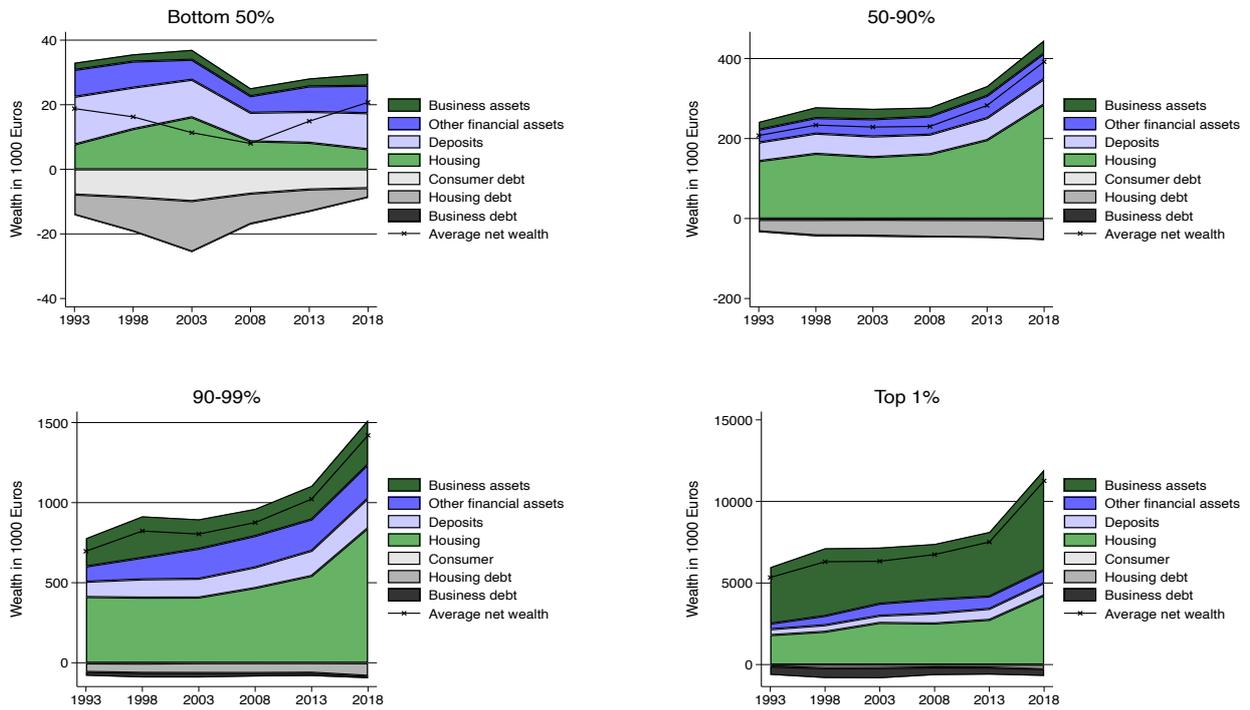**Figure A.10: Wealth growth from asset price changes, 1993-2018**

(a) East

(b) West

Source: EVS-TU.

Note: Growth from housing prices and stock prices computed using Bulwiengesa house price index and CDAX performance index following Equation 18. Grey shaded areas are synthetic savings.
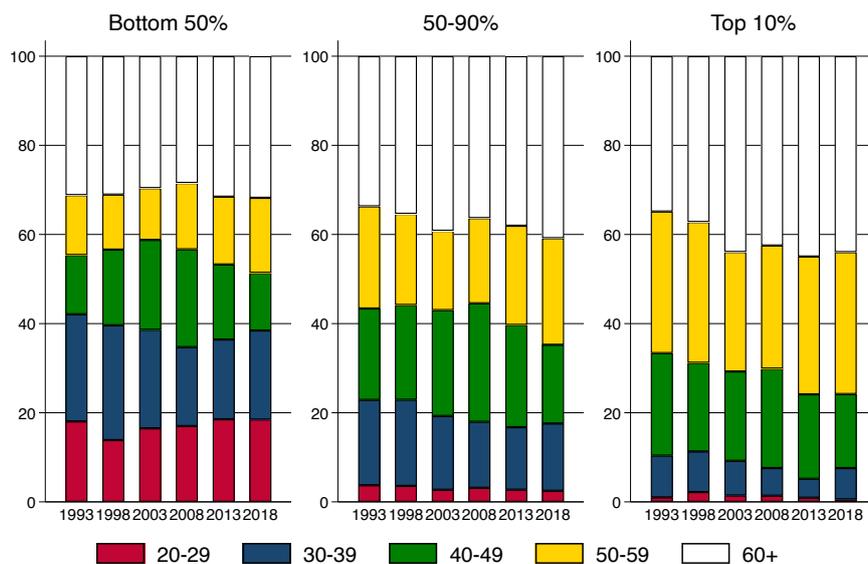
Figure A.11: Heterogeneity of portfolios for the bottom, middle and top, 1993-2018, EVS
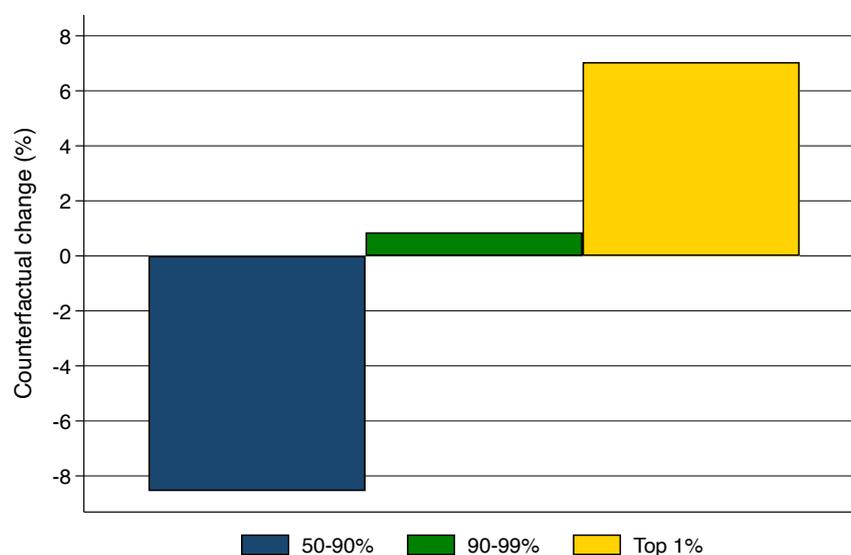

Source: EVS-TU.
Note: Average net wealth in 2015 Euros. Business assets include shareholdings in both corporate and non-corporate firms. Other financial assets include securities and insurances.

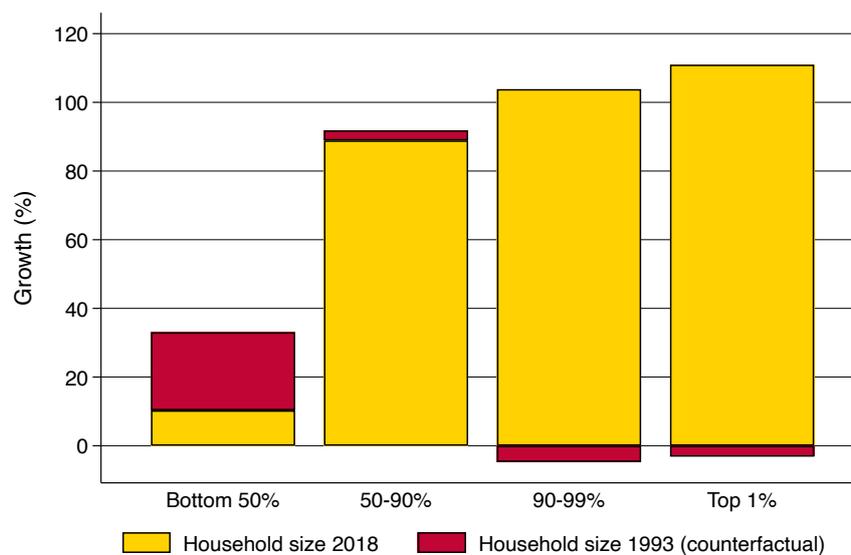## Figure A.12: The wealth distribution by age, 1993-2018

Source: EVS-TU.

Figure A.13: Changes in wealth shares assuming US saving rates, 1993-2018

Source: EVS-TU.
Note: Counterfactual wealth growth assuming US saving rates: the middle class (50-90%) 0%, 90-99% 15%, and top 1% 30%.

Figure A.14: Wealth growth: accounting for decreasing household size and aging, 1993-2018

Source: EVS-TU.
Note: Growth of average net wealth in 2015 Euros. Red bar shows the additional increase/decrease that would have occurred if the distribution of household size and age had remained constant between 1993 and 2018.