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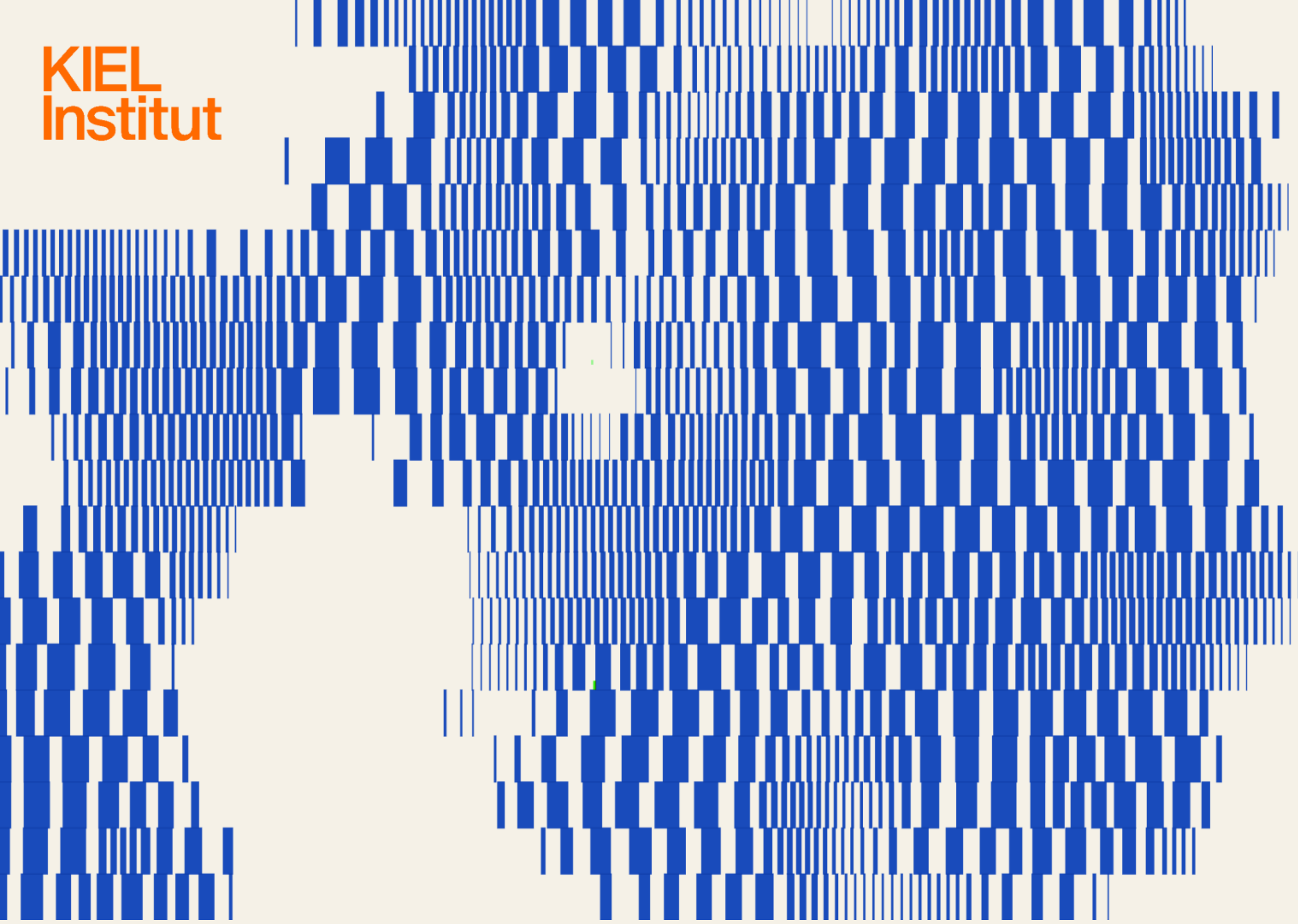

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The Great Leveler According to HANK

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Abstract

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Using historical income and wealth data, we show that war reduces inequality: the top-1% income share falls by 20% and the top-1% wealth share by 10%. We measure three key drivers of inequality---capital destruction, taxation, and inflation---in the data and quantify their role with a Heterogeneous Agent New Keynesian (HANK) model. Destruction depresses profits and thus top incomes. Taxation primarily influences wealth dynamics, while inflation has little effect on top shares, but reduces indebtedness among poorer households. We validate our findings using new data on inequality across German towns in World War 2 and cross-country data on profits.

Keywords: Interstate Wars, Inequality, Income share, Wealth share, Distribution, Capital destruction, Inflation, Taxes, HANK
JELs: F40, F50, E50

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1 Introduction

The history of inequality cannot be told without war. Seminal work by Piketty (2014) and Scheidel (2018) has advanced the notion that wars act as a "Great Leveler", but stops short of providing estimates for the quantitative effect of war on inequality. Likewise, the historical literature debates specific channels—destruction, taxation, and inflation—through which this effect may operate, yet we lack a systematic assessment of their quantitative importance. In this paper, we adopt a macroeconomic perspective on this debate and ask to what extent wars equalize societies, and by how much do different channels contribute to this effect?

We answer these questions by combining historical data with a Heterogeneous Agent New Keynesian (HANK) model. Our first contribution is to quantify empirically how inequality, along with its potential drivers, responds to wars. Second, we use the calibrated HANK model to quantify the importance of different drivers for the income and wealth distribution via counterfactuals.

We use historical macro and micro data to establish facts on the effects of war on income and wealth inequality, as well as its potential drivers. We find that large wars reduce the top-1% income share persistently by more than 20% relative to the pre-war level. In contrast, the top-1% wealth share declines by about 10%. We obtain these estimates for war site economies and find weaker effects for belligerent countries that were spared fighting on their own soil, which suggests that destruction is crucial for the distributional impact of war. The observed decline in capital shares is qualitatively consistent with these patterns, but a simple accounting exercise in the spirit of Meade (1964) shows that it cannot quantitatively account for the reduction in inequality.

We use the novel evidence to calibrate the HANK model and to quantify the importance of three structural shocks suggested by the historical literature: destruction, taxation and inflation. The model replicates the observed decline in inequality as well as its driving forces. Quantitatively, capital destruction explains the bulk of the decline in inequality through its effect on firm profits, the primary source of income at the top. The model also attributes an important role to increased top-end taxation for explaining the reduction in wealth inequality. Finally, while wartime inflation benefits the lower end of the wealth distribution, it does not affect inequality at the top. To externally validate the model mechanism, we collect new data and show that indeed firm profits fall during and after wars: War is bad for business.

To study the impact of war on inequality, we assemble a new long-run macroeconomic dataset, building on a research program that has compiled inequality data for countries across the world (Piketty, 2014). We construct additional time series that capture the forces shaping the income and wealth distribution over time, allowing us to identify the mechanisms of wartime leveling in the HANK model. Our main focus is on war sites—countries that experienced significant warfare on their territory, as defined in Federle et al. (2025). War destroys capital, and we collect data on both the amount and, where available, the distribution of capital destruction in the wars we study. As an alternative indicator of the situation of capitalists during wartime—less prone to the challenges of directly measuring capital destruction—we use the capital share, sourced from Bengtsson and Waldenström (2018). We also gather data on top marginal tax rates to quantify the wartime rise in tax progressivity, as well as on inflation rates and the capital stock.

We trace out the consequences of wars over a 15-year period after the start of the war, using standard macroeconometric techniques, interpreting wars as shocks in a panel local projection setting. In a first step, we quantify the effects of war on inequality, measured by the share of total income or wealth of the top-1%. We find large leveling effects for *income* inequality. Relative to pre-war trends, the top percentile income share drops by more than 20%. This effect is long-lasting and persists well after the end of the war. In contrast, for *wealth* inequality, we find a decline of the top percentile share by only up to 10%.
War is a shock with multiple economic dimensions, which we measure in turn. Most directly, war destroys physical capital. Directly observable measures suggest that approximately 10% of the capital stock is destroyed during war. However, we find that, over time, the capital stock declines by about 20% in the average war site, suggesting that war also depresses investment. The capital-income share likewise falls sharply during wars—by about 25% over the medium run. The rise in progressive taxation during wartime leads the top marginal tax rate to increase by up to 50%. Finally, war has a substantial inflationary effect, with the price level rising by around 70% over a 10-year horizon.
The distributional consequences of war have not only been noted in countries that are war sites themselves, but also in countries that engage in large scale warfare on foreign soil, most prominently the U.S. (Goldin and Margo, 1992). We investigate those countries separately and find important heterogeneities. The top-1% wealth share declines by as much as in war sites, and taxes re-

spond as strongly, if not stronger. Yet along other dimensions, the responses are weaker. Notably, the drop in the top-1% income share is weaker and much less persistent, and the decline of the capital stock is not even half as large as in war sites, suggesting that destruction is a key feature of wartime leveling.

In support of this interpretation, we offer additional micro-level evidence using a panel of German towns during World War II. These data allow us to identify the direct effect of destruction on income inequality holding macroeconomic conditions fixed. Destruction lowers inequality at the town-level: Increasing the share of the housing stock destroyed by one percentage point lowers top-1% income shares by 0.3%. This effect is confirmed in an instrumental-variables setting leveraging variation in the distance to London.

As a first step in rationalizing these findings, we develop a simple accounting framework following Meade (1964) that takes the decline in the capital-income share as given and quantifies—all else equal—its impact on income and wealth inequality. Top earners derive more income from capital, whereas overall income is more heavily skewed toward labor. Thus, a decline in the capital-income share, for instance due to war destruction could potentially account for the effects on inequality. The accounting framework can explain the evolution of inequality in the cross-section of German towns holding macroeconomic conditions fixed. However the framework cannot, quantitatively, explain the decline in top income or wealth shares in the time series.

We therefore quantify the importance of different shocks for inequality in general equilibrium extending the HANK model developed by Bayer et al. (2024). In the model households are heterogeneous in both income and wealth, such that we can study how inequality evolves in response to shocks. The New Keynesian features—monopolistic competition and infrequent price adjustments—are also crucial. First, under monopolistic competition, firms earn pure rents or profits in equilibrium. These profits are a source of capital income for households, supplementing the return they receive for the capital they lend to firms. Second, because prices are adjusted infrequently, markups—and by extension, the capital-income share—fluctuate over time; this would not happen if prices were flexible. We calibrate the model to match initial levels of income and wealth inequality and use impulse response matching to pin down key parameters. The calibrated model successfully replicates the observed decline in inequality as well as its potential drivers: destruction, taxation and inflation.

Quantitatively, the model attributes the bulk of the decline in income inequality to the destruction shock, operating through its effect on firm profits, which constitute the lion's share of income at the top. The destruction shock raises marginal costs which are only partially passed through into prices during times of war. As a result, firms experience a squeeze on profit margins. The distinction between profits—which accrue to the very rich—and other forms of capital income allows the model to replicate the decline in the top-1% income share, even though the capital share moves by the same amount as in the accounting exercise. Top wealth shares are less affected, because, consistent with the data, the direct effects of the destruction shock affect wealth owners more proportionally, leaving relative inequality unaffected.

In contrast, we find a smaller role for taxation in leveling the income distribution. This is because our results on income inequality concern pre-tax inequality, due to data availability and consistent with the prior literature. In our model, labor supply elasticities are relatively low, consistent with the data as reviewed for example in Saez et al. (2012), so that pre-tax income inequality is not affected strongly by changes in tax rates. However, we find that the rise in progressive taxation, in addition to the fall in capital returns, is key for the decline in wealth inequality. They reduce the post-tax disposable income out of which the rich accumulate wealth (Piketty, 2018).[1]

We find no role for inflation in explaining income or wealth inequality at the top. Applying the approach of Doepke and Schneider (2006), we show that this is the case because the inflation exposure of the top-1% and average wealth portfolios is similar. However, the model allows us to study the bottom of the wealth distribution, which we do not observe in historical data. We document important redistributive effects from inflation at the bottom of the wealth distribution.

Do profits decline in war? We validate the model mechanism using newly constructed cross-country data on firm profits. In the data, we also find a large fall in profits. While there is an initial boom in profits during the military buildup in many economies, this quickly reverses once the war turns violent and profits contract sharply – often due to wartime price controls restricting the ability of firms to pass on cost increases. In sum, consistent with Scheidel (2018), we find that the wartime leveling of incomes primarily reflects violent forces, rather than a peaceful expansion of the welfare state. In contrast, peaceful forces can explain part of the decline in wealth inequality (Waldenström, 2024).

[1] Auray et al. (2024) find that rising markups increased income inequality in France since 1980, whereas taxation plays a larger role for wealth inequality in a heterogeneous-agent model.

The paper is organized as follows. In the remainder of the introduction, we place the paper in the context of the literature and clarify its contribution. Section 2 introduces the data and econometric framework. We present our empirical results in Section 3. We outline the HANK model in Section 4, explain how and under which conditions it can account for the evidence, and inspect the transmission mechanism through model simulations. A final section concludes.

Related Literature. The original contribution of our paper is to study the impact of war on inequality through the lens of a fully-specified general equilibrium model. In doing so, we bridge two important strands of research. First, we build on a literature in economic history that studies the long-run determinants of inequality (Kuznets, 1955; Piketty, 2014; Lindert and Williamson, 2016; Scheidel, 2018; Alfani, 2021; Waldenström, 2024). This literature has studied different determinants of inequality, building in a massive data collection effort by many researchers around the world that have carefully constructed historical inequality series for specific countries.[2] While there is some agreement that wars are important determinants of inequality (though some contributions de-emphasize their role (Kuznets, 1955; Lindert and Williamson, 2016; Waldenström, 2024)), little is known about the quantitative effect of war on inequality and the importance of different channels of wartime leveling. Our contribution to this literature is to comprehensively measure the leveling effects of war and their underlying channels empirically and to specify the underlying causes in a state-of-the-art HANK model.[3] This allows us to assess the channels through which wars reduce inequality quantitatively for the first time. Here, we join a small literature that uses quantitative models to assess historical drivers of inequality (Albers et al., 2023; Gabaix et al., 2016; Hubmer et al., 2021).
Second, an important literature investigates the macroeconomic consequences of wars and disasters focusing on many aspects such as trade, capital flows, and asset prices (Braun and McGrattan, 1993; Barro, 2006; Ursùa and Barro, 2010; Gabaix, 2012; Gourio, 2012; Nakamura et al., 2013; Farhi and Gabaix, 2016; Auray and Eyquem, 2019; Horn et al., 2020; Federle et al., 2025). Ramey

[2]For an incomplete list see Goldin and Margo (1992) and Saez and Zucman (2016) for the U.S., Albers et al. (2022) and Bartels (2019) for Germany, Alvaredo et al. (2018) for the U.K., Garbinti et al. (2021) for France, Moriguchi and Saez (2008) for Japan, and Toussaint et al. (2022) for the Netherlands. Roine and Waldenström (2015) provide a summary.

[3]Heldring et al. (2022) study the causal impact of bombing on wealth inequality using variation across British regions and also find small effects, consistent with our results on aggregate data. We provide complementary results on the effect of destruction on income inequality across German towns.

and Shapiro (1998) study the macroeconomic impact of military buildups in a neoclassical two-sector model. Inequality is a key aspect of disasters that has so far been considered only by economic historians. Relative to these papers, we empirically show that disasters matter for inequality and build a model with heterogeneous agents. Song et al. (2023) and Panon and Conteduca (2024) find that large natural disasters reduce income inequality and firm markups respectively, consistent with the evidence we present for wars.

Quantitative incomplete-markets models have become the workhorse for studying inequality. These frameworks—pioneered by Huggett (1993) and Aiyagari (1994) and extended to incorporate entrepreneurs (e.g. Castaneda et al., 2003; Cagetti and De Nardi, 2006)—successfully reproduce the right tail of the wealth distribution and its response to taxation (Kaymak and Poschke, 2016). Building on this foundation, Heterogeneous Agent New Keynesian (HANK) models now dominate research on the *dynamic* distributional effects of aggregate shocks. The transmission and distributional consequences of monetary policy (e.g. Kaplan et al., 2018; Auclert, 2019; Luetticke, 2021) and fiscal policy (e.g. Bayer et al., 2023; Ferrière and Navarro, 2025) are by now well documented. What is more, portfolio and asset-return heterogeneity have emerged as a distinct driver of inequality: Kuhn et al. (2020) and Bayer et al. (2024) show that asset-return movements account for much of the cyclical variation in top-wealth shares.

2 Data and Econometric Framework

In order to study the distributional consequences of wars we build a new historical database, assembling data from existing studies and complementing it with several newly constructed indicators. In this section, we introduce the data and the econometric framework that we use in the subsequent analysis.

2.1 Sample and Data

In our baseline sample, we focus on major wars (with more than 10K casualties) in *war sites*, that is, the countries that experience military action on their own soil. For this, we rely on the classification of Federle et al. (2025), who aggregate battle-level data to the country level in order to geolocate war sites.[4] Our

[4] As in Albers et al. (2022), we consider Germany in World War 1 a war site, because the historical inequality statistics for Germany do not adjust for the change in borders. This allows us to capture the large battles and the associated destruction in (then German-Reich) East Prussia and the loss of land after the war. Our results remain unchanged when dropping individual

Table 1: Baseline sample—War Sites

Country	Year	Country	Year
Germany*	1914	Netherlands*	1940
France*	1914	India	1944
Germany*	1939	Japan*	1944
Finland*	1939	India	1962
Norway*	1940	India	1971
United Kingdom*	1940	Bosnia and Herzegovina	1992
France*	1940	Afghanistan	2001
		Iraq	2003

Notes: This table shows summary statistics on war sites with available inequality data. Year refers to the start of the war in Federle et al. (2025). Starred wars indicate world wars, for which we construct additional data as explained in the text.

focus on war sites as a baseline sample rests on the premise that war affects inequality through its destructive nature, and that its impact will therefore differ systematically between war sites and non-sites. We test this conjecture below by comparing our baseline sample of war sites to a sample of non-sites.

In practice, we are strongly limited by the availability of inequality data—there are already few observations when it comes to wars, and there are even fewer wars with available inequality data. Table 1 shows the wars in our sample with available inequality data before and after the war. We choose to focus not only on the world wars to establish as much external validity as possible. Nevertheless, for many additional variables that we construct, we are restricted to the world wars. We also study the world wars separately below and show that results are similar when considering world wars only (where data quality may also be the highest). In additional analyses, we further extend our study to include wars fought on foreign soil (*non-war sites*) and smaller wars (with less than 10K casualties). These are listed in Table B.4 in the Appendix.

Our baseline measures for inequality is the share of the top percentile in the wealth and income distribution, but we also consider the top deciles in robustness analysis below. We obtain these data primarily from the World Inequality Database (WID), using *pre-tax* income as per the standard concept in WID.[5]

war sites (Figure B.8).

[5]Data on post-tax income inequality is not available for most countries over a long time period. Bozio et al. (2024) argue that long-run shifts in inequality, such as the ones we are interested in largely reflect changes in pre-tax income inequality, studying France and the U.S., for which such data is available. We compare pre- and post-tax income shares in Figure A.1.

Wealth shares are computed based on assets valued at market prices, with underlying studies making corrections for assets that are difficult to value, such as business assets.

For a number of countries, we deviate slightly from the baseline WID concept and instead use different series, from other published research papers, which cover a longer historical period (for instance, Bartels, 2019; Roikonen, 2022; Moriguchi and Saez, 2008) and also refer to income before taxes, see Table A.1 for these cases.[6] For the countries we consider, inequality data is usually based on tax tabulations, which capture inequality at the top of the distribution accurately (Roine and Waldenström, 2015). Our estimation controls for country fixed effects to account for variations in the income concept between countries, we also show below that our findings are not driven by individual countries.

We also take up two potential caveats regarding the inequality measures we use. First, a recent literature discusses the reliability of income and wealth inequality data, focused on the U.S. (Saez and Zucman, 2016; Geloso et al., 2022; Smith et al., 2023). We show in Appendix A that this concerns mostly the level of inequality and that war-time trends are similar across series.[7] In terms of wealth inequality, many advanced economies had wealth taxes in place throughout most of 20th century, which were only abolished towards the turn of the millennium (Saez and Zucman, 2022). Therefore, arguably, coverage of top wealth holders is as reliable as in more recent data, which often relies on top-corrected survey data or income capitalization methods to construct wealth inequality measures in the absence of wealth tax data.

Second, in some cases, there are gaps in the series of top income and wealth shares, which we interpolate linearly in our baseline specification. This conservative procedure means that we may underestimate the true equalizing effects of wars, because some of the potential reduction in inequality that occurs after wars is attributed to a pre-war decline. We conduct robustness checks in Appendix B.3, including a specification in which we attribute the entirety of the decline in inequality between gaps to the war. While the response of inequality is slightly larger, the differences are small quantitatively.

Drivers of Wartime Leveling. We collect additional times series to inform the

[6]The income concept in these series is usually 'fiscal income', i.e. income as reported in income tax returns. By contrast, WID makes imputations for income not reported in tax returns. In countries where both series are available, trends are very similar across both.

[7]Also, inequality trends around wars have found to be consistent in countries in which researchers have updated older studies with new methods and additional data, see for instance Bartels (2019) and Dell (2007) for Germany.

drivers through which war impacts inequality. We start from existing studies and fill gaps during war years, which are usually not the focus of these papers. To measure the impact of war on capital, we use capital shares obtained from Bengtsson and Waldenström (2018) and the capital stock (Bergeaud et al., 2016). They cover a host of advanced economies since 1890 to which we add data for the capital share in Japan during WW2 from the statistical yearbook (Statistics Bureau of Japan, 1949 – 2023). Importantly, we adjust data for the capital stock using own estimates of destruction that we construct for each country in our sample.[8] The destruction estimates are reported in Table C.8, with a discussion for each country in Appendix C.2. In the countries with the largest destruction, we also show how to account for the incidence of destruction along the distribution in Appendix C.3. To study asset prices and inflation, we rely on the macrohistory database (Jordà et al., 2017), extended in Funke et al. (2020) to cover an extended sample of countries.[9]

War implies not only destruction, but also large changes in the fiscal regime. To account for these, we obtain data on top marginal tax rates from Scheve and Stasavage (2018). We estimate how top marginal tax rates change in response to war, and discuss how these translate into the tax system considered in the HANK model below. We further construct data on government consumption during wars, for which there exists no coherent database to date. We provide details in Appendix A.2.

Before turning to our econometric framework, a general remark on the quality of our data is in order. Much of the economic data comes from a time period in which modern practices of national accounting were not yet established. Building national accounts is hard, and even more so during times of wars. That said, we focus on variables which have been been subject to great scrutiny over time. The outcomes we consider are central economic variables such as inflation, the capital share, and top marginal tax rates that have been revisited frequently by researchers and economic historians in the respective countries. The effects we document persist long after the war itself has ended, so they do not rely on war-time data alone. Because the government takes on an outsized role during wars, data on government activities is among the best war time data and has been studied by many economic historians.

[8]Concretely, we use our war destruction estimate instead of the adjustments made in Bergeaud et al. (2016) to construct the capital stock.

[9]We drop the German hyperinflation 1922–1924 from our sample.

2.2 Econometric framework

To identify the consequences of wars, we assume that the onset of wars is exogenous to business cycle and inequality dynamics in the war sites. The evidence suggests that this assumption is warranted: Federle et al. (2025) offer a systematic classification of the casus belli for all wars in our sample based on a range of historical sources and find that the causes of war are generally unrelated to the current economic conditions, but rather related to broader nationalist or ideological causes.[10] Moreover, narrative historical work by Scheidel (2018) and many others identifies war and its aftermath as the trigger for inequality dynamics, directly through destruction and indirectly through the responses of governments. The weight of the historical evidence thus suggests that war was the cause of the subsequent inequality changes. Below, we also provide additional evidence on pre-trends, as well as comparison to non-war-participants, which corroborates the interpretation that the war triggered the subsequent inequality dynamics.

Conceptually, we view war as a multi-faceted shock composed of several underlying structural shocks (e.g., capital destruction, taxation, inflation, . . .). We trace out the economic consequences of the composite shock using panel local projections. Denoting by i the country and t the year, for any outcome variable $y_{i,t}$ we estimate the following linear specification:

$$y_{i,t+h} - y_{i,t-1} = \alpha_i + \beta_h \text{War Start}_{i,t} + \gamma_h X_{i,t} + \varepsilon_{i,t+h}, \quad h = 0 \ldots 14, \tag{1}$$

where α_i is a country fixed effect and $X_{i,t}$ is a vector of controls. Our baseline specifications control for 4 lags of the dependent variable and the regressor, and cluster standard errors at the country level. Including lagged variables is important to capture trends in the outcome prior to the war, as is common in macroeconomic data. This is important, as inequality is falling in most advanced economies throughout the first half of the 20th century. Our specification isolates the effects of wars beyond this trend.

In our baseline specification, we define War Start$_{i,t}$ as a dummy variable, which takes on a value of one when a country becomes a war site and is zero otherwise. Hence, our estimates capture the effect of the average war onset in our sample. The specification also accommodates wars of different duration: β_h in

[10] They also find that interstate wars are not Granger-caused by lags of output growth—unlike civil wars which we do not include in our data; there is evidence that inequality causes civil wars (Alesina and Perotti, 1996; Baten and Mumme, 2013).

specification (1) measures the development of inequality in the war site h years after the start of 'average war', independently of its length.

The outcome variables are measured in changes relative to the pre-war value, so that the total effect of the shock on variables of interest can be read off directly from the β_h coefficients. Note that our specification accommodates the case where the effect of war is permanent (Stock and Watson, 2018), and indeed, we estimate impulse responses at long horizons— up to 15-years following the start of the war—to allow for long-lasting effects of wars. We do so, first, because our sample consists mostly of wars that are fought over multiple years, so that effects likely take a few years to fully materialize. Second and more importantly, the historical literature on the leveling effects of wars thinks of these as long-lasting shocks (Piketty, 2014; Scheidel, 2018), and we want to take into account the effects of wars at longer durations as well. Jordà et al. (2020) show that local projections, when appropriately augmented with lags as in our case, are able to detect the effects of shocks at very long horizons.[11]

We consider a number of variations of specification (1) below and report on robustness in Section B.3. This includes a quantitative shock measure, which is meant to capture the intensity of the war. To do so, we proxy the intensity of the war by the destruction to the pre-war capital stock. Moreover, in other robustness analyses, we vary the definition of the war dummy, study the effects of wars on belligerent countries which do not experience war on their own soil and consider variations of our baseline sample.

3 The Distributional Impact of War

In this section, we present new time-series evidence on the distributional impact of war and the adjustment of key indicators, which we later use to develop a structural account of the transmission mechanism within the HANK model. We complement this with micro-level evidence for German towns during WWII, isolating the direct impact of war destruction on inequality. We conclude this section by introducing a simple accounting framework to quantify the direct effect of destruction on income and wealth inequality.

[11] Local projections form the backbone of a literature analyzing the long-run effects of other shocks, such as temperature shocks (Bilal and Känzig, 2024) or pandemics (Jordà et al., 2022).

3.1 Time-Series Evidence

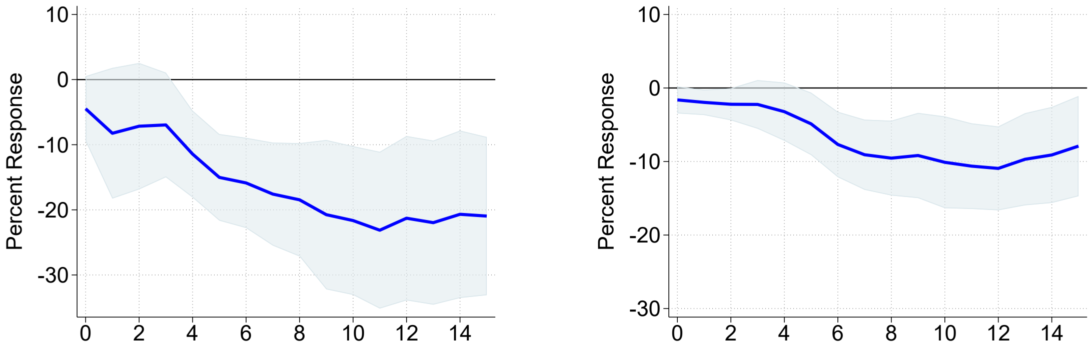
Figure 1 displays the response of top-1% income and wealth shares to the war shock. The solid line represents the point estimates, while the shaded areas indicate 90 percent confidence intervals. The estimates are based on specification (1), introduced above, and thus reflect the impulse responses to the start of the war in the war site. The horizontal axis measures time in years since the onset of the war. Income and wealth shares are log-transformed, so the vertical axis measures the percentage change relative to the pre-war trend.

Inequality. The top-1% income share, shown in the left panel, drops by more than 20%. The top-1% wealth share (right panel) also falls, but the effect is weaker—less than half of the decline in the top-1% income share. In both instances, however, the effect is very long-lived and the reversal at the end of our estimation period is far from complete. The decline in income and wealth inequality after wars reflected in our estimates, are consistent with and offer a quantification of the historical narrative (Scheidel, 2018). To put these numbers into perspective, note that the income share of the top-1% ranges between 5-20% over the 20th century, while for wealth, the top-1% share ranges from 20% to as much as 60% over the 20th century (Piketty and Saez, 2014; Roine and Waldenström, 2015). The percent decline in top income and wealth shares reported in Figure 1 translates into a decline of around three percentage points for both top income and wealth shares, see Appendix Figure B.4. However, because the level of top wealth shares is higher, in relative terms the impact of war on top income shares is stronger than on top wealth shares.

We also consider the response of the top decile, and show results in the Appendix (Figure B.4). Consistent with the top percentile, we find that top decile income shares fall more than top decile wealth shares. The top-10% income share declines by around 10%, while we are unable to detect any movement in the top-10% wealth share.

The impact of war on wealth inequality is limited, even though wealth inequality has been declining strongly during the first half of the 20th century, as noted by several observers (top-1% wealth shares decline from around 60% in 1900 to 20-30% in 1980, see Figure B.10, p Panel (a)). Against this background, we find that it is important to account for the declining trend in wealth inequality via the inclusion of lags in specification (1). With no lags in the estimation, results would suggest that war caused a stronger decline in wealth inequality, as we illustrate in Figure B.10, Panel (b). However, wars do not represent very large breaks in the steady decline of wealth shares for most advanced economies.

Figure 1: Response of Top Income and Wealth Shares to War Shock



(a) Top-1% Income Share (b) Top-1% Wealth Share

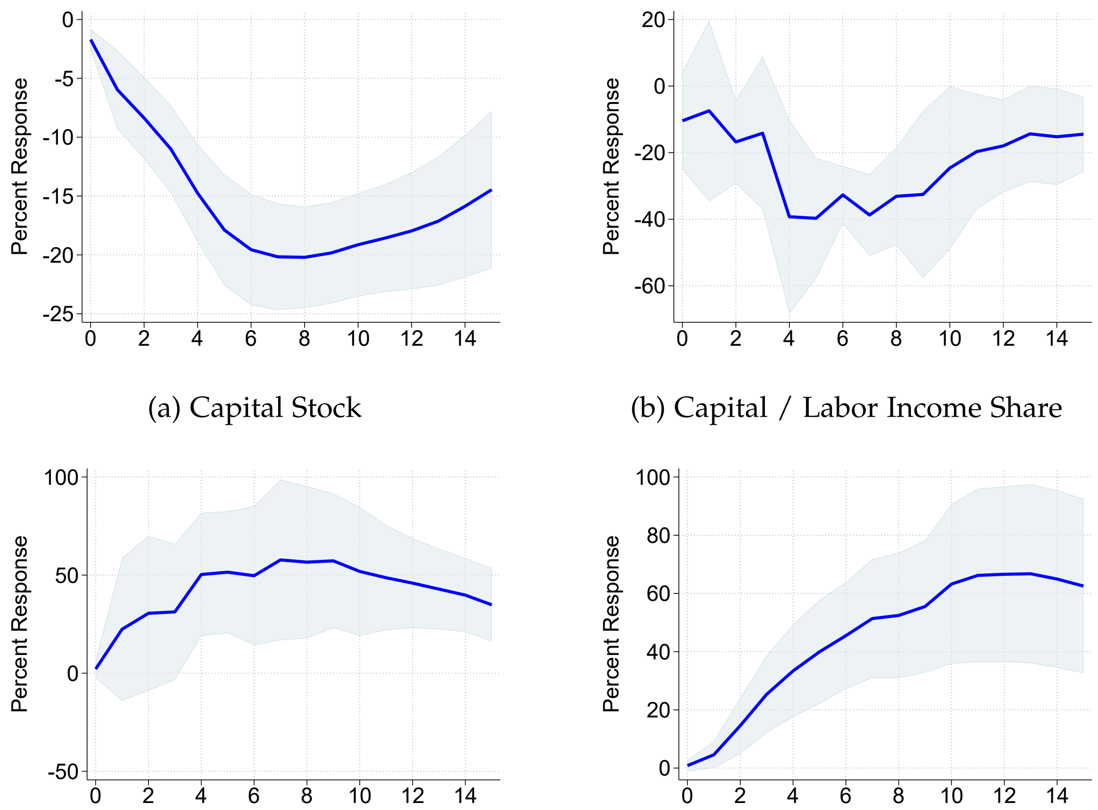
Notes: Solid line shows response to war shock in war site, estimated based on specification (1); start of war as specified in table 1. Shaded areas indicate 90% confidence intervals. Horizontal (vertical) axes measure years since start of war (deviation from pre-war level in percent).

In light of our results, we attribute the bulk of the change of wealth inequality around wars to the secular decline that is observed throughout the 20th century, rather than to the war shock. This conclusion aligns well with Waldenström (2024) who notes that wars do not constitute large breaks in inequality series and stresses other explanations for the long-run evolution of wealth inequality, such as the rise in 'popular wealth' owned by the middle class. Further, Heldring et al. (2022) show that across U.K. districts, bombing did not have a causal effect on wealth inequality on average.

Drivers of Wartime Leveling. The historical literature suggests destruction, taxation and inflation as key driving forces of wartime leveling (Scheidel, 2018) and we study each in turn in Figure 2, which displays impulse responses that further discipline the structural account in the HANK model below. Panel (a) shows that there is a long-lasting drop in the capital stock by around 20% in response to the war; it does not recover the pre-war level by the end of our estimation period. The maximum decline exceeds the historical evidence on war destruction for most countries reported in Table C.8 by a wide margin. This suggests that the capital stock declines not only due to destruction, but because investment declines in response to the war, too (Federle et al., 2025).

Next, we turn to the functional distribution of incomes, that is, the split of income into capital and labor. Panel (b) shows the adjustment of the ratio of capital to labor income. Returns to capital decrease in wartime and the capital

Figure 2: Response of Key Drivers to War Shock



(a) Capital Stock

(b) Capital / Labor Income Share

(c) Top Marginal Tax Rate

(d) Price Level

Notes: Solid line shows response to war shock in war site, estimated based on specification (1); start of war as specified in table 1. Shaded areas indicate 90% confidence intervals. Horizontal (vertical) axes measure years since start of war (deviation from pre-war level in percent).

share falls strongly relatively to the labor share: the capital-labor ratio drops by about 30-40% in the medium run. This shows that the wartime decline in income hits capital incomes in particular.

Panel (c) plots the response of top marginal tax rate in war sites. Wars and the associated fiscal expansions are usually financed by raising taxes and tax progressivity (Vélez, 2014). According to our estimates, the top marginal tax rates increases by up to 50% in response to war, and the tax-and transfer system remains more progressive for a considerable amount of time after the war has ended. We discuss in Appendix A.2 how the response of the top marginal tax rate translates into the HANK model we use.

Finally, we consider the response of the prices in Panel (d): Wars sharply increase the price level, which rises by about 70% relative to the trend. This is consistent with the evidence in Barro (2006), who notes that war periods are generally accompanied by extremely high inflation and correspondingly low asset returns.

Additional Outcome Variables. To characterize the economic developments in the countries under study, we examine the adjustment dynamics of several additional outcome variables shown in Figure B.5 in the Appendix, and summarize them here to economize on space. First, we find that wars lower output in the war site considerable (Panel (a)), in line with the notion that wars are the quintessential macroeconomic disasters (Barro, 2006). Consistent with this, we find large declines in asset returns, for both risky and safe assets, see Table B.3. We further document the large fiscal expansion during wartime, both in government expenditure and in the more narrowly defined measure of government consumption (Panels (b) and (c)). Wars lead to a substantial increase in government consumption—by more than 50 percent—driven to a large extent by military spending, which we report separately in Panel (d). Later, that is, after the average war, this expansion reverses, and government consumption falls substantially below its pre-war trend, in line with the notion of spending reversals (Corsetti et al., 2012).

Finally, we also consider two variables that are informative about how war impacts the labor market (Goldin and Margo, 1992). Specifically, we consider how the total population as well as total hours worked adjust in response to war. While the population drops relatively quickly by around 3-4% (and only recovers slowly), hours remain stable or even rise in the first year after the war and only then decline, so that there is a muted overall effect, see Figure B.5, Panels (e) and (f). Wars may have mechanical effects on the income and wealth distribution because of the (potentially) unequal incidence of deaths along the distribution. We discuss those in Appendix B.4, which derives bounds on the size of these effects. Because the mechanical effects of war casualties on inequality are bounded by the change in population (less than 4%), they cannot account for the effects we document on inequality, which are much larger. Similar arguments apply to changes in country borders (which only matter for the case of Germany), which we discuss in the same appendix.

Evidence for non-war sites. The distributional consequences of war have not only been noted in countries that are war sites themselves, but also in countries that engage in large scale warfare on foreign soil, most prominently the U.S. (Goldin and Margo, 1992; Lindert and Williamson, 2016). We investigate those countries separately and compare results to war sites. This comparison provides an initial understanding of the mechanisms through which wars affects inequality, as the underlying economic shocks differ across war sites and non-sites (for instance, there is no direct physical destruction in non-war sites). As with war sites, we include only non-sites with more than 10K casualties in a war, thereby focusing on wars fought on foreign soil that left a significant mark on the country itself (see Table B.4 for this sample).

Comparing impulse responses reveals that the impact of war on inequality is generally more moderate in non-sites (see Figure B.6). The response of the top-1% income share is noisier and it declines by only about half as much as in war sites. In contrast, effects on the top-1% wealth share are only slightly weaker than in war sites. The response of other variables is also generally weaker—except for taxation, where the top marginal tax rate actually increases more in non-sites. This is consistent with work in political science, which highlights that countries experiencing destruction were economically and politically constrained in their ability to levy high taxes on the rich (Haffert, 2019). We can similarly split the sample into winners and losers of war and find that losers tend to see much larger responses in terms of income inequality, while effects are similar in terms of wealth inequality (Figure B.6, Panels (g) and (h)).

Robustness. We check the robustness of our findings to both alternative sample constructions and variations of the dependent and independent variable.

We first show our results on inequality for both a smaller sample which considers the world wars only and for a larger sample which adds a number of smaller wars with less than 10K casualties in the war site (see Table B.4 for the samples). Figure B.7 shows that result for inequality are close to our baseline sample. In terms of income inequality, we find a slightly larger reaction when focusing on world wars only, but a smaller reaction when considering also smaller, less destructive wars. For wealth inequality, the choice of sample matters even less. To further test the sensitivity of results, we drop each war successively, to see if individual wars drive our results given the small sample size, see the bottom panels of Figure B.7. Doing so does not influence our results, the leveling we document is broad-based across countries.

Next, we consider variations of the main dependent and independent variables, as well as standard errors. Concretely, we let the 'war shock' to refer not only to the war start but rather set the war dummy equal to one over the entire war period; change the interpolation of missing inequality data so that all the decline in top shares between wars is attributed to the war period only and compute Driscoll-Kraay standard errors instead of standard errors clustered by country. Results remain consistent across these specifications, see Figure B.8. We also consider a specification that uses the degree of destruction in the war site to proxy for the intensity of the war, and continue to find sharp drops in income and wealth inequality, with the income inequality drop being more pronounced, see Figure B.9. When including the trend in inequality in the years before the war we show in Figure B.10 that there are no large such movements.

We finally conduct a placebo check, in which we estimate the response of inequality in countries that are not party to the world wars (such as Switzerland). Although this is an imperfect check due to the international spillovers of wars, we still find that 'placebo wars' do not lower inequality (panel (d) of Figure B.10). This suggests that effects specific to these time periods cannot explain our findings.

3.2 Micro-Level Analysis

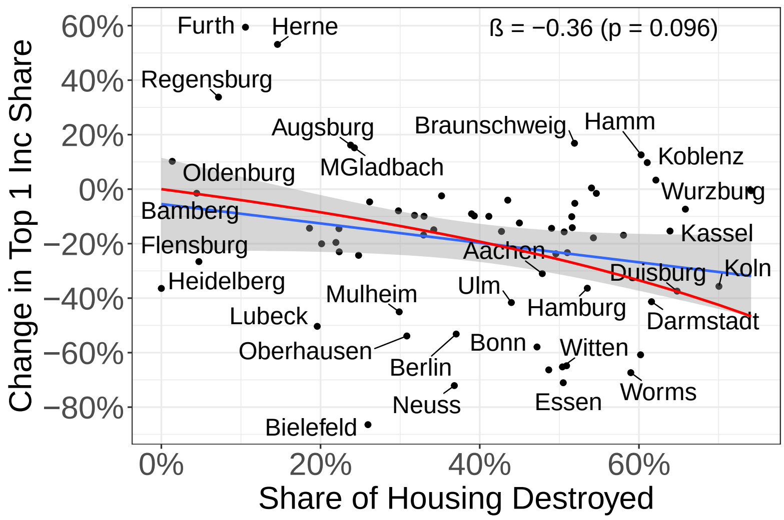
We complement the time-series evidence with a micro-level analysis based on a newly constructed dataset that includes measures of income inequality and destruction for more than 70 German towns during World War II. Zooming in on this panel allows us to isolate the direct effect of destruction on income inequality, controlling for the macroeconomic environment (e.g., taxes and inflation).

We rely on newly digitized income tax statistics for 1928–1954 to compute top-1% income shares for each town (data on wealth inequality at the local level are not readily available after World War II). The definition of income follows the aggregate inequality series for Germany by Bartels (2019) used above (both series are constructed from the same income tax), so the aggregated town-level data track macroeconomic trends. As before, income is measured before taxes and includes capital and business income, see Appendix B.5 for further details.

We measure destruction as the share of the housing stock destroyed during the war, since we lack data on the destruction of the capital stock. Alternatively, when we measure destruction by debris (in cubic meters per capita), we obtain similar results. Both measures were constructed by local administrators in the reconstruction after the war, see Appendix B.5.

We begin by plotting the raw data in Figure 3 which shows the correlation between the change in the top-1 income share from 1936 to 1950 (vertical axis) and the share of housing stock destroyed during the war (horizontal axis) across

Figure 3: Destruction and Inequality in a Panel of German Towns



Notes: The y-axis shows the percent change in the top-1 income share, the x-axis the share of the housing stock that is destroyed in war. The blue line is a fitted linear regression, the top of the plot indicates the coefficient in the regression of the percent change in the top 1 income share on the share of housing destroyed together with the (robust) p-value. The red line shows the implied change in income inequality using equation (4) from the simple framework.

towns. The extent of destruction varies greatly—from zero in some towns, such as Heidelberg, to more than 70 percent in others, such as Cologne. As with the cross-country data, we find that higher destruction levels are associated with a greater reduction in income inequality: a simple estimation suggests that a 1-percentage-point increase in destruction reduces the top-1% income share by about 0.35 percent, as indicated by the blue line. We also use the simple framework from Section 3.3 to predict changes in inequality using observed destruction (plotted in red) and find that it can account well for the observed cross-section within Germany.

Some of the variation in destruction across towns may be due to differences in industrial structure, which made certain cities more attractive targets. Therefore, we also conduct a more formal analysis that leverages the panel dimension of our data and and an instrumental variable. Concretely, we estimate the difference-in-differences specification

$$\log(\text{top-1 share}_{i,t}) = \alpha_i + \gamma_t + \beta(\text{Share Destroyed}_i \times \text{Post 1945(t)}) + X_{i,t} + \varepsilon_{i,t}, \quad (2)$$

where i is the town and t is the year. The coefficient of interest is β, which captures the percent change in inequality induced by a percentage point increase in war destruction. We control for both town (α_i) and time (γ_t) fixed effects to ac-

Table 2: Baseline Results

	Log Top 1 Inc Share		
	(1)	(2)	(3)
Share Destroyed × Post	-0.324*	-0.318*	-1.679*
	(0.180)	(0.179)	(0.990)
City FE	✓	✓	✓
Year FE	✓	✓	✓
Controls		✓	✓
KP F-Stat			3.67
AR-CS Set			[-7.27, -.14]
Towns	110	71	71
Observations	541	463	463

Notes: This table plots the estimated coefficients from the regression (2). Column (3) of the table shows IV Specification, we report the first-stage F-Statistic as well as the Andrews (2018)-weak instrument robust confidence intervals below. Standard errors are clustered by town. Significance codes: *** 0.01, ** 0.05, * 0.1.

count for time-invariant differences between cities and aggregate developments in the German economy, and additionally for the pre-war share of employment in industrial jobs, interacted with the post dummy (to proxy for the industry structure). Table 2 shows the results of the regression, which are in line with the scatterplot. A one percentage point increase in war destruction is associated with 0.3% decrease in income inequality, even after controlling for the industry structure in column 2. Reassuringly, there are no visible pre-trends in inequality prior to the war (Figure B.11), suggesting that high-and low bombing intensity cities were not affected differentially by aggregate trends which mattered for inequality (like the military buildup).

The allied bombing of Germany was of course not fully random. We therefore introduce an instrumental variable, which we argue affected inequality only through war destruction. We use the distance to London (interacted with the post dummy) as our instrumental variable, following Halbmeier and Schröder (2025) and Vonyó (2012). For most of the war, the bombing of Germany was conducted by planes stationed in the United Kingdom, which made it easier to bomb towns in the German northwest. We show the instrumental variable results in column (3) of Table 2. The instrumental variable results confirm that the effect of bombing on inequality is causal: The coefficient becomes more negative, so that a percentage point increase in destruction causes top-1% income shares to decline by 1.7%. Because the first-stage F-statistic are relatively low, we also report Andrews (2018) weak-instrument robust confidence intervals which confirm the effects, although they are noisily estimated.

3.3 Capital incomes and inequality: Some simple accounting

The evidence provided above suggests that the leveling effects of war operate at least partially through their effect on capital. The hypothesis that wartime shocks to capital lower inequality by reducing capital incomes is well established.[12] The key question is whether destruction is sufficient to account for the observed decline in inequality during war. We address this question through a simple accounting exercise in the spirit of Meade (1964). For this purpose we consider an exogenous decline in the capital–labor income ratio and operate under an *all-else-equal* assumption, abstracting from further effects due to, for instance, changes in labor supply or markups. This restriction will be relaxed in the general-equilibrium analysis below.

In what follows K denotes wealth (including capital and other assets), and I denotes income; both may arbitrarily distributed over the population. The income share of the top-p percentile is the sum of labor and capital income:

$$sh_p^I = \frac{sh_p^L \cdot w \cdot L + sh_p^K \cdot r \cdot K}{w \cdot L + r \cdot K}. \tag{3}$$

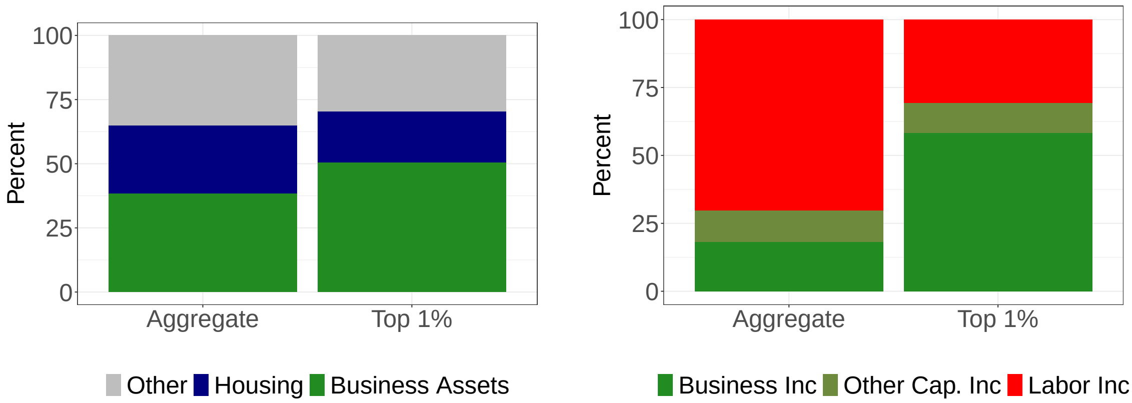
In this expression sh_p^L is the share of total labor income accruing to the top-p percentile, $w \cdot L$ is labor income, and sh_p^K is the share of capital income accruing to the top-p percentile. Capital income is the rental rate of capital r times the capital stock K. The top wealth share is given by $sh_p^K = K_p/K$, that is, the fraction of wealth owned by the top-p percentile.

Based on equation (3), we quantify the impact of an exogenous decline in the capital–labor ratio by D%. In the accounting framework, this can be due to, for instance, directly by physical destruction or, more broadly, by depreciation or low returns to capital (in the HANK model, we endogenize how shocks to e.g., the capital stock affect the capital-labor ratio).[13] To simplify the analysis, we assume that the shock affects wealth uniformly—that is, it eliminates

[12]For example, Piketty (2014, p. 275) notes that "the shocks endured by capital, especially private capital, in the period 1914–1945 diminished the share of the upper decile (and upper centile)."

[13]For example, in a study after World War II, the U.K. government noted that "industrial and other enterprises have been compelled, by shortage of material and labour, to allow arrears of normal depreciation and obsolescence to accumulate" (Chancellor of the Exchequer, 1945).

Figure 4: Wealth and Income Portfolios along the Distribution in France, 1937



(a) Wealth Composition

(b) Income Composition

Notes: This figure shows the composition of wealth and income in France in 1937, both for the top 1 and the aggregate. For wealth, we distinguish three asset categories: Business assets, housing and a residual. For income, we distinguish business income, other capital income (real estate and interest incomes) and labor income. The precise definition of these categories is in section C.3. See figures C.14e and C.14f for an analogue for Germany.

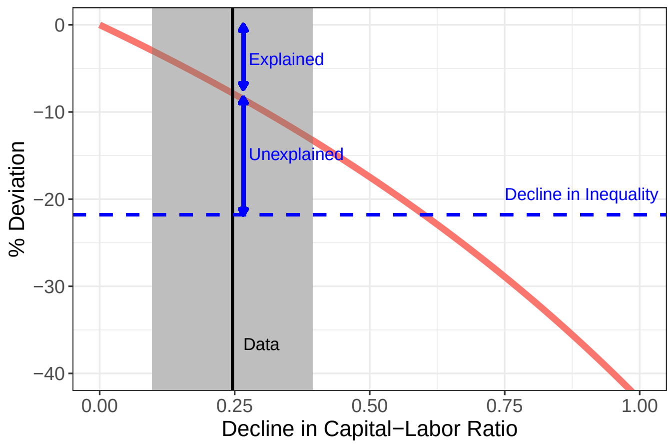
a fixed *share* of wealth for all wealth owners. This assumption is empirically motivated, as Figure 4 illustrates based on data for France: the wealth composition of the top percentile is very similar to that of the aggregate portfolio across all households (left panel), especially when compared to the composition of income (right panel). This similarity reflects that, in historical data, much of the wealth is concentrated within the top decile, so that the average wealth-holder does not look very different from a top-1% wealth-holder (we study deviations from this assumption in Appendix C.3).[14]

It follows directly that the D-shock does not alter the top-1 *wealth* share. Capital is lost, but proportionally across the wealth distribution, so relative wealth inequality measures remain unchanged. By contrast, the shock affects *income* shares because the composition of income differs substantially along the distribution, with capital income much more concentrated at the top (see again the right panel of Figure 4). Formally, we can write the income share of the top-p percentile as a function of the shock:

$$sh_p^I(D) = \frac{sh_p^L + sh_p^K \cdot (1-D) \cdot \frac{r \cdot K}{w \cdot L}}{1 + (1-D) \cdot \frac{r \cdot K}{w \cdot L}}. \tag{4}$$

[14]Historically, top-1% households consisted mainly of landowners or industrialists who lived off the proceeds of their capital. In modern data, wages are more important even at the top. Piketty (2014) refers to this as the transformation of the income-rich from "rentiers" to "supermanagers."

Figure 5: Top 1 Income Share as a Function of Changing Capital-Labor Ratio



Notes: The red line shows the implied decline in the top-1 income share as a function of a decline of the capital-labor ratio, which is on the y-axis. The Vertical line indicates response of the capital labor ratio at the 10-year horizon in Figure 2, shaded area indicates 1-sd confidence bands. Arrows indicate the decline in income inequality that can be explained by direct effect of destruction basic accounting framework, see eq. (4), and the unexplained part relative to the decline in top income shares in Figure 1.

A decline in the capital-labor ratio D lowers the income share for the top-p percentile, if the share of total capital income accruing to the top-p percentile sh_p^K is greater than its labor income share sh_p^L. Formally, the derivative $\partial sh_p^I(D)/\partial D$ is negative if $sh_p^L < sh_p^K$.

Importantly, D can be measured in the data such that—given data on the composition of top incomes—we can gauge its quantitative effect on the top-1 income share.[15] We first apply the accounting framework to the city-level evidence from Germany, calibrating the composition of top incomes to pre-war data. The red line in Figure 3 shows the framework's prediction for how the destruction of capital affects the top-1% income share, when calibrated to pre-war German data. It aligns closely with with the blue regression line of best fit. Similarly, we show that countries with larger capital losses (measured via capital shares or destruction) experience larger declines in income inequality in the data (Figure C.12), also in line with the framework. Hence, the framework successfully captures the *direct* effect of destruction on income inequality.

However, the direct effect of destruction cannot explain the *overall* effect of war on inequality in the time-series, as we show below. We use data on the composi-

[15] Meade (1964) and Moll et al. (2022) apply similar frameworks to study inequality in post-war U.K. and in the U.S. in recent years. We extend this approach to the wealth distribution and find larger effects on income inequality from shifting capital shares than they do, owing to the fact that in pre-war data the initial distribution of capital income is more unequal.

tion of top incomes, which is available for France, Germany, Japan and the U.K. in the pre-war period to calibrate the simple framework (shown in Table C.7) and vary the decline the capital labor ratio D.[16] Figure 5 shows the results of this exercise. The solid red line shows the implied decline in the top-1% income share, measured against the vertical axis, caused by an exogenous decline in the capital-labor ratio, measured along the horizontal axis. The black vertical line indicates the empirical estimate for the decline of the capital-labor ratio, around 25% at the 10-year horizon. For the top-1% share, this generates a decrease of around 8% in top-1 income shares —sizable but still less than half of what is observed in the data (more than 20%, see again Figure 1). Matching the observed decline in top-1% income shares would require implausible declines of the capital share by more than 50%, and the simple framework cannot account for the effects on wealth inequality.[17]

Hence, we need to move beyond the direct effect of war destruction on capital—and account for its full repercussions in general equilibrium. We do so in the next section, as we rely on a HANK model to study the distributional consequences of wars. In terms of equation (4), this means in particular that the distribution of capital and labor income ($sh^I_{p,L}$ and $sh^I_{p,K}$), which we assumed to be fixed so far, and the capital-labor ratio adjust endogenously.

4 A structural interpretation according to HANK

The HANK model provides a general equilibrium framework which allows us to quantify—through counterfactuals—the contributions of destruction, taxation, and inflation to the wartime compression of inequality. The two *defining features* make the model particularly suitable for our analysis: (i) it feature heterogeneous agents (HA) due to income differences that are not insured through complete financial markets—wealth and income distributions respond endogenously to aggregate disturbances; (ii) prices and wages exhibit nominal

[16] Note that the composition of top incomes does not directly give sh^L_p, which is the share of labor (or capital) income accruing to the top fractile. However, we can compute sh^L_p directly as $sh^L_p = \frac{Y}{w \cdot L} \cdot \frac{L_p}{Y_p} \cdot \frac{Y_p}{Y}$ using income composition data on top earners, where L_P/Y_p is the labor share within the fractile and Y is total income.

[17] In Appendix C.3, we relax the assumption that the D-shock affects all wealth holders uniformly, taking into account that top wealth holders may have been more exposed to war-related destruction. For this purpose, we compiled data for the three hardest-hit countries: France, Germany, and Japan. Nevertheless, we find that the direct impact of war destruction is less than half of the observed change in wealth inequality. Destruction alone cannot—all else equal—account for the full effect of war on the top-1 income or wealth share.

rigidities in the New Keynesian (NK) sense, so markups—and thus the capital share—respond endogenously to shocks, too. Together, these two features allow the HANK model to capture the empirically estimated effects of war on inequality and its driving channels successfully, as we show below.
In what follows, we first provide a compact overview of the model, which builds on Bayer et al. (2024), while delegating details and the recursive definition of the equilibrium to Appendix E. We then explain how we bring the model to the data before quantifying the different channels. The section concludes with an external validation of the mechanism which drives our results.

4.1 Model outline

The model features heterogeneity across households and firms but nevertheless allows for a tractable characterization of aggregate dynamics. We outline the framework from a top-down perspective, beginning with the aggregate relationships. In this way, we can, first, define the "war shock" as a composite of three structural shocks—capital destruction, inflation, and taxation—all of which operate at the aggregate (rather than the idiosyncratic) level, and, second, characterize the response of the functional income distribution.

Aggregate economy. Output $Y_t \equiv \left(\int_0^1 Y_{jt}^{\frac{\varepsilon-1}{\varepsilon}}\, di\right)^{\frac{\varepsilon}{\varepsilon-1}}$, with $\varepsilon > 1$, is an aggregate of varieties produced by imperfectly competitive firms, indexed by $j \in [0, 1]$. Aggregate production, in turn, depends on the economy's capital stock, K_t, and labor input, L_t:

$$Y_t = (u_t K_t)^{\alpha} L_t^{1-\alpha}, \qquad 0 < \alpha < 1, \tag{5}$$

where u_t measures the intensity with which capital is utilized.[18] All variables are in real terms unless otherwise noted.
Owing to imperfect competition, firms charge a markup over marginal cost. The resulting profits are a source of capital income for households in addition to the rental return on capital. Because prices are adjusted infrequently, the aggregate markup μ_t fluctuates, and so does the ratio of capital-to-labor income, given by:

$$\frac{r_t K_t + \Pi_t^F}{w_t^F L_t} = \frac{\alpha + (\mu_t - 1)}{1 - \alpha}, \tag{6}$$

where r_t is the rental rate of capital, w_t^F is the (product) wage paid by firms, and

[18]Eq. (5) omits a term capturing price dispersion, which is zero to a first-order approximation.

Π_t^F denotes firm profits. Expression (6) illustrates that—unless μ_t moves—labor and capital adjust in equilibrium to keep the capital share constant; a familiar property of the Cobb-Douglas production function (5).[19]
Output is used for consumption, C_t, investment, I_t, and government spending, G_t, such that $Y_t = C_t + I_t + G_t$; and the capital stock evolves according to

$$K_t = (1 - \mathcal{D}_t\delta(u_t))K_{t-1} + \Psi(I_t, I_{t-1}), \tag{7}$$

where $\Psi(I_t, I_{t-1})$ represents investment adjustment costs borne by perfectly competitive capital producers. The depreciation rate, $\delta(u_t)$, depends on utilization but is also subject to exogenous capital destruction, $\mathcal{D}_t\delta(u_t)$—intended to capture one of the key economic impacts of war, namely, physical destruction:

$$\log \mathcal{D}_t = \rho_{\mathcal{D},1} \log \mathcal{D}_{t-1} + \rho_{\mathcal{D},2} \log \mathcal{D}_{t-2} + \varepsilon_t^{\mathcal{D}}, \qquad \varepsilon_t^{\mathcal{D}} \sim \mathcal{N}(0, \sigma_{\mathcal{D}}^2). \tag{8}$$

We assume that $\mathcal{D}_t$ follows an AR(2) process with persistence parameters $\rho_{\mathcal{D},1}$ and $\rho_{\mathcal{D},2}$, allowing it to generate both a transitory jump and persistence, consistent with the historical evidence of the U-shaped destruction of the capital stock during wars. $\varepsilon_t^{\mathcal{D}}$ represents the destruction shock.

The central bank sets the nominal bond rate, R_t^b, via a Taylor rule,

$$\log \frac{R_t^b}{\bar{R}^b} = \rho_R \log \frac{R_{t_1}^b}{\bar{R}^b} + \phi_\pi \log \frac{\pi_t}{\bar{\pi}_t} + \phi_y \log \frac{Y_t}{\bar{Y}}, \tag{9}$$

where π_t is inflation, π_t; $\bar{R}$ and $\bar{Y}$ denote steady-state values and $\bar{\pi}_t$ is a time-varying inflation target subject to shocks $\log \bar{\pi}_t = \rho_{\bar{\pi}} \log \bar{\pi}_{t-1} + \varepsilon_t^{\pi}$, with $\varepsilon_t^{\pi} \sim \mathcal{N}(0, \sigma_{\pi}^2)$, which captures possible regime changes in monetary policy, in turn, associated with large shifts inflation—the second dimension of the war shock. Government debt, B_t, evolves according to

$$B_{t+1} = (1 + R_t^b)B_t + G_t - T_t, \tag{10}$$

where T_t are tax revenues. Government spending adjusts to stabilize debt and output:

$$\log \frac{G_t}{\bar{G}} = \rho_G \log \frac{G_{t-1}}{\bar{G}} + (1 - \rho_G)\theta_B^G \log \frac{B_t}{\bar{B}} + (1 - \rho_G)\theta_Y^G \log \frac{Y_t}{\bar{Y}}, \tag{11}$$

[19] The framework in Section 3.3 above abstracts from this adjustment since it maintains an *all-else-equal*-perspective throughout.

where parameters ρ_G and $\theta_{G\cdot}$ determine "smoothing" and the responsiveness of spending to debt and output, respectively. For taxes, we distinguish a proportional payroll tax, τ_t, and an extra rate for high incomes that features a temporary war surcharge, τ_t^{war}, levied on both, labor income and capital income of top-decile households only. The payroll tax follows a policy rule isomorphic to (11) while the war surcharge follows a shock process to capture the third dimension of the war shock:

$$\log \frac{\tau_t^{\text{war}}}{\bar{\tau}^{\text{war}}} = \rho_{\tau^{\text{war}},1} \log \frac{\tau_{t-1}^{\text{war}}}{\bar{\tau}^{\text{war}}} + \rho_{\tau^{\text{war}},2} \log \frac{\tau_{t-2}^{\text{war}}}{\bar{\tau}^{\text{war}}} + \varepsilon_t^{\tau^{\text{war}}}, \quad \varepsilon_t^{\tau^{\text{war}}} \sim \mathcal{N}(0, \sigma^2_{\tau^{\text{war}}}). \tag{12}$$

As before, we assume an AR(2) process with persistence parameters $\rho_{\tau^{\text{war}},1}$ and $\rho_{\tau^{\text{war}},2}$; $\varepsilon_t^{\tau^{\text{war}}}$ is the taxation shock.[20]

Households. There is heterogeneity among households, indexed by i, along three dimensions: liquid savings, b_{it}, capital ownership, k_{it}, and productivity, h_{it}. Asset market clearing requires that $B_t = \int_0^1 b_{it}\, di$ and $K_t = \int_0^1 k_{it}\, di$. The distinction between the two assets is central to the analysis of Bayer et al. (2024); it is also particularly suitable for studying the issue at hand: in this way, we can distinguish between the distributional impact of war that operates via inflation (bonds) and that which operates via physical destruction (capital). Formally, to solve the model, we need to keep track of the distribution of households along three dimensions, $\mu_t(b, k, h)$, as detailed in Appendix E.

Productivity drives differences in labor income across households and evolves exogenously:

$$\log h_{it} = \rho_h \log h_{it-1} + \epsilon_{it}^h, \qquad \epsilon_{it}^h \sim \mathcal{N}(0, \sigma_h^2), \tag{13}$$

where ρ_h captures persistence and ϵ_{it}^h is an idiosyncratic productivity shock.

Each period, some households work as entrepreneurs, earn firm profits and do not receive labor income ($h_{it} = 0$). Entrepreneurship is persistent, transitions into and out of the entrepreneur state occur exogenously, with probabilities ζ and ι, respectively. This "fat-tail" mechanism generates very high income at the top, consistent with the data and captures the importance of business income for households in the right tail of the distribution.

[20] In our empirical analysis, we focus on the top marginal tax rate, as tax rates across the income distribution are not systematically available across countries. Where data are available, the response of the top decile's average tax rate closely tracks that of the top marginal tax rate (see Figure A.3).

Preferences are of the Greenwood-Hercowitz-Huffman type:

$$\mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \frac{[c_{it} - n_{it}^{1+\gamma}/(1+\gamma)]^{1-\xi} - 1}{1-\xi}, \tag{14}$$

with elasticity parameters γ and ξ, and n_{it} denoting hours worked. $\mathbb{E}_0$ is the expectation operator and β the discount factor. Household decide on how much to consume and to work, given wages, w_t, and adjust their portfolios in order to maximize (14). Capital is traded at price q_t, but only subject to frictions: households can adjust their holdings only when a Poisson adjustment shock of probability λ arrives; otherwise $k_{it+1} = k_{it}$. This captures the fact that capital is less liquid than bonds. The period budget constraint reads as follows:

$$\begin{aligned} c_{it} + b_{i,t+1} + q_t k_{i,t+1} = (1 - \tau_t - \tau_{i,t}^{\text{war}}) w_t h_{it} n_{it} + \frac{R(b_{it}, R_t^b)}{\pi_t} b_{it} + (q_t + (1 - \tau_{i,t}^{\text{war}}) r_t) k_{it} \\ + \Pi_t^F \mathbf{1}_{\{h_{it}=0\}} + \Pi_t^U \mathbf{1}_{\{h_{it} \geq 0\}}. \end{aligned} \tag{15}$$

Capital holdings cannot be negative but bond holdings may be negative up to a borrowing limit in which case borrowers pay an interest-rate penalty on negative b_{it}.

Entrepreneur households receive firm profits as capital income, $\Pi_t^F = (1 - mc_t)Y_t$, while other households receive the profits earned by a union, $\Pi_t^U = (w_t^F - w_t)N_t$. The profits of the union reflect its market power in the labor market, which in turn drives a wedge between the product wage and the wage received by households. The union renegotiates wages infrequently across different segments of the labor market, giving rise to a wage Phillips curve:

$$\log\left(\frac{\pi_t^W}{\bar{\pi}_W}\right) = \beta \mathbb{E}_t \log\left(\frac{\pi_{t+1}^W}{\bar{\pi}_W}\right) + \kappa_w \left(\frac{w_t}{w_t^F} - \frac{1}{\mu^W}\right), \tag{16}$$

where π_t^W and $\bar{\pi}_W$ is product-wage inflation off and on steady state, and $1/\mu^W$ is the desired wage mark-down. κ_w parametrizes the degree of wage rigidity.

Firms. There is heterogeneity at the firm level because firms adjust their prices infrequently. The implication is a price Phillips curve:

$$\log\left(\frac{\pi_t}{\bar{\pi}}\right) = \beta \mathbb{E}_t \log\left(\frac{\pi_{t+1}}{\bar{\pi}}\right) + \kappa_Y \left(mc_t - \frac{1}{\mu}\right), \tag{17}$$

where mc_t are marginal costs, $\bar{\pi}$ is steady-state inflation, and μ is the desired markup. κ_Y parametrizes the degree of wage rigidity.

4.2 Accounting for the evidence

We now interpret the evidence through the lens of the model, following a two-step procedure that targets, in turn, steady-state (or long-run) relationships and the evidence on the adjustment triggered by the war shock.

Steady state. We fix the parameters that govern the steady state of the model by targeting key features of the data and by relying on estimates provided by earlier work. Table 3 shows the calibration targets in Panel A and summarizes the steady-state parameters in Panel B. One period in the model refers to a year. For the steady state, we match 5 targets: (1) a capital-to-output ratio of 271%, (2) a ratio of public debt-to-output of 55%, (3) the average top-1% share of wealth of 31%, (4) a ratio of household debt-to-output of 8%, (5) a ratio of government spending-to-output of 13%. This yields a discount factor of $\beta = 0.94$, a portfolio adjustment probability of $\lambda = 8.5$ percent, a borrowing penalty of $\bar{R} = 8.0$ percent (given a borrowing limit of 120% of output), a transition probability from worker to entrepreneur of $\zeta = 0.11$ percent, and a labor tax rate of 14% plus a surcharge of 22% for high income households. Steady-state inflation is set to zero ($\bar{\pi} = 1$), as there is indexation to it in the Phillips curves, and the steady-state interest rate on bonds is set to 1.0 percent.

For the remaining steady-state parameters, we use values established in the literature; these are reported in Panel B of Table 3. For idiosyncratic income risk, we take standard values and set $\rho_h = 0.9$ and $\sigma_h = 0.2$. Guvenen et al. (2014) estimate the probability that a household falls out of the top-1% of the income distribution in a given year as $\iota = 25$ percent, which we interpret as the transition probability from entrepreneur to worker. The relative risk aversion is set to 2, and the Frisch elasticity is set to 0.5 (Chetty et al., 2011).

Turning to firms, we set the labor share in production, α, to 66 percent. An elasticity of substitution between differentiated goods of 11 implies a markup of 10 percent, while an elasticity of substitution between labor varieties of 40 implies a wage markup of 2.5 percent. The depreciation rate is 8.0 percent per year.

Figure 6 illustrates how wealth and assets are distributed in the steady state. The left panel plots net wealth, along with bond and capital holdings (as a

Table 3: Steady-state Targets and Parameters

Panel A: Targets for stead steady state				
Targets	Data	Model	Source	Parameter
Capital to GDP	271%	271%	Bergeaud et al. (2016)	Discount factor
Government debt to GDP	55%	55%	Mauro et al. (2015)	Portfolio liquidity
Top 1% wealth share	30%	31%	WID	Fraction of entrepreneurs
Household debt to GDP	8%	8%	Müller and Verner (2024)	Borrowing limit
Government spending to GDP	13%	13%	Own Data	Tax rate

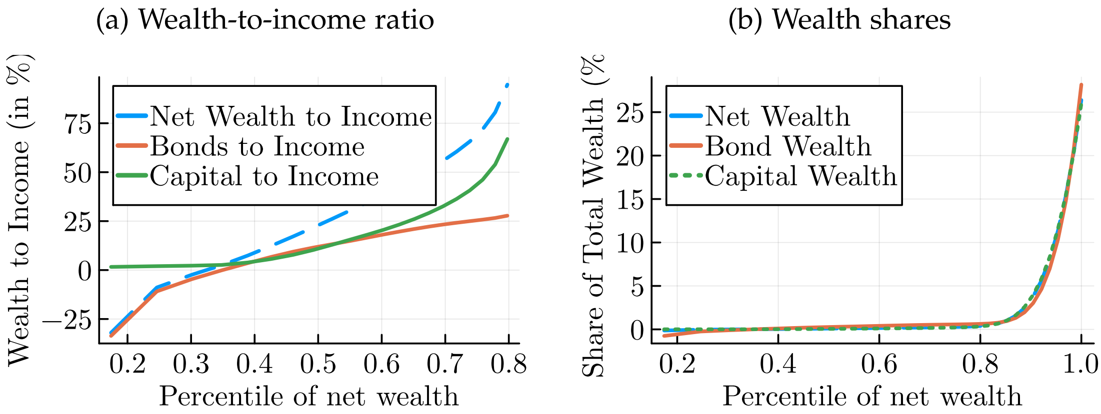
Panel B: Steady State Parameters					
	Description	Value		Description	Value
Households: Income process			**Households: Preferences**		
ρ_h	Persistence	0.90	ξ	Relative risk aversion	2.00
σ_h	Standard deviation	0.20	γ	Frisch elasticity	0.50
ι	Trans. prob. (E→W)	25.00%	β	Discount factor	0.94
ζ	Trans. prob. (W→E)	0.11%	λ	Portfolio adj. probability	8.50%
Households: Borrowing			**Government**		
$\bar{R}$	Borrowing penalty	9.00%	τ	Tax level	0.14
$b_{\max}/Y$	Borrowing limit to output	120%	τ^{war}	High income tax	0.22
			$\bar{\pi}$	Inflation target	1.00
Firms			$\bar{R}^b$	Nominal bond rate	1.01
α	Labor share	0.66	δ_0	Depreciation rate	8.00%
$\bar{\eta}$	Goods elasticity	11	$\bar{\zeta}$	Labor Elasticity	40

Notes: Panel A shows calibration targets based on cross-country averages since 1870. Household debt to GDP excludes mortgage debt; Appendix A.2 provide further details on government spending. Panel B reports parameter values set to match steady state value, as well as other papers, see main text for details.

percent of income) on the vertical axis, against the wealth distribution on the horizontal axis. To preserve readability, the distribution is cut off at the 80th percentile, since the holdings of the top 20 percent amount to several times their income. After all, the aggregate capital-to-GDP ratio is close to 3. Showing the assets of the very rich in the left panel would mask the patterns of interest at the lower end of the distribution, where indebtedness is concentrated as the 40% poorest households hold no capital. In the right panel of the same figure, we show the *share* of wealth in the population—also broken down into bonds and capital—held by different households (vertical axis) across the full wealth distribution (horizontal axis). The top percentile clearly holds the lion's share of total wealth in both bonds and capital; but the top decile also owns a sizable share.

Adjustment dynamics. In a second step, we estimate the parameters that govern the model's adjustment dynamics in response to aggregate shocks by matching the empirical impulse responses, using the Bayesian approach of Christiano et al. (2010). In the model, the "war shock" is represented as a composite of the three structural shocks introduced above: a capital destruction shock, an

Figure 6: Asset holdings across the wealth distribution



Notes: Figure shows distribution of assets in steady state. Left panel measures net wealth, bonds and capital in percent of income (vertical axis) across wealth distribution (horizontal axis), up to 80th percentile only. Right panel shows share of wealth held by households (vertical axis) across wealth distribution (horizontal axis).

inflation (target) shock, and a taxation shock. These shocks occur simultaneously, scaled by their standard deviations: in the estimation we identify the relative importance of the components of the war shock by pinning down their persistence and standard deviations.

More formally, we treat the empirical impulse responses $\hat{\psi}$ as "data" and estimate the remaining model parameters ϑ while matching the model impulse responses $\psi(\vartheta)$ to $\hat{\psi}$. The Bayesian log posterior is then given by

$$\log f(\vartheta|\psi) \propto -\frac{1}{2}\left(\hat{\psi}-\psi(\vartheta)\right)' W \left(\hat{\psi}-\psi(\vartheta)\right)' + \log p(\vartheta)\,, \tag{18}$$

where W is a weighting matrix and $p(\vartheta)$ denotes the priors on ϑ. $\hat{\psi}$ stackes the empirical impulse responses shown in Figures 1 and 2 above: the responses of the top 1 income and wealth share, the capital stock, the capital-to-labor ratio, the top marginal tax rate, and inflation. In addition, we use three variables to discipline the fiscal policy response beyond taxation: government spending, tax revenues, and output, shown in Figure E.17. Following common practice in the impulse-response-matching literature (Christiano et al., 2005; Christiano et al., 2010), we use a diagonal weighting matrix W, where the diagonals are 1 divided by the squared standard error of the respective empirical impulse response.

Table 4 reports the estimation results. Where available, we use prior values (left panel) that are standard in the literature and independent of the underlying data. For the shock processes we assume wide priors on the persistence pa-

Table 4: Prior and Posterior Distributions of Estimated Parameters

Parameter		Prior		Posterior			
	Distribution	Mean	Std. Dev.	Mean	Std. Dev.	5 %	95 %
			Capital Destruction Shock				
$\rho_{\mathcal{D},*}$	Beta	0.50	0.20	0.716	0.028	0.668	0.761
$\rho_{\mathcal{D},2}$	Normal	0.00	0.50	0.090	0.066	-0.016	0.199
$\sigma_{\mathcal{D}}$	Inv.-Gamma	0.10	0.03	0.846	0.047	0.770	0.925
			Tax Shock				
$\rho_{\tau^{\mathrm{war}},*}$	Beta	0.50	0.20	0.933	0.016	0.910	0.959
$\rho_{\tau^{\mathrm{war}},2}$	Normal	0.00	0.50	-0.654	0.149	-0.912	-0.432
$\sigma_{\tau}^{\mathrm{war}}$	Inv.-Gamma	0.50	0.25	0.265	0.072	0.141	0.358
			Inflation (target) Shock				
$\rho_{\bar{\pi}}$	Beta	0.50	0.20	0.495	0.203	0.163	0.819
$\sigma_{\bar{\pi}}$	Inv.-Gamma	0.10	0.03	0.000	0.000	0.000	0.000
			Real and Nominal Frictions				
δ_s	Gamma	5.00	2.00	3.637	0.954	2.371	5.447
ϕ	Gamma	4.00	2.00	2.870	1.781	0.810	6.420
κ	Gamma	0.10	0.03	0.196	0.038	0.136	0.261
κ_w	Gamma	0.10	0.03	0.030	0.007	0.019	0.042
			Monetary and Fiscal Policy Rules				
ρ_R	Beta	0.75	0.20	0.393	0.099	0.227	0.561
ϕ_π	Normal	1.70	0.30	1.998	0.258	1.681	2.531
ϕ_Y	Normal	0.13	0.05	0.136	0.049	0.058	0.221
ρ_G	Beta	0.5	0.20	0.866	0.029	0.813	0.905
θ_Y^G	Normal	0.00	1.00	-20.439	2.612	-24.717	-16.039
θ_B^G	Normal	0.00	1.00	0.332	0.104	0.180	0.520
ρ_τ	Beta	0.5	0.20	0.351	0.170	0.103	0.664
γ_Y^τ	Normal	0.00	1.00	-1.925	0.865	-3.302	-0.457
γ_B^τ	Normal	0.00	1.00	0.475	0.176	0.214	0.787

Notes: To estimate the AR(2)-processes for shocks to capital depreciation and war taxation, we estimate $\rho_* = \rho_1 + \rho_2$ in addition to ρ_2.

rameters with a mode of low autocorrelation of 0.5 (for the AR(2)-processes, we estimate $\rho_* = \rho_1 + \rho_2$, which follows a beta distribution with mean 0.5). The standard deviations, $\sigma_{\mathcal{D}} = 10\%$, $\sigma_\tau^{\mathrm{war}} = 25\%$, $\sigma_{\bar{\pi}} = 10\%$, are large to capture the sizable empirical response of the three corresponding observables (capital stock, tax rate, inflation).

Following Justiniano et al. (2011), we assume a gamma distribution with prior mean of 5.0 and standard deviation of 2.0 for δ_2/δ_1, the elasticity of marginal depreciation with respect to capacity utilization, and a gamma prior with mean 4.0 and standard deviation of 2.0 for the parameter controlling investment adjustment costs, ϕ. The slopes of the price and wage Phillips curves, κ_Y and κ_w, follow gamma priors with mean 0.1 and standard deviation 0.03, in line with the macroeconomics literature, which implies a moderate degree of nominal rigidity.

Regarding monetary policy, the inflation and output feedback parameters in the Taylor-rule, θ_π and θ_Y, follow normal distributions with prior means of 1.7

and 0.13, respectively, while the interest rate smoothing parameter ρ_R follows a beta distribution with mean 0.75 and standard deviation 0.1. For fiscal policy, we estimate the response of government spending and taxes to deviations of government debt and output. We impose Normal distributions centered around zero to allow the data to speak to the cyclicality of both.

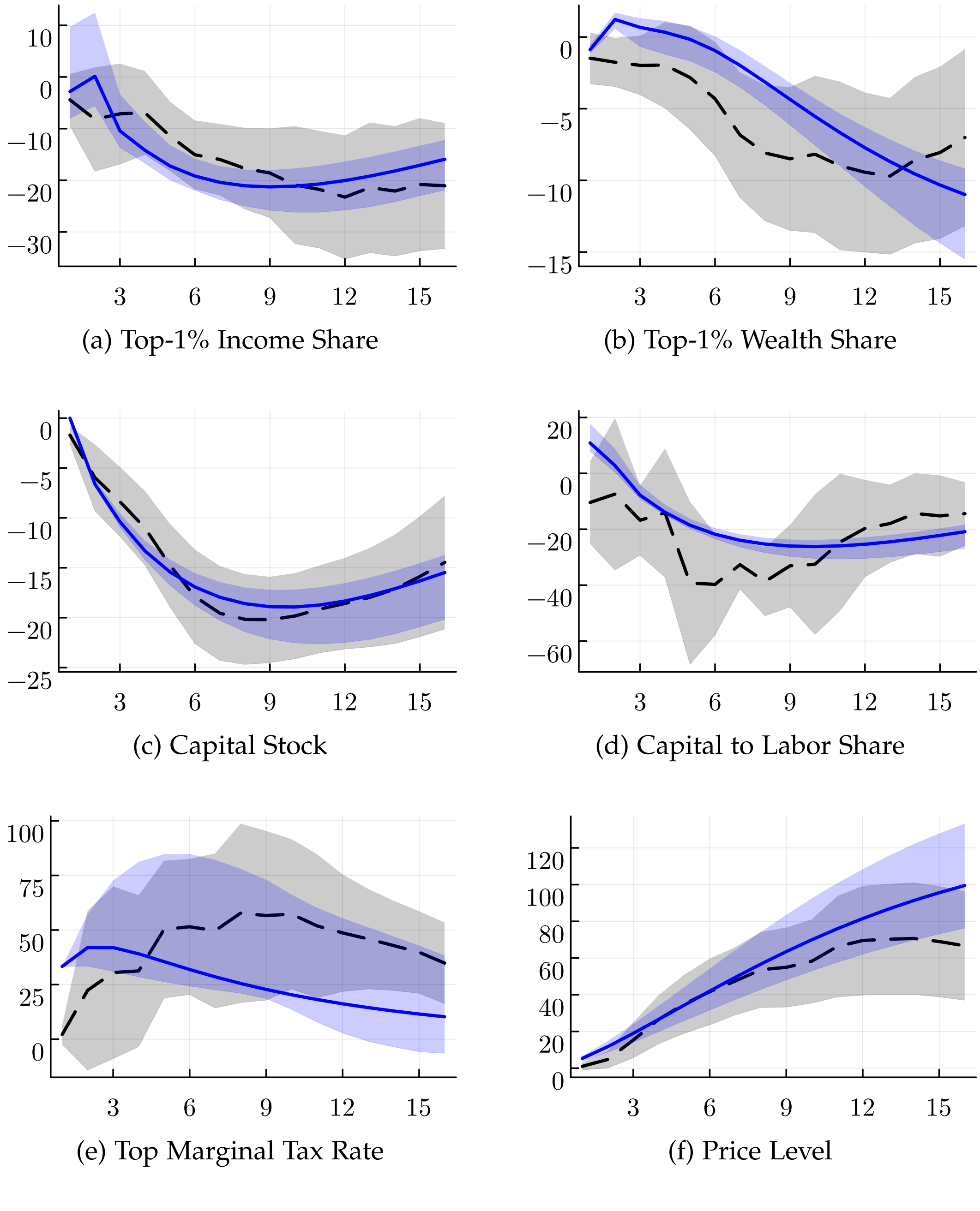
We report the posterior distribution in the right panel of Table 4. They are based on a standard random walk Metropolis–Hastings algorithm, with 400,000 draws including burn-in. Our estimates suggest that the war shock comprises: 1) a capital destruction shock doubling the depreciation rate to 16% p.a., with an overall persistence of 0.72; 2) a 27% tax increase on wealthy households, with a persistence of 0.93; and 3) no change to the central bank's inflation target. We estimate that government spending rises significantly during wars, with an elasticity of -20 with respect to output, while taxes increase with an elasticity of -2. For the Taylor rule, as well as for real and nominal frictions, we find parameter estimates that are not uncommon in business cycle literature.

Figure 7 shows the predictions of the estimated model compared to the data. The panels are organized analogously to Figures 1 and 2 in Section 3, and reproduce the empirical impulse response functions (dashed lines) together with their confidence bounds (grey areas), alongside the model's prediction for the adjustment to the war shock (blue solid lines). Although the estimation targets the empirical responses, the degrees of freedom are limited. It is therefore noteworthy that the model succeeds in capturing the empirical dynamics so well.

In particular, the estimated model replicates the decline in top-1% income and wealth shares observed in the data, see Panel (a) and (b). It also captures the adjustment of the key potential drivers that are the focus of our analysis, see Panels (c) to (f). In the model, the capital stock declines to the same extent as in the data; the capital-to-labor share also falls markedly; and both the top marginal tax rate and the price level rise, all within a range comparable to the empirical evidence. The sharp increase in prices is particularly noteworthy. Recall that the estimated standard deviation of the inflation (target) shock is zero, meaning there is no exogenous rise in prices. Thus, the model predicts an endogenous increase in prices, reflecting the adverse supply-side effects of the shocks to capital destruction and taxation. We report the additional model predictions in the Appendix (see Figure E.17).[21]

[21] The model does not fit the observed decline in output. The working paper version of (Federle et al., 2025) show that this requires additional TFP shocks, which tend to have only very muted effects on income or wealth inequality (Bayer et al., 2024).

Figure 7: Adjustment to war shock—model fit



(a) Top-1% Income Share

(b) Top-1% Wealth Share

(c) Capital Stock

(d) Capital to Labor Share

(e) Top Marginal Tax Rate

(f) Price Level

Notes: Blue solid line: Baseline model estimated via IRF-matching. Black dashed line: Local-projection estimates. Gray shaded areas: 90 percent confidence bounds based on Newey and West (1987)-standard errors; blue shaded areas: 90 percent bands based on simulating 10,000 sets of IRFs using posterior draws. Y-axis: Percent deviation from steady state. X-axis: Years.

4.3 Inspecting the mechanism

The estimated model successfully captures how the economy—notably top-1% percent income and wealth shares—responds to war. We therefore use the model to examine the underlying mechanisms: first, by disentangling the quantitative importance of the three components of the war shock; second, by revisiting the exposure of portfolios across the wealth distribution to surprise inflation and destruction; and finally, by analyzing the channels through which destruction and taxation affect the top-1 income and wealth shares.

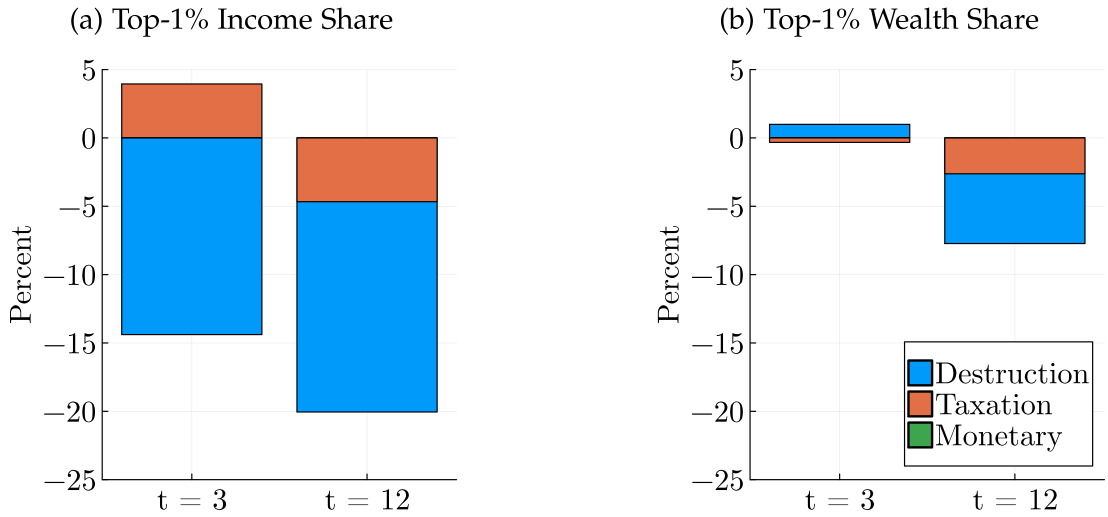
Shock decomposition. The war shock is a composite of the destruction shock, the inflation shock (reflecting loose monetary policy), and the shock to tax rates at the top. The posterior estimates of the corresponding standard deviations provide an initial indication of their relative importance: zero for the inflation (target) shock, 0.84 for the capital destruction shock, and 0.26 for the tax shock. These values, however, are not sufficient to assess the contribution of each component to the decline in inequality.

Instead, we run the model with each component of the war shock in isolation and compute the resulting changes in top-1% income and wealth shares. Figure 8 presents the results for 3 and 12 years after the onset of the war. The reduction in the top-1% income share (left panel) is overwhelmingly driven by the destruction shock, both in the short and long run. By year 12, it explains three-quarters of the 20-percentage-point drop, with the remainder due to the tax shock. As expected, the inflation shock has no effect. The decomposition for wealth is similar: the destruction shock accounts for the largest share, but the relative importance of the tax shock is higher—about one-third of the total effect 12 years after the war begins. Again, there is no contribution from the inflation shock.

In Section 3.3, we show that the mechanical effect of changing capital-labor ratios cannot account for the empirically observed decline in wealth inequality. In contrast, in general equilibrium, destruction can account for a marked decrease in the top 1 income share. We show below that having multiple types of capital income is key here. Increases in taxation have smaller effects on top income shares, which are measured pre-tax. In our model labor supply elasticities are relatively low, consistent with the data as reviewed for example in Saez et al. (2012), so that pre-tax income inequality is not affected strongly by changes in tax rates.[22] Progressive taxation can explain a larger share of the effects on

[22]The empirical evidence on the effects of tax progressivity on pre-tax inequality is mixed:

Figure 8: Shock decomposition



Notes: Decomposition using the IRFs for each shock from the estimated model. Y-axis: Percent deviation from steady state. X-axis: Years.

wealth inequality, because its reduces the disposable income out of which the rich accumulate wealth, which formalizes the argument of Piketty (2003).

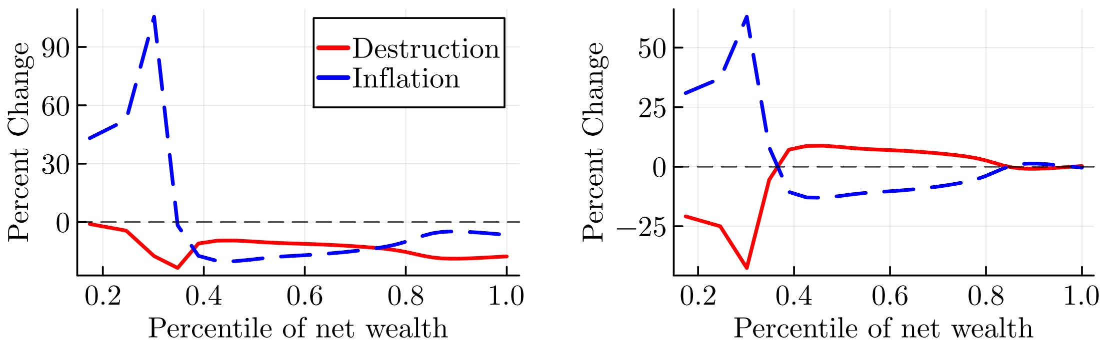
Portfolio exposure. The inflation shock does not contribute to the decline in the top-1% wealth share. This is unsurprising given the estimated standard deviation of the shock. Still, as stressed above, prices rise strongly during war—not because of a direct shock but endogenously. To see whether this matters for the impact of war on inequality, we compute the exposure of the steady-state portfolio across the wealth distribution to surprise inflation and to capital destruction, in the spirit of Doepke and Schneider (2006). Specifically, we calculate the change in net wealth given an unexpected increase in the price level and given destruction, and report the results in Figure 9. The left panel shows the change in wealth levels; the right panel shows the change in wealth shares. The solid line reports the effect of destruction; the dashed line reports the effect of inflation.

Households in the top 1 percent of the wealth distribution lose from both capital destruction and surprise inflation. However, their wealth share is unchanged because the losses at the top are not disproportionate—the bottom 99 percent also lose to a similar extent, on average. This is consistent with the analysis in Section 3.3, and provides an ex-post check for this earlier assumption on the

Studying a sample of tax reforms in modern data, Rubolino and Waldenström (2020) find that progressive taxation reduces pre-tax inequality, in contrast Robinson et al. (2025) find no effects when studying state tax reforms in the U.S..

Figure 9: Portfolio exposure

(a) Percent Change in Wealth Levels (b) Percent Change in Wealth Shares



Notes: In this partial equilibrium exercise, we assume a one-time destruction of 20% of capital and inflation of 50% in line with our empirical estimates.

incidence of destruction along the distribution.

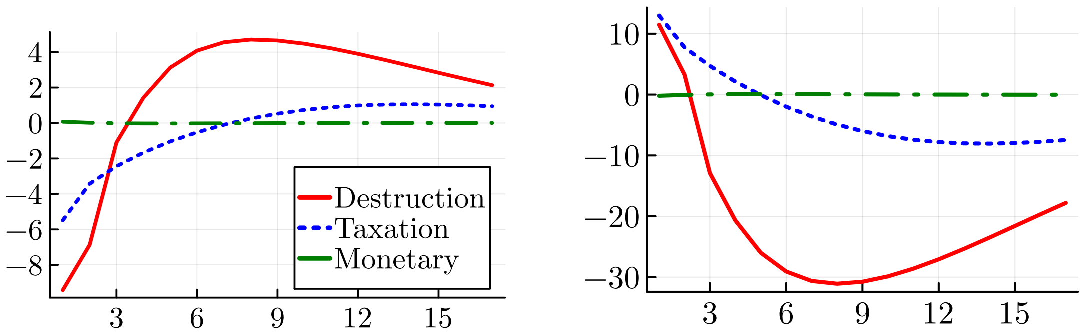
However, the figure reveals that the bottom 20 percent gain from inflation in absolute and relative terms, an effect that is only partly offset by capital destruction. These households hold leveraged positions in capital, so their net wealth responds disproportionately to both shocks.[23] Hence, war-time inflation will generally affect the wealth distribution—but the effect is only visible beyond the top. This highlights a benefit of our structural approach, which allows us to study parts of the distribution that are not observed in historical data.

Transmission channels. Finally, we turn to the channels through which destruction and taxation impact the top-1% income and wealth share. For this purpose Figure 10 decomposes the impulse response of income into payments to labor, capital, and profits for the three shocks. The left panel focuses on labor and capital incomes: both fall in response to the destruction and the taxation shock, but the effect is moderate and short lived.[24] The right panel zooms into the response of firm profits which make up entrepreneur income. Here we see a very strong decline, notably in response to the destruction shock. Profits fall persistently and by more than 30 percent. This is the key difference to the simple model in Section 3.3, where the distribution of capital and labor income sh_p^L, sh_p^K was held fixed. Through the lens of the stylized framework, this corresponds to a specific type of capital income, profits, which is more concentrated at the top. Figure 11 then decomposes the changes in top-1% income and wealth into

[23]See Kuhn et al. (2020) for a discussion of this mechanism in the U.S. post–WW II period.

[24]There is no effect of the inflation ("monetary") shock—since it is basically non-existent.

Figure 10: Income Sources



(a) Labor and Capital Incomes

(b) Profit Income

Notes: IRFs from estimated model. Y-axis: Percent deviation from steady state. X-axis: Years.

the contribution of each price. As expected, the 20% fall in the share of top 1% income comes almost exclusively from falling profits, with the effects of the other price changes cancelling each other out.

In terms of the underlying mechanism, profits decline because firms' markups decline—the model generates a pro-cyclical markup response to the capital depreciation shocks, consistent with observations by Nekarda and Ramey (2020).[25] Anecdotal evidence from Okazaki (1992), who studies price controls in Japan, shows that this was a goal of wartime price controls that were introduced for *'making producers bear sacrifices to cover the rise in production costs'*.[26] We also show directly that profits decline after wars below. In modern data, Auray et al. (2024) similarly find that the rise in markups in France since 1980 generate rising top 1 pre-tax income shares (taking markups as exogenous).[27]

[25] In particular, they provide evidence for a pro-cyclical response of markups to a TFP shock, consistent with the basic New Keynesian model. They stress however, that this model predicts a counter-cyclical markup response to demand shocks which is at odds with the evidence.

[26] Similarly, the goal of the U.K.'s prices of goods act was to *'freeze sellers net pre-war income'* (Earley and Lacy, 1942, p. 166).

[27] We can also use the model to study the adjustment of variables for which we lack observations. We do so in Figure E.19, which contrasts the response of the top-1% income share in terms of pre- and post-tax income. Recall that our data is on pre-tax income only. We find that the top percentile experiences a far greater decline in terms of post-tax income, at least in the first few years. This reflects the increase in war taxation targeting high-income households. We also consider how the wealth share of bottom 90% and bottom 50% respond.

Figure 11: Income decomposition

Notes: Decomposition of the change in top-1% income and wealth shares into the contribution of changes in asset, labor and profit income as well as taxation. Y-axis: Percent deviation from steady state. X-axis: Years.

4.4 External Validation of the Model Mechanism

The model suggests that falling profits are a key driver of the decline in inequality. But do profits actually fall during wartime? While many contemporaries condemned war profiteering, pointing to large gains in individual corporations, little is known about whether wars reduce profits more generally. To address this, we construct historical data on war profits for the countries in our sample and show that wars indeed systematically decrease firm profits.

In some cases, we can rely on prior work (e.g., Baten and Schulz (2005); Spoerer (1996) for Germany), but in other cases we construct profit data from primary sources as detailed in Section D.1. We aim for broad firm coverage, though sometimes only listed corporations can be included.[28] Table 5 shows real profits for the war sites in our sample. Because the series are short and definitions differ across countries, we normalize real profits to 100 in the initial year and trace their evolution over time. For comparability, we fix the initial year across countries, but our estimation in Section 3 begins when each country becomes a war site.

Before the outbreak of war, there is some evidence of rising profits during mil-

[28]When possible, we use post-corporate tax profits, since only these enter top income shares.

Table 5: Index of Profits and Profits relative to GDP

WW2	1935	1938	1941	1944	1949	1952
Finland	67.4	100.0	94.5	64.3	56.1	51.9
over GDP	*87.3*	*100.0*	*98.0*	*53.0*	*39.0*	*26.0*
France	75.6	100.0	61.1	–8.3	115.5	124.6
over GDP	*99.8*	*100.0*	*87.3*	*–16.4*	*88.5*	*80.9*
Germany	61.2	100.0	81.3		2.1	15.8
over GDP	*82.8*	*100.0*	*58.1*		*3.2*	*16.1*
Japan	59.3	100.0	149.3	186.0	33.9	94.2
over GDP	*73.7*	*100.0*	*119.0*	*131.7*	*55.1*	*96.0*
Netherlands		100.0	138.0	16.0		
over GDP		*100.0*	*202.6*	*44.9*		
UK	68.7	100.0	95.4	71.6	96.3	110.6
over GDP	*75.6*	*100.0*	*80.7*	*58.6*	*78.8*	*89.0*
WW1	**1911**	**1913**	**1915**	**1917**	**1919**	**1919**
France	71.1	100.0	21.7	59.6	58.2	65.2
over GDP	*78.2*	*100.0*	*23.9*	*73.6*	*77.3*	*76.9*
Germany		100.0	76.0	41.0		
over GDP		*100.0*	*89.6*	*51.9*		

Notes: This table shows real profits during the wars in our sample. For each war, we construct an index of real profits that is equal to 100 in the year given in the table. Then, in the next rows, we show the respective indices when dividing by an index of real GDP, so that profits are falling relative to GDP if the figure is lower than 100. Details on the data are in section D.1. Note that in Germany we cannot construct an index of real profits in WW2, so instead we show an index for the return on equity. For WW1 in Germany, we show 'medium war-related industries' in the data of Baten and Schulz (2005).

itary buildups (Spoerer, 1996). This trend quickly reverses, however: In all countries, real profits fall sharply in the aftermath of wartime destruction. The decline is pronounced—profits drop by more than 25 percent of their initial level in most economies. The largest contractions occur in France, Germany, and Japan after World War II, where profits fall by more than 50 percent and even turn negative in France. Importantly, this pattern cannot be explained solely by the general decline in economic activity during wars. Dividing each profit index by an index of real GDP shows that profits fall to a greater extent than output. In several countries (such as the U.K. and France), the decline in profits is even larger when measured relative to economic activity.

An alternative way of validating this mechanism is by studying dividends of listed firms. If all firm earnings are payed out to shareholders, these coincide with profits. We construct the real dividend flow to shareholders across countries and show the impulse response in Figure D.16b. Real dividends also fall massively after wars, by more than 70%. Together, this evidence suggests that wars markedly reduce firm profits, validating the key mechanism in the model.

5 Conclusion

This paper provides a comprehensive analysis of the distributional impacts of war, covering both income and wealth inequality. We show that war is indeed a great leveler, and effects are strongest concerning income inequality in war sites. For wealth inequality, and non-war sites, effects on inequality are smaller. We study these facts jointly, both through a partial equilibrium framework, in which we can characterize the impact of wars on income and wealth inequality analytically as well as in general-equilibrium HANK model. Our quantitative analysis highlights the role of capital destruction, which wiped out profits—the main source of earnings at very top. Both destruction and taxation contribute to declining wealth inequality, which is less affected, as effects are more proportional along the distribution.

War is now back on the international agenda, with the Russian full-scale invasion of Ukraine dominating headlines since 2022. While the long-run impact on inequality is not yet clear, preliminary studies find that in both countries, one consequence has been a reduction in the economic standing of 'oligarchs'. The mechanisms we outline continue to be at play more than 70 years after the world wars: Several Ukrainian oligarchs have seen their assets destroyed, wages are rising strongly, and a governments in both countries enacting policies to curtail corporate profits.[29] Indeed, it appears that war continues to have large effects on top business owners, even in the 21st century.

[29]For sources see here, here and here.

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A Appendix: Data and Methodology

In this section, we describe in detail the data sources used in the paper.

A.1 Inequality Data

Table A.1 provides a list of instances where we use a series other than the WID baseline series. As explained in the text, this is done to make use of historical series that cover a longer time horizon in some countries.

Table A.1: Summary of Top Income Data

Country	**Source**	**Variable**	**Period**	**Unit**	**Concept**
Finland	Roikonen, 2022	Top 1	1865-2017	Tax Unit	Fiscal Inc
Germany	Bartels, 2019	Top 10, 1	1871-2014	Tax Unit	Fiscal Inc
Germany	Bartels, 2019	Top 10, 1	1871-2014	Tax Unit	Fiscal Inc
Japan	Moriguchi and Saez, 2008	Top 10, 1	1886-2005	Individuals	Fiscal Inc
Netherlands	Salverda and Atkinson, 2007	Top 10, 1	1914-2012	Tax Unit	Fiscal Inc
Norway	Aaberge and Atkinson, 2010	Top 1	1875-2017	Individuals	Fiscal Inc
UK	Atkinson, 2007	Top 10, 1	1918-2009	Family -1989, Individuals age 15+ post 1989	Fiscal Inc

Notes: This table presents every country in which we deviate from the baseline WID income concept, alongside with the period the series covers, the unit of observation (Individual, Tax unit etc.) and the income concept as denoted in WID. The reason for the deviation is that using a different income concept allows us to cover a longer time horizon in these countries.

Due to data availability, we can only present results on pre-tax income inequality. In the U.S. and France, for which long-run data on post-tax inequality is available, pre- and post-tax inequality has evolved similarly after large wars. In Figure A.1 we plot pre and post-tax top income shares for these countries. In France, the evolution of pre- and post-tax top income shares is similar in the aftermath of wars, while in the U.S. post-tax top shares drop considerably more than pre-tax top shares. This is likely a function of the larger increase in tax progressivity in the U.S..

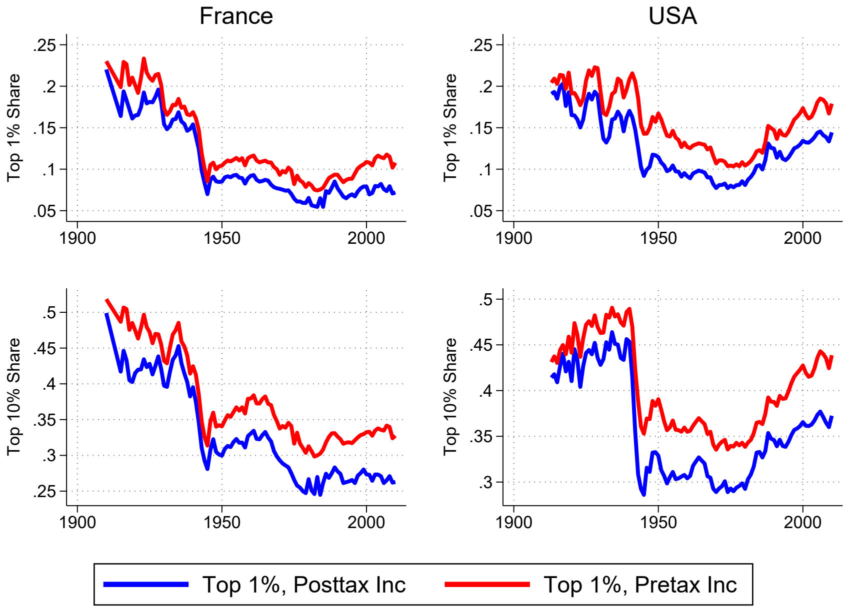


Figure A.1: Pre-and Post Tax Top income shares in France and the U.S.

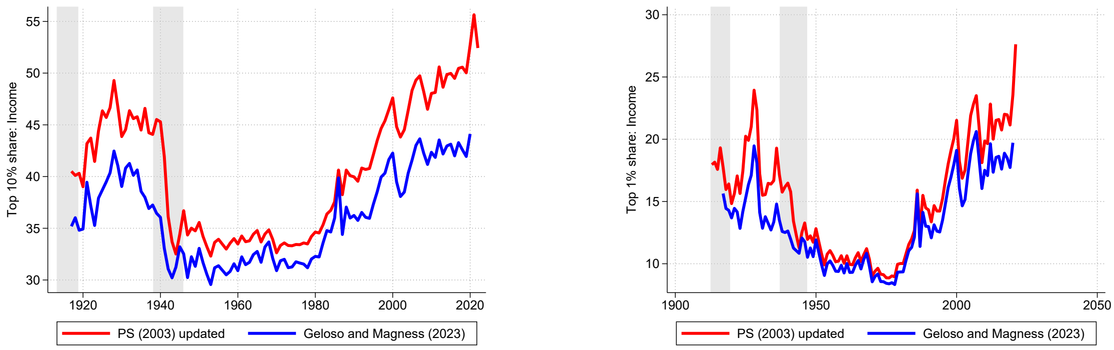
Notes: This figure shows pre- and post-tax top income shares for the U.S. and France. Data is from the World Inequality Database.

Recently, Smith et al. (2023) and Geloso et al. (2022) have raised concerns about the measurement of top income and wealth shares in the U.S.. We show below that these concerns do not affect our result that wars have an important equalizing impact on the income distribution. For the wealth distribution, Smith et al. (2023) only provide a post-war series; moreover the top wealth shares of Smith et al. (2023) and Saez and Zucman (2016) align closely up to the top-1%, with major differences only at higher percentiles.
Figure A.2 compares the data of Geloso et al. (2022) with the updated series of Piketty and Saez (2003), which are most comparable in terms of income concept. The main difference between is in the levels, with the PS series showing a consistently higher level of inequality. The trends in inequality, which are the primary concern of this paper are relatively similar. The top decile income share drops by around 10pp from 45% to 35% in the PS data and from around 37% to 32% in the GM data, a pronounced fall in both cases.

A.2 Fiscal Data

Tax Progressivity. The HANK model in Section 4 uses a tax schedule in which there is a wartime surcharge levied on the the top decile of the income distribution. Historical data is generally not detailed enough to allow us to describe the tax schedule at every percentile of the income distribution across countries, this is why we limit ourselves to the top marginal tax rates for our main empirical analysis. However, for three war sites, France, Germany and

Figure A.2: Top Percentile Shares across Data Sources



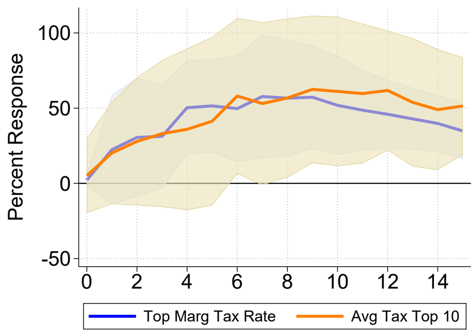
(a) Top 10 Income Shares

(b) Top 1 Income Shares

Notes: This figure compares the evolution of top income shares across data sources. The red line corresponds to the data of Piketty and Saez (2003) (updated to the present) while the blue line corresponds to the data of Geloso and Magness (2023).

the Netherlands, more detailed data on the average tax rate along the income distribution exists.[30] The response of the tax rate levied on the top decile of the income distribution is similar to the response of the top marginal tax rate, as we show in Figure A.3. The two track each other closely, indicating that using the top marginal tax rate is a reasonable proxy in the absence of more detailed data.

Figure A.3: Top Marginal Tax Rate vs Top 10 Average Tax rate



Notes: This Figure shows the impulse response of the top marginal tax rate from Figure 2 in blue together with the response of the average tax rate paid by the top decile in yellow.

Government Consumption. War implies large increases in government consumption. To capture these accurately, we construct historical data on government consumption across country. This overcomes limitations with existing data sources, which only cover government expenditures (Mauro et al., 2015). This includes a number of expenditures that do not directly map into our model,

[30] We obtain data for these countries from Piketty (2003) (France), Salverda (2019) (Netherlands) and Bartels (2019) (Germany).

such as interest payments on government debt or pension payments. We construct this data from various national sources that build national accounts across specific countries, listed in table A.2.

Table A.2: Summary of Government Consumption Data

Country	**Source**	**Notes**
Finland	Hjerppe et al. (1989)	
France	Piketty and Zucman (2014)	
Japan	Ohkawa et al. (1965–88)	
Germany	Hoffmann (2013)	During WW2 Survey (1945)
Netherlands	Bochove and Huitker (1987)	
Norway	Grytten (2004)	
UK	Ryland and Dimsdale (2017)	

Notes: This table presents the sources for the data on government consumption.

B Appendix: Results

This Appendix supports the results we document in Section 3. We provide robustness checks as well as additional results supporting the main text.

B.1 Additional Outcomes

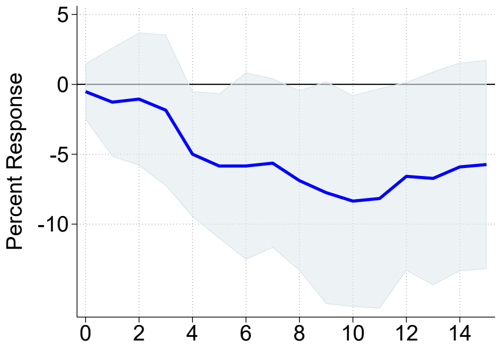
This section reports a number of additional outcomes to the war shock considered in Section 3.

Inequality. In the main text, we focus on inequality as measured using the share of income or wealth that accrues to the top percentile as in Scheidel (2018) or Piketty and Zucman (2014). For a number of other countries, we are also able to study inequality not only at the very top but also for the entire upper class.[31] In particular, Figure B.4 reports the response of the top *decile* share of income and wealth to the war shock. We find a similar picture to the top percentile when comparing income and wealth: Income inequality drops following the war shock, but wealth inequality remains insulated.

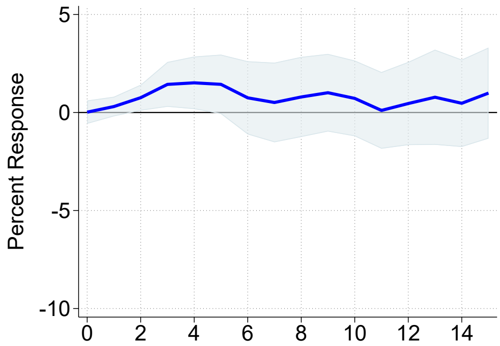
Next, in panels (c) and (d), we report the response of top income and wealth shares measured in percentage points. Consistent with the findings in the main text, top income and wealth shares decline in response to wars. Measured in percentage points, top-1% income and wealth shares both decline by around three percentage points in the medium to long run. This may appear surprising, in light of the effects reported in the main text, in which income inequality declines more than wealth inequality. The reason is that in levels, top wealth shares are much higher than top income shares – historically, the top-1% wealth

[31] Doing so shrinks our sample because for a few countries we only have top-1% shares.

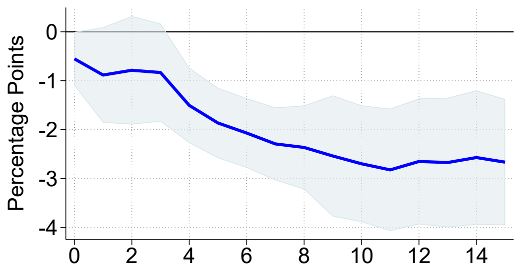
Figure B.4: Additional Outcomes, Inequality



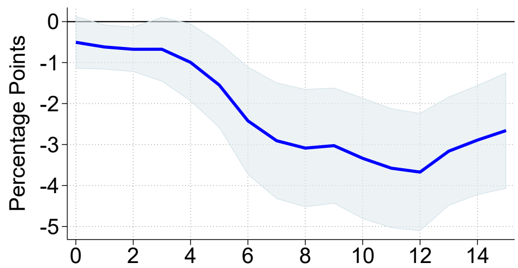
(a) Top-10% Income Share



(b) Top-10% Wealth Share



(c) Top-1% Income Share, p.p.



(d) Top-1% Wealth Share, p.p.

Notes: Panels (a) and (b) show the responses of the top-10% income and wealth share to the onset of war. Variables are log-transformed so that coefficients indicate percent responses. Panels (c) and (d) show the response of top-1% income and wealth shares measured in percentage points. Impulse responses are computed using specification 1 using the start of war as in table 1 as a shock in specification 1. Shaded areas indicate 90% confidence intervals.

share is more than twice as large the top-1% income share, and often even around 3-4 times as large (Roine and Waldenström, 2015). Top percentile wealth shares range from 20 to up to 60% (historically) across countries, while top percentile income shares range from 5-15%. Therefore, a 3 p.p. decline in top income shares corresponds to a larger decline in inequality relative to initial levels than a 3 p.p. decline in the top wealth share.

Macroeconomic Aggregates and Asset Prices. We first focus on the response of asset returns, which also drop sharply during wars (Barro, 2006; Jordà et al., 2019). Both safe and risky assets perform poorly and earn negative returns during war times. Perhaps surprisingly, safe assets (bills and bonds) perform worse than risky assets (equity and housing). This is due to wartime inflation, which erodes the value of safe and nominal assets. However, for both asset classes, wartime returns are far below their long-run average of 1-3 % (safe assets) (resp. 7-8% on risky assets). The fact that equity returns are low is consistent with our channel of falling profits during war times. The fact that equity returns are low is consistent with our channel of falling profits during war times.

Table B.3: Asset Returns in War Sites

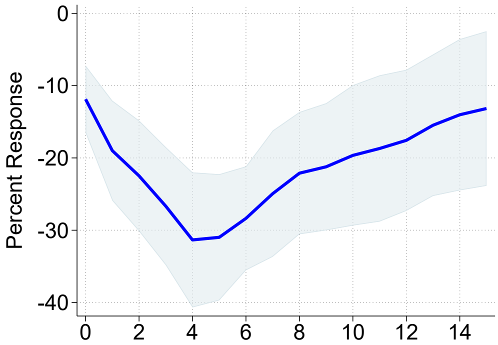
Asset	Arithmetic Mean: Real Returns	Arithmetic Mean: Nominal Returns	Geometric Mean: Real Returns	Geometric Mean: Nominal Returns
Bills	–11.75	2.82	–15.44	2.81
Bonds	–11.06	4.32	–14.54	3.90
Equity	–2.91	14.62	–8.11	11.01
Housing	0.14	13.18	–0.86	12.28

Notes: This table presents real and nominal asset returns on various assets during wars. Asset returns in the sample of war sites, we do not impute missing asset returns. Therefore implied inflation rates from the real and nominal returns differ across assets.

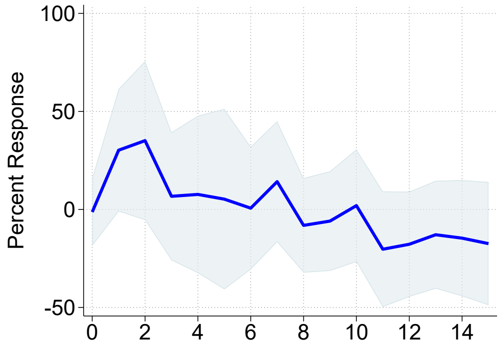
Finally, in Figure B.5 we consider further economic outcomes. Wars are macroeconomic disasters, and go hand-in-hand with a large drop in output (Panel (a)). However, the government also takes on an outsized role during wars as there are large increases in spending. We first show the response of all government expenditures, obtained from Mauro et al. (2015) in panel (b). However, this indicator includes a number of expenditures (such as interest payments on debt), that do not directly map into the model we consider in Section 4. Therefore, we construct additional data on government consumption, as detailed in Section A.2. Panel (c) displays the response of government consumption. This increases strongly in the initial years of the war. However, after around 4-5 years, when the wars in our sample end, government consumption reverts below trend. This is because at this point, with the large losses in output, governments cut back on the spending they were doing relative to the pre-war period. Similarly, when we look at military expenditure in Panel (d) (obtained from the Correlates of War), which is a large sub component of government consumption at this time, we find an initial increase and then a drop below the pre-war trend after the war has ended.

Finally, Panels e) and f) study the human losses of wars. There is a decline in population around the wars we study relative to the pre-war trend by around 4% in the immediate years after the war, but population reverts back to trend in the long run. On the other hand, the number of total hours worked to display a non-monotonic behavior. Initially, there appears to be a slight increase in the amount of total hours worked, perhaps due to hightened wartime patriotism Ramey and Zubairy (2018) as well as the inclusion of women in the labor force (Goldin and Margo, 1992). Afterwards, total hours worked fall by up to 10% but then recover in the long run.

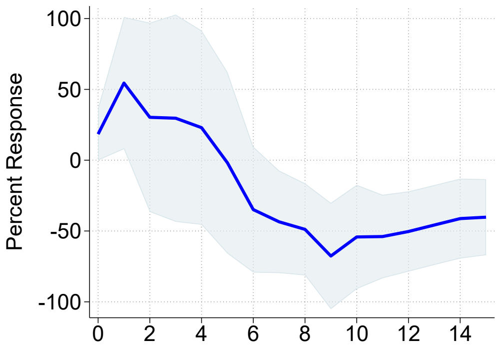
Figure B.5: Additional Outcomes following War Shock



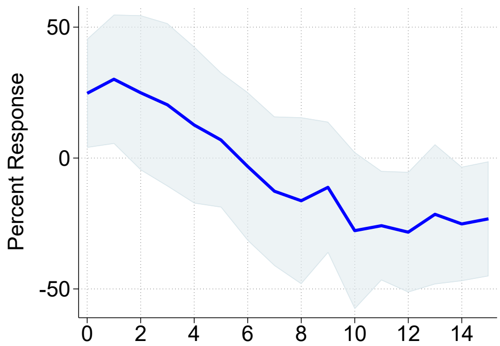
(a) Real GDP



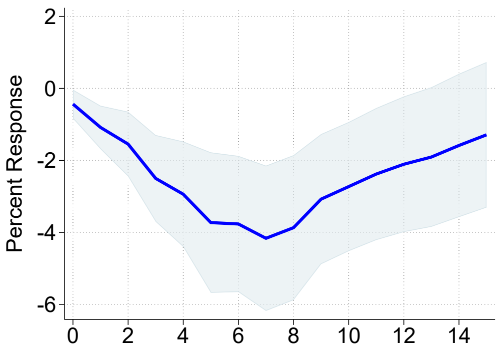
(b) Government Expenditures



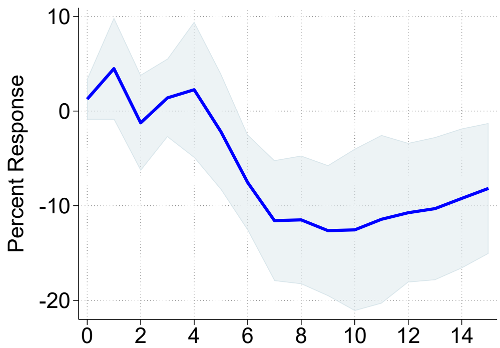
(c) Government Consumption



(d) Military Expenditure



(e) Population



(f) Total Hours Worked

Notes: This figure displays the response of additional outcomes to the onset of war. Impulse responses are computed using specification 1 using the start of war as in table 1. All quantitities are in real terms. Data on population is from Bolt et al. (2018), total hours worked are from Bergeaud et al. (2016). Shaded areas indicate 90% confidence intervals.

B.2 Alternative Country Samples

In addition to the sample in the main text, we consider alternative samples, both including smaller wars and including wars not fought on the soil of the country, but with more than 10.000 casualties. The wars included in both samples are in Table B.4, which shows all countries which are (i) classified as participants in wars on foreign soil with more than 10.000 casualties in Federle et al. (2025) or (ii) classified as war sites with less than 10.000 casualties (those with more then 10.000 casualties compromise the base sample of wars). In both cases, we show only wars with available inequality data around the war starts.

Table B.4: Additional Country Samples

Country	Year	Country	Year
Panel A: Non-War Sites			
Japan	1904	Canada	1939
Australia	1914	Australia	1940
United Kingdom	1914	United States	1941
United States	1917	United States	1950
New Zealand	1939	United States	1965
Panel B: Small War Sites			
Denmark	1940	Peru	1995
India	1947	Ecuador	1995
India	1965	Albania	1998
Tunisia	1985	India	1999
Israel	1991	Pakistan	1999

Notes: This table shows the sample of wars with available inequality we employ in additional analyses. Panel A shows non-war sites, i.e. war participants with more than 10,000 casualties that did not experience war on their own soil. Panel B shows additional smaller war sites, with less than 10,000 casualties (in contrast to the main sample).

B.2.1 Wars in Non-Sites

The leveling effects of wars have not only been discussed for war sites, but also for non-sites, most prominently in the case of the U.S. (Scheidel, 2018). We investigate war sites and non-sites separately, as the underlying shocks are likely very different. We know that non-sites experience markedly smaller declines in GDP (Federle et al., 2025), no capital destruction (Auray and Eyquem, 2019) and a larger increase in tax progressivity (Haffert, 2019). In this section, we study our main outcomes for non-war sites, i.e. countries with more than 10K casualties in a war on foreign soil.

Figure B.6 compares impulse responses across countries. In terms of income and wealth inequality inequality, we find that income inequality declines less in non-sites than in war sites than in non-sites (Panel (a)), and estimates are noisier for non-sites. This suggests that destruction is key in the leveling process during wars. In terms of wealth inequality, the two look more similar, and we find a slight decline in wealth inequality both for war sites and for non-sites.

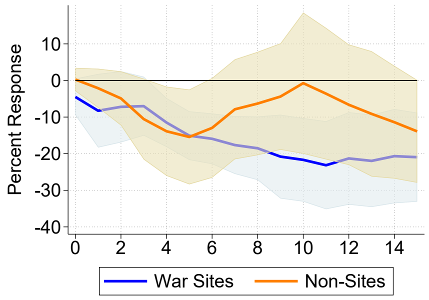
Turning to the channels, non-sites do not experience wartime destruction by definition, so the capital stock remains relatively unaffected. There is a small decline, due to reduced investment also in non-sites, but the magnitude is much smaller than in war sites. This can be also seen in the capital share, in Panel (d). On the other hand, we still see large expansions in fiscal spending and debt. In terms of inflation, non-sites also remain much more insulated than war sites, so that the increase in inflation is much smaller. Finally, we observe a somewhat stronger increase in tax progressivity in non-sites than in war sites. This is consistent with the narrative in Haffert (2019), who argues that after the second world war, the U.S. found it easier to institute highly progressive taxation than European countries, which had to rebuild their destroyed capital stock.

Taking stock, the nature of wars is fundamentally different in war sites and non-sites. Whereas wars cast a long shadow in terms of economic performance in war sites, non-sites emerge relatively unscathed. In these countries, an increase in progressive taxation to finance the military effort emerges as a main legacy of war.

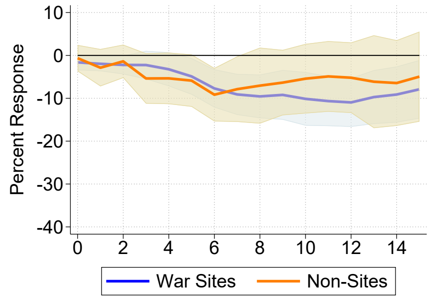
Losers and Winners. We can similarly compare how losers and winners of wars differ in terms of inequality outcomes. Of course, classifying losers and winners is not always straightforward. Our baseline classification follows the Correlates of War.[32] Figure B.6, Panels (g) and (h) compare inequality outcomes of winners and losers. We find that winners see smaller declines in inequality than losers, consistent with the fact that losers of wars tend to face larger destruction in their own country. Responses for wealth inequality are similar across winners and losers.

[32]This means that all non-war sites are classified as winners. Of the war sites, only India in 1971, the U.K. in WW2 and France in both world wars are classified as winners (we have experimented with reclassification of France in WW2, results are similar).

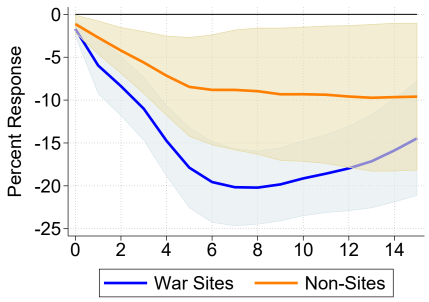
Figure B.6: War Sites vs Non-Sites



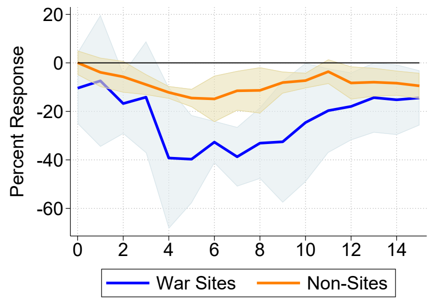
(a) Top 1 Income Share



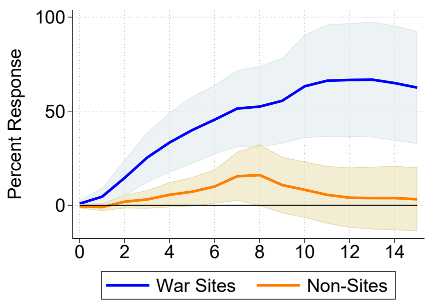
(b) Top 1 Wealth Share



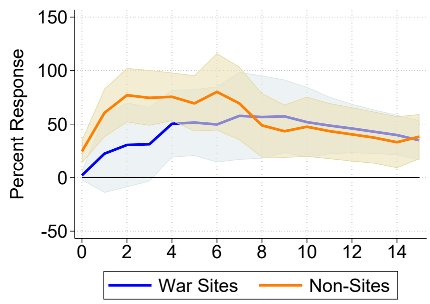
(c) Capital Stock



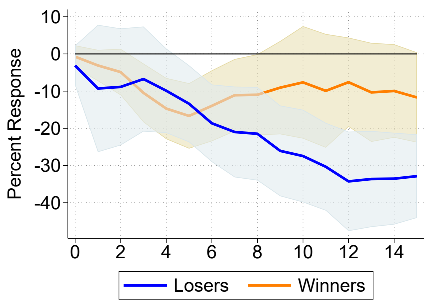
(d) Capital/Labor Share



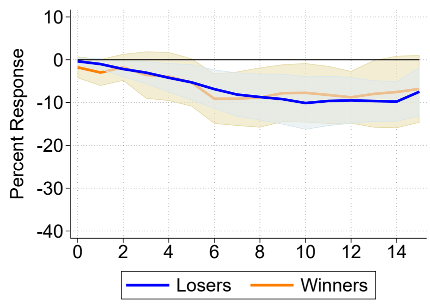
(e) Price Level



(f) Top Marginal Tax Rate



(g) Top-1 Inc Share: Losers vs Winners



(h) Top-1 Wealth Share: Losers vs Winners

Notes: This figure displays the response of various outcomes to the onset of war for non war sites, defined as countries with more than 10K casualties in a war that does not occur on their soil. Shaded areas indicate 90% confidence intervals.

B.2.2 Different Samples

Figure B.7 shows results when using a sample of different war sites. We consider two main variations of the samples: first, a sample including just the war sites from world wars, and second, a sample that includes all countries that are classified as war sites in Federle et al. (2025) with available inequality data (see Table B.4), not just those with more than 10K casualties.

Income inequality declines substantially across samples. For the sample including just world wars, the decline in income inequality is around 5 percentage points larger (-20 vs -25% at the 10 year horizon). In contrast, the impact on income inequality decreases if we include smaller wars, but remains quite negative. In contrast, the impact on wealth inequality is virtually unchanged across samples. The fact that results on income inequality vary more with the composition of the sample is consistent with destruction being a key force in bringing down income inequality.

We check for the impact of individual wars on our results. Panels (c) and (d) of figure B.8 reports the impact individual wars have on our results by showing impulse response functions computed by dropping each war successively from our sample. Doing so results in a decline in inequality that is very similar across samples, because the fall in inequality was a common experience across the countries in our sample. Our results are not driven by individual wars and their leveling effects.

B.3 Robustness

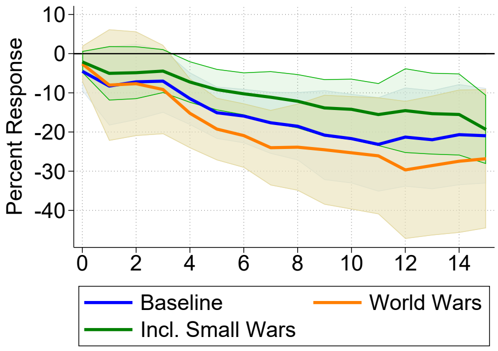
In this section we provide a number of checks to assess the robustness of the results in Section 3. We first focus on the results on income and wealth inequality.

Alternative Specifications. We consider alterations to our baseline specification (1). In particular, we vary both the construction of the dependent and independent variable. The results are in Figure B.8.

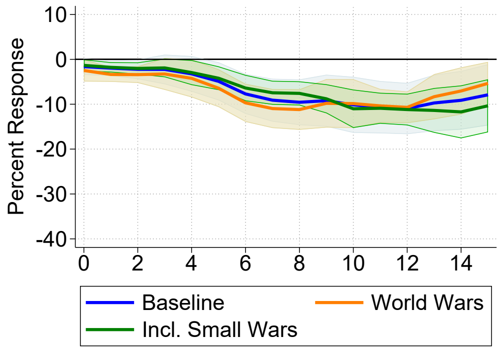
First, the figure shows the baseline regression, now also using Driscoll and Kraay (1998)-robust standard errors (rather than robust standard errors clustered at the country level). Next, we vary the independent variable to be a dummy variable equal to one during the entire duration of the war (and not only on the war onset). Finally, we change the interpolation of inequality so that the entire change in inequality between missing years is attributed war years. These changes do not affect the results in the main text – this is because the wars represent large and important shifts in inequality that are clearly visibly in the time series in most countries.

Quantitative War Shock. Finally, we use a quantitative measure of the size of the war shock. Concretely, we normalize the war shock we consider in the main text by the share of the capital stock that is destroyed in the war. The sources for our estimates of destruction are given in C.3, together with a small narrative for each country. We then normalize the war shock so that it corresponds to a destruction of 10% of the capital stock in the war site economy. Figure B.9 plots

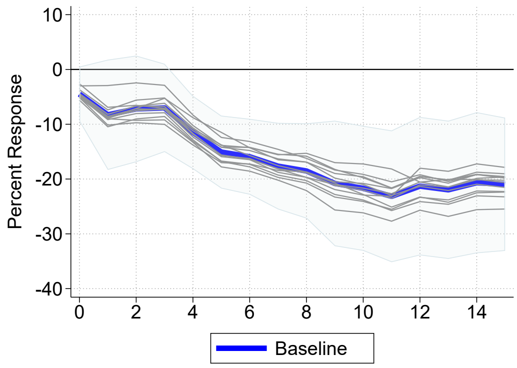
Figure B.7: Inequality in War Sites, Alternative Samples



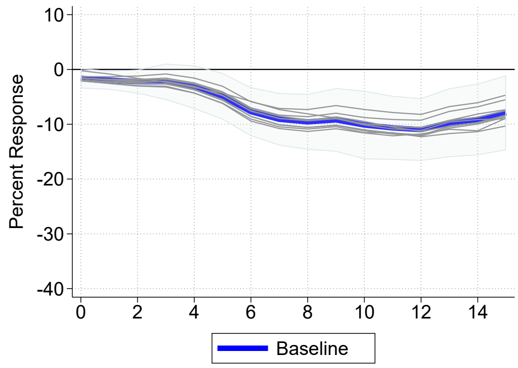
(a) Top-1% Income Share



(b) Top-1% Wealth Share



(c) Top-1% Income Share, Leave-out



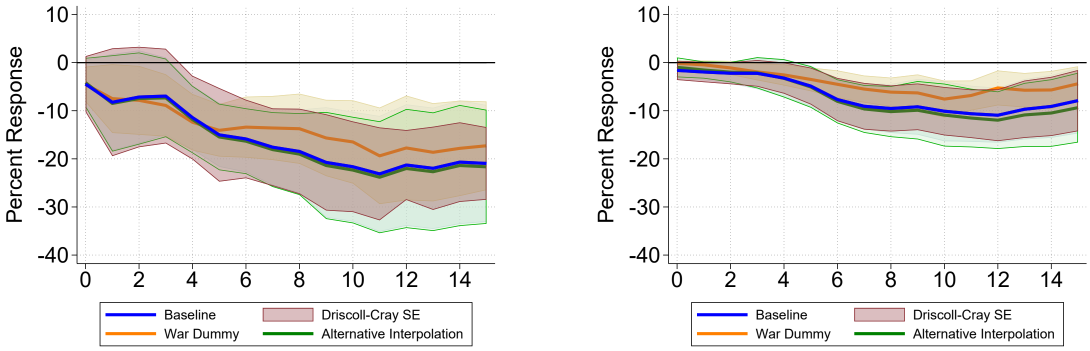
(d) Top-1% Wealth Share, Leave-out

Notes: This figure displays the response of various outcomes to the onset of war for war sites. Shaded areas indicate 90% confidence intervals. The blue line indicates our baseline results from section 3. The yellow line adjusts the sample to include world wars only, the green line adds smaller wars (see table B.4). Panels c) and d) show the impulse responses when dropping wars one-by-one, both for income and wealth inequality.

the impulse responses obtained this way. We find results consistent with the main text: Income inequality drops sharply, but wealth inequality is relatively insulated. Intuitively, this is because the most destructive wars also saw the largest declines in inequality, which we show explicitly in Figure C.12.

The reaction of wealth inequality. We now offer additional details on the results concerning the response of wealth inequality. In our baseline findings, as for instance reported in Figure 1, we find that wealth inequality reacts less to war than income inequality. Figure B.10 provides further insights on this. We show that controlling for lags of the dependent variable, as is standard in the macroeconometric literature and recommended e.g. in Montiel Olea and Plagborg-Møller (2021) generates the muted response of wealth inequality. Intuitively, adding lags means that we are controlling for trends in wealth inequality prior to the war. If we add no lags at all, we would find a larger equalizing

Figure B.8: Response of top income and wealth shares, Robustness Checks

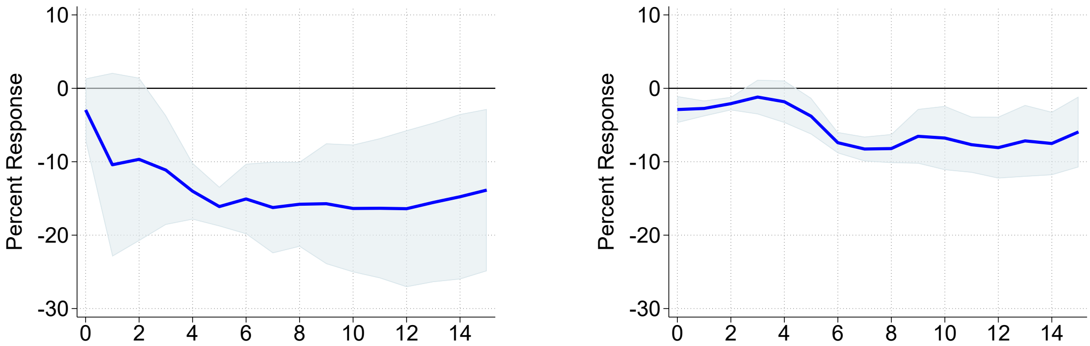


(a) Top 1 Income Share Robustness

(b) Top 1 Wealth Share Robustness

Notes: This figure displays robustness to the main results on top percentile income and wealth shares in figure 1 in the main text. Panels (a) and (b) provide alternative specifications to those in the main text. The blue line shows the effects as computed in the main text. Next, the red shaded areas provide Driscoll and Kraay (1998)–standard errors. The yellow line corresponds to a specification with a dummy equal to one during the entire war, and the green line varies the interpolation of inequality during missing years.

Figure B.9: Response of top shares to war shock, quantitative measure



(a) Top 1 Income Share

(b) Top 1 Wealth Share

Notes: This figure displays the response to the onset of war for top income and wealth shares. Variables are log-transformed so that the outcome refers to the percent change in inequality. Figures are computed using specification 1 using the using the percent of the initial capital stock destroyed as a shock variable. Impulse responses are normalized to destruction of 10% of capital stock. Shaded areas indicate 90% confidence intervals.

effects in terms of wealth inequality, as in Scheidel (2018), where the unconditional comparison of wealth shares before and after wars is reported.[33]

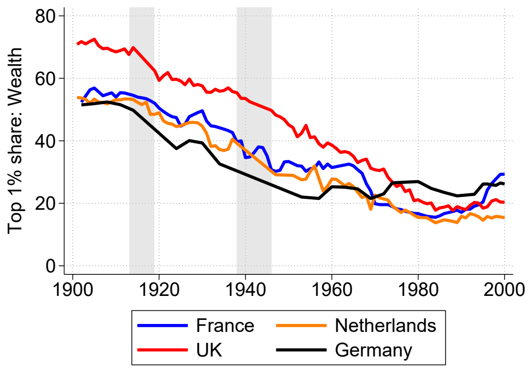
We also also show data on top wealth shares for four prototypical countries –

[33]The impact of adding lags to the results on income inequality are smaller, as wars represent sharper breaks in the income inequality series.

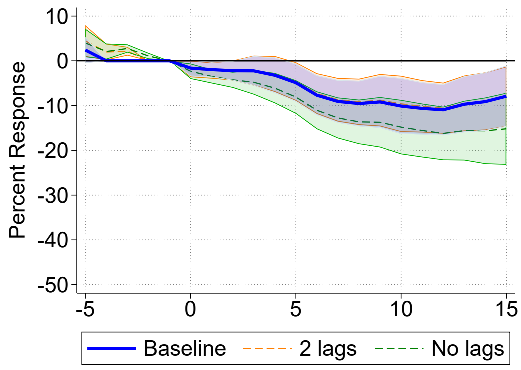
indeed wealth inequality is falling in all economies already prior to the world wars, with the wars having relatively small effects in visual terms. Consistent with the lack of visual evidence, our macroeconometric method finds a small reaction of wealth inequality.

Moreover, in this figure we also show the evolution inequality prior to the wars, both for income and wealth. In our baseline specification, we control for 4 lags of the outcome, so that there are no pre-trends in the 4 years before by construction. Figure B.10 shows that the there are no important pre-trends in prior years, even when controlling for less lags. The fact that there are no large movements in inequality prior to wars strengthens the interpretation of war as the ultimate cause of movements in inequality.

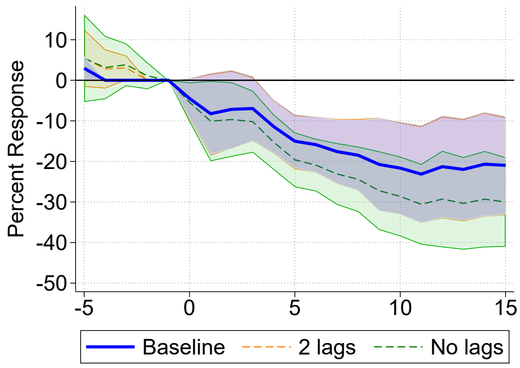
Figure B.10: Response of Top Shares to War Shock, Changing Amount of Lagged Outcomes in Control and Placebo Sample



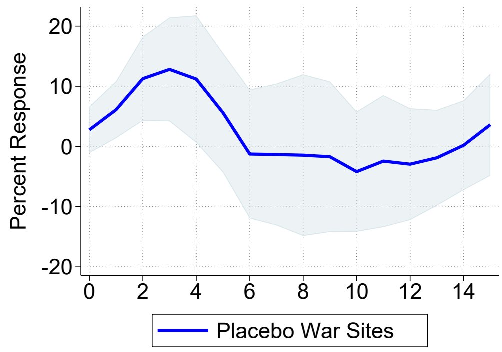
(a) Top Wealth Share in select countries



(b) Top 1 Wealth Share; Different Lags



(c) Top 1 Income Share; Different Lags



(d) Top 1 Income Share, Placebo

Notes: This figure shows the impact that controlling for lagged outcomes has for our empirical results. Panel (a) shows the raw data on the top wealth share for four prototypical economies. Panel (b) displays the response of the top 1 wealth share to the onset of war, Panel (c) shows the top 1 income share estimated based on specification (1). We include a different number of lags of the outcome across specifications, the baseline specification includes 4 lags. The start of war as specified in table 1. Panel d) estimates specification 1 using the placebo war sample of countries that were not fighting in the World Wars in table B.5. Shaded areas indicate 90% confidence intervals.

Placebo Check. We conduct a Placebo exercise to test the robustness of our findings. In particular, our methodology might mechanically find important leveling effects of wars because it is hard to separate the effects of war shocks from the underlying trends in inequality. We use countries which have long series of inequality available around the world wars, but were not part of the war themselves (either directly or indirectly via colonial linkages) as a control group to see if we are able to find effects from placebo war shocks in 1914 and 1939. The countries included are listed in Table B.5.

Table B.5: Countries and Years for Placebo War Assignment

Country	**Year**	**Country**	**Year**
Argentina	1939	Norway	1914
Denmark	1914	Switzerland	1939
Finland	1914	Sweden	1914, 1939

Notes: This table shows the country and war years considered in the placebo sample.

Of course, this is an imperfect check given the international spillovers of war, but it gives an idea whether the leveling we document happened also absent the war shocks. Due to data limitations, we only study the top-1% income share. We then estimate specification (1) using the placebo wars, the resulting impulse response is given in Figure B.10d. Unlike for war sites, or even war participants, we are unable to effect large leveling effects, if anything there appears to be a slight increase in inequality in the early war years.

B.4 Effects due to Changes in Population and Borders

War may have effects on income and wealth inequality due to mechanical changes in the size of the population and borders. This section shows that these effects are too small to account for the observed responses of income and wealth inequality (and can potentially go in the opposite direction, increasing inequality). To do so, we develop bounds on the effects that deaths due to war have on top income and wealth shares. Throughout, we assume that war deaths are concentrated at the bottom of the distribution.

Income Inequality. Consider a shock that reduces the population by x%. We show that this would tend to *increase* top income shares. We write the top-1% income share as $sh_1^Y = \frac{Y_1}{Y_1+Y_{99}}$, that is the total income of the top 1 over total income. The mechanical effect of war deaths among the bottom 99 is to decrease the income of the bottom 99, so that Y_{99} goes down and the top-1% income share goes up. Assuming that the income of the deceased is equal to the average income among the bottom 99 and using a shock that kills x% of the bottom 99 yields a top-1% income share $sh_1^{Y,\text{post}}$ after the war shock equal to

$sh_1^{Y,\text{post}} = \frac{sh_1^{Y,\text{pre}}}{1-(1-sh_1^{Y,\text{pre}})x}$. The percent change in top income shares is then

$$\frac{sh_1^{Y,\text{post}}}{sh_1^{Y,\text{pre}}} \approx 1 + (1 - sh_1^{Y,\text{pre}})x.$$

This means that war would increase income inequality, as measured by top shares, the increase is bounded by the share x of the population dieing in wars. Assuming that the deceased have lower income would mean that income inequality increases less; if the deceased have higher income (but are still in the bottom 99), income inequality would rise more.

Note that this analysis holds the income of the top-1% fixed. In a mechanical sense, the income of the top-1% also decreases slightly; because the overall size of households is lowered some households that were previously in the top-1% move to the bottom 99. However, these effects are likely to be smaller than the deaths in the bottom 99, because only the re-ranking of households affects only a small percentage of the top-1%.

Wealth Inequality. For wealth inequality, deaths at the bottom of the distribution have the potential to decrease top wealth shares. The big difference is that wealth does not disappear at death, but is passed on to the inheritors. We assume that all inheritors remain in the bottom 99 and consider a shock that reduces the population by x%. This means that only the threshold at which households enter the top-1% changes.

Therefore changes in wealth inequality ocurr due to re-ranking – because the size of the population decreases, some wealth owners in the top-1% now enter the bottom 99. If wealth holders in the top-1% all have equal wealth holdings, the mechanical effect of the re-ranking is to decrease the wealth of the top-1% by x%, because those wealth owners now enter the bottom 99. Because aggregate wealth remains is unchanged, the top wealth share decreases by x%. This is an upper bound for the decrease, because generally the 'poorer' members of the top-1% are affected by the re-ranking. In any case, the mechanical effect can only explain at most a decline of 4% in the top-1% wealth share, lower than the effects we find.

Border Changes. Wars sometimes entail large changes in borders. To the extent that the affected territories have the same distribution of income or wealth as the overall country, this will not affect inequality statistics. For the wars in our main sample, this only affects the case of Germany, where inequality statistics reflect historical borders that change over time. Albers et al. (2022) decompose the mechanical effects of territorial changes on the top 1 wealth share in Germany and find them to be small, around a 0.3pp decrease in the top 1 wealth share for WW1 and no effects for WW2. For income inequality, territories in Eastern Europe generally had lower incomes than the rest of the historical German state, so that removing then would tend to increase income inequality by similar arguments as above.[34]

[34]Even around the reunification of Germany, top income and wealth shares appear stable.

B.5 Within-City Inequality Data

We provide additional information on the town-level data that we construct for Germany. The data is sourced from the *Statistisches Jahrbuch Deutscher Gemeinden* (Statistisches Reichsamt, 1929–1958), an annual statistical compendium on German towns. The covered cities vary slightly by year, so we work with an unbalanced panel of around 70 cities every year. The post-war data only covers West-Germany, so we are restricted to a sample of West German cities. The data was collected by local administrations and then reported to the compendium.

For each year in which data on the income tax is available (these are 1928, 1929, 1932, 1934, 1934, 1950 and 1954), we construct the pre-tax distribution of income across available cities. Income tax data is reported in bins, we construct the full distribution using generalized pareto interpolation (Blanchet et al., 2022). The income tax that underlies the data is the national income tax, which also underlies the aggregate German income inequality series by Bartels (2019). In particular, it covers business and capital incomes.[35] We further measure destruction at the town level. In an effort to rebuild german towns, administrators gathered detailed data on the extent of destruction in their respective towns. Our preferred measure of destruction is the share of the pre-war (1939) housing stock that is destroyed in the war. Alternatively, we can also measure the debris (in cubic meters) per capita. We also collect data on the industry structure, measured as the share of the labor force employed in manufacturing.

Table B.6: Summary Statistics for Key Variables

Variable	N Obs	N Cities	Mean	SD	Median	Min	Max
Share Destroyed	547	116	0.36	0.21	0.37	0.00	0.89
Top 1% Share	754	179	0.15	0.05	0.14	0.08	0.33

Notes: This table shows summary statistics for the within-country analysis.

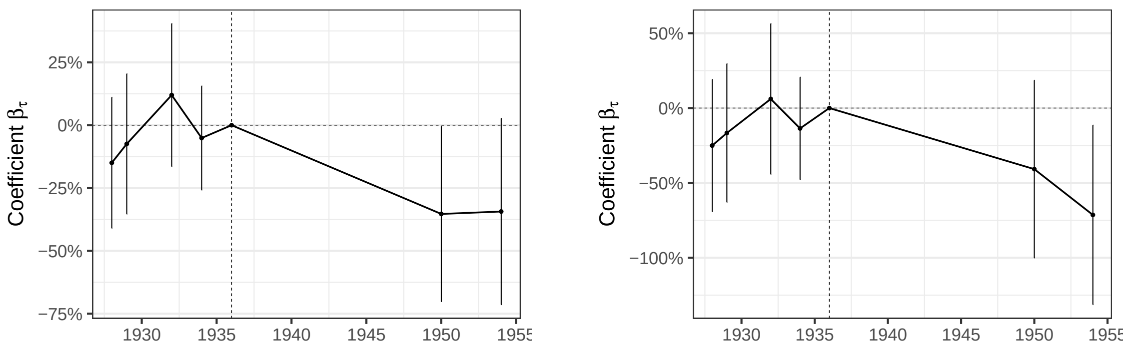
Table B.6 reports summary statistics for the main variables used in our analysis (the panel is unbalanced and there are fewer towns post-war). Next, in Figure B.11 we show the difference-in-differences plots underlying specification (2). Panel (a) shows the difference-in-differences plot, while Panel (b) shows results measuring destruction instead as debris (in cubic meters) per capita.

C Appendix: Stylized Framework

In this section, we provide additional details and results on the framework laid out in section 3.3.

[35]We winsorize top income shares at the 1 and 99% level.

Figure B.11: Destruction and Inequality in a Panel of German Towns



(a) DiD Plot

(b) DiD, different destruction measure

Notes: Panel (a) plots the estimated coefficients estimating specification (2) year-by-year together with 90% confidence intervals. Panel b) plots the estimated coefficients from (2) when measuring destruction as debris in cubic meters per capita. Standard errors are clustered by town.

Table C.7: Summary Statistics: Simple Framework

Country	Top 1 Income Share	$sh^I_{1,L}$	$sh^I_{1,W}$	Capital Share	Labor Share	Capital / Labor Share
France	0.17	7.83	40.88	29.73	70.27	0.42
Germany	0.13	8.87	19.73	37.57	62.43	0.60
Japan	0.28	16.79	57.30	26.76	73.24	0.37
U.K.	0.17	10.25	30.13	31.39	68.61	0.46
Average	0.19	10.93	37.01	31.36	68.64	0.46

Notes: This table displays the initial calibration for the stylized framework as presented in section 3.3. 'Average' corresponds to an unweighted average of France, Germany, Japan and the U.K., which we use to produce the simulations in section 3.3.

C.1 Calibration and Further Results

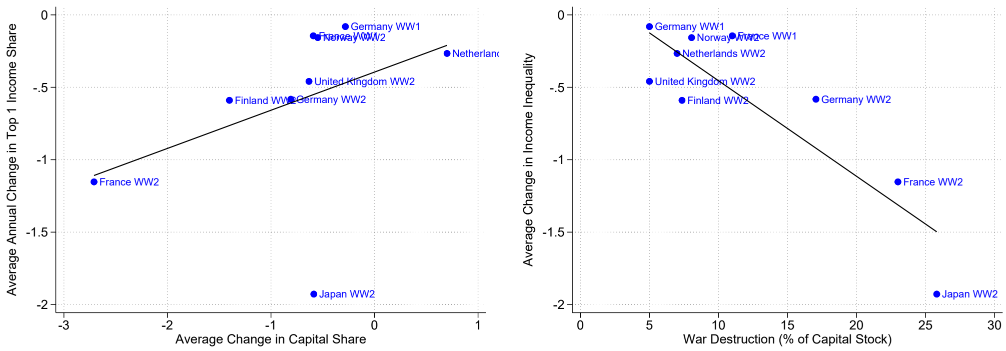
Calibration. We calibrate the framework to those economies for which we have data on the composition of top incomes before wars. Due to data limitations this restricts our sample to four economies before World War II. We summarize the calibration, which averages over the period 1930-1938 in Table C.7.

Destruction and the Fall in Inequality. The framework offers a simple empirical prediction: In wars that see larger declines in capital shares, income inequality should fall more. We test this prediction empirically in Figure C.12, which compares the evolution of overall income inequality and the capital share. Concretely, we compute the average annual decline in inequality during the wars and correlate it the the average annual decline in capital shares, as well as the share of the capital stock that is physically destroyed in each war.[36] Figure C.12 plots this correlation for the wars in our sample. Although there is consistent decline in income inequality during war years, income inequality declines more for countries with larger declines in the capital share. The correlation with the destruction of the capital stock similarly shows that countries which experi-

[36]We define the periods as 1914-1920 for WW1 and 1939-1950 for WW2, to allow for the effects of wars to level out. The choice of periods does not affect our results.

enced larger capital destruction due to wars saw larger declines in inequality.

Figure C.12: Correlation: Change in Inequality, Capital Shares and Destruction



(a) Inequality and Capital Shares

(b) Inequality and Destruction

Notes: This figure shows the correlation between the change in inequality and both the decline in capital shares and wartime destruction. In both plots, the y-axis shows the average annual change in inequality. Panel (a) shows the average annual change in the capital share on the x-axis, Panel (b) provides instead uses the estimates of capital destruction from Table 1. Due to data availability, we restrict to countries in the World War sample.

Income Inequality with Differential Destruction. Finally, we can calibrate the framework to a higher loss of capital for the top-1% than for the whole economy. This generates a larger decline in top income shares for a given loss in wealth, because the rich are hit more by the shock. Concretely, we consider that the rate of destruction D_1 for the top-1% can be computed from the decline in the top percentile wealth share as follows

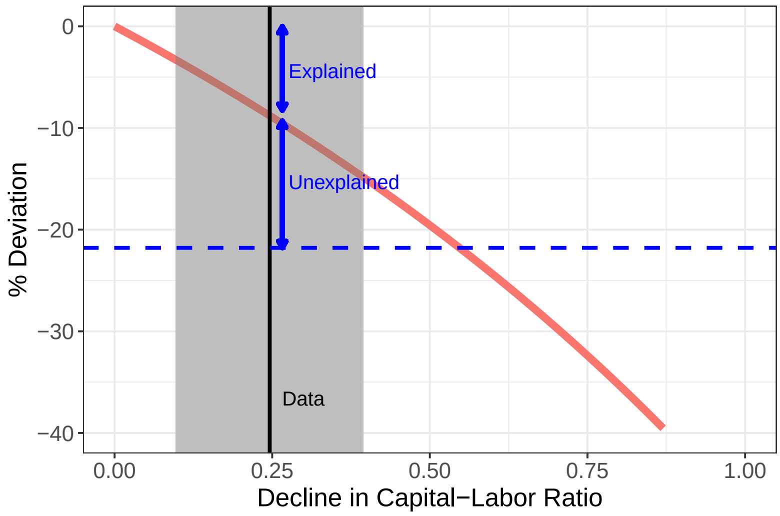
$$sh_{1,W}^{post} = \frac{(1-D_1)W_1^{pre}}{(1-D)W^{pre}} \quad \text{so that} \quad \frac{sh_{1,W}^{post}}{sh_{1,W}^{pre}} = \frac{1-D_1}{1-D} \approx 1 + D - D_1$$

where $sh_{1,W}^{post}$ is the top-1% wealth share after the war, W_1^{pre} is the wealth of the top-1% and W^{pre} is total wealth (measured before the war). Using decline in top wealth shares, the differential loss of wealth comes out to $D_1 = D - \Delta \log sh_{1,W}$. To calibrate the framework with differential destruction, we then compute

$$sh_p^I(D) = \frac{sh_p^L + sh_p^K \cdot (1-D_1) \cdot \frac{r \cdot K}{w \cdot L}}{1 + (1-D) \cdot \frac{r \cdot K}{w \cdot L}}, \tag{19}$$

with D_1 computed as above. Figure C.13 shows the implied decline in the top-1% income share when taking into account differential destruction of capital. It plots the aggregate rate of destruction D against the explained decline in the top-1%share, when fixing D_1 to the decline in the top wealth share at the 10-year horizon (about 10%). While potentially, larger losses of wealth at the top of the distribution could account for the fall in income inequality with a lower decline of the capital-labor ratio, quantitatively the decline in the top-1% wealth share is relatively small, such that the resulting simulation is close to the benchmark with proportional losses.

Figure C.13: Framework Simulation Accounting for Differential Wealth Losses



Notes: This figure shows simulations of the top 1 income share for a given decline in the capital-labor ratio using equation (19). The red line indicates the decline in the top income share as a function of the decline in the capital-labor ratio. The vertical line indicates the average decline in the data at the 10-year horizon. The blue line indicates the observed decline in the top 1 income share.

C.2 War Destruction Across Countries

We now provide the sources for our estimates of destruction for the other countries in our sample, in addition to the more granular data on France, Germany and Japan discussed in Section C.3. Of course, the fog of war means that these estimates are surrounded with some uncertainty, which we discuss for each country. Table C.8 summarizes our estimates.

Finland. Finland suffered repeated war destructions during a series of battles and bombings in the second world war, first during the 'Winter War' in 1939-40 and then through German destruction at the end of the war. We base our analysis on the work of Finnish economic historian Nummela (1993)'s analysis of the Economics of the world war in Finland. It is hard to exactly quantify the extent of destruction in Finland in general. In terms of dwellings, 13.27% of the total housing stock was destroyed in Finland during the Winter War (Nummela, 1993, page 123). The exact value of the destroyed housing stock is not known, however we know the extent to which different kinds of buildings were destroyed (fully destroyed, more than half, less than half) (Nummela, 1993, Table 24). Factoring this in leads to an estimate on the lower bound of 7.36% of the total dwelling stock.[37] This yields a lower rate of destruction of 7.36% of

[37]Concretely, we weigh houses fully destroyed by 1, those destroyed 'more than half' by 0.75,

Table C.8: War Destruction Across Countries

Country	Year	Destruction	Country	Year	Destruction
Finland	1939	7.4%	Japan	1944	25.8%
France	1914	11.0%	Netherlands	1940	7.0%
France	1940	23.0%	Norway	1940	8.1%
Germany	1914	5.0%	U.K.	1940	5.0%
Germany	1939	17.1%			

Notes: Table shows wars for which we construct additional data on capital destruction, measured here as a percentage of the pre-war capital stock.

the total dwelling stock. We assume the same for industrial assets and use this figure in our calculations. In calculating the capital stock, we assume even destruction across the years 1939, 1940 and 1945. This does not factor in the loss of territories in Karelia or war reparations paid to the Soviet Union in terms of Machinery.

Netherlands. The Netherlands experienced war destruction as well as German plunder in the second world war, especially towards the end of the war in 1943-45. Our baseline estimate accounts for only destruction and is 7% of the initial capital stock, taken from Groote et al. (1996, page 8). As noted there, this estimate is on the low end compared to immediate post-war reactions, which were on the order of 28%. However, given the limited fighting on dutch soil, we find the estimate of Groote et al. (1996), who carefully survey the post-war data more plausible. We apply the destruction evenly to the 1943-45 period when computing the capital stock.

Norway. During the German occupation of Norway, there were repeated allied raids on Norwegian territory to sabotage the military and industrial capacity of the German military. Moreover, at the end of the war, Norway experienced destruction through the scorched earth policy in the area of Finnmark. The Norwegian administration quantified the capital losses during the war in a statistical publication in 1946 (Sentralbyrå, 1949). The data provides an estimate of the losses due to the war as well as the pre-war capital stock. We take those numbers directly from the publication and thus arrive at an estimate of destruction around 8.05 % of the capital stock.[38] Because war destruction is not broken out separately, this figure should be considered an upper bound for the total destruction of the Norwegian capital stock. In computing the capital stock, we apply this evenly from 1940 and 1944-45, when allied raids as well as destruction by German forces was concentrated.

and those destroyed by 'less than half' by 0.25.

[38]We include capital destruction in land, buildings, and machinery (and exclude destruction in boats and durable goods).

United Kindom. Harrison (2000) surveys the war damages in the United Kingdom during the second world war. Although war damages in the U.K. were more limited, the U.K. was subject to aerial attacks on its territory through German bombings, which killed more than 40,000 people and injured many more. Harrison (2000) puts the figure of destruction for the U.K. economy at 5% of the capital stock. This does not account for the large wartime 'disinvestments' (foregone investment due to the war), which are argued to have lowered the capital stock even more. To compute the capital stock, we assume that this happens evenly throughout the period 1941-42 as well as 1944-45, when allied raids were concentrated.

C.3 Empirical Evidence on Differential Destruction

We provide additional empirical evidence on war destruction, and in particular on the indidence of destruction along the distribution. To do so, we construct estimates of destruction at the asset class level for a number of economies. We then use a version of the framework with multiple assets to understand the impact that differential destruction may have on top wealth shares. Although there is some uncertainty around the wealth lost in wars, we find little evidence for wealth losses that are very disproportional along the the distribution.

The Impact of Destruction in the Simple Framework. To fix ideas, consider an economy with two types of assets, housing H and the rest of the wealth stock R. Then the top-1% wealth share is the composite of both assets,

$$sh_1^W = \frac{W_1}{W} = \frac{H_1 + R_1}{H + R},$$

where H_1 and R_1 are the wealth holdings of housing and the other asset of the top-1% of the wealth distribution. Then we consider a shock D that destroys parts of the housing stock. After the shock, we have that the top-1% share comes out to

$$sh_1^W(D) = \frac{(1-D)H_1 + R_1}{(1-D)H + R}. \tag{20}$$

The top wealth share falls in the degree of wealth destruction if and only if

$$sh_1^{W'}(D) = \frac{HR_1 - H_1R}{((1-D)H + R)^2} < 0 \Leftrightarrow \frac{H_1}{R_1} > \frac{H}{R}$$

i.e. if the portfolio of the top wealth holders is more tilted towards housing, the asset destroyed in this case, than the aggregate portfolio.

The decomposition is straightforward to extend to multiple assets, for which we each know the rate of destruction. The coverage of asset classes varies by country, and is given in the table. Generally, we are able to consider three types of asset holdings; Housing, Business (and equity claims) and a residual asset category, which is in practice made up mostly of safe asset holdings. For each asset category, we compute a rate of destruction and apply it to wealth

Table C.9: Simulation of Destruction Effects on Top 1 Wealth Share

Country	Pre-War	Post-War (Simulation)	Delta	Percent Change	Post-War (Data)
France WW1	55	55	0	-0.1	50.6
France WW2	42.8	42.2	-0.6	-1.5	32
Germany WW1	50.7	50.4	-0.3	-0.6	37.5
Germany WW2	32.6	30.4	-2.2	-6.7	22
Japan WW2	*40*	*38.7*	*-1.3*	-3.1	

Notes: This table shows the impact of destruction on the top 1 wealth share, taking into account the effect of differential destruction across asset classes. The 'Pre-War' column shows the top 1 wealth share before the war, while the 'Post-War (Simulation)' column shows the top 1 wealth share after the war in the simulation, accounting for differential destruction across asset classes. The next two columns show the implied impact on the top wealth share, both in percentage points (Change in Share), and in percent (Percent Change). The 'Post-War (Data)' column shows the top 1 wealth share after the war in the data. Note that for Japan, we do not have data on the pre-war top wealth share, instead we use a value of 40%. The resulting change in percent is invariant to this choice (see footnote 42), the absolute change in share is not.

holdings to calculate the impact of destruction on the wealth distribution in a more granular way. The results of this exercise are shown in table C.9, we give precise details on the calculations below.
The direct effects of destruction on wealth inequality through these simulations is limited. Concretely, we find that destruction directly lowers wealth inequality by around 7% in Germany in World War 2, and by less in the other wars. For France we find barely any potential reduction of wealth inequality in World War 1, and around 1.5% in World War 2. For Japan, we find a somewhat intermediate result, with a decline in inequality of a bit more than 3%.
The muted effect of destruction is a result of portfolio composition: Differences in the wealth portfolio of the top-1% and the aggregate portfolio are small historically. Figure C.14 illustrates this by comparing the wealth portfolio of the top-1% to the aggregate portfolio for a number of countries with detailed data available. In the historical sample, wealth is more concentrated than in modern data, so that there is not as much space for the aggregate wealth portfolio to deviate from the top-1% wealth portfolio. The pre-World War 1 portfolio in France is a case in point: The top-1% portfolio looks very similar to the aggregate portfolio and top-1% wealth shares stand at 55% (top decile shares at 80%).

France. For France, we use portfolio data from Piketty (2011), who provides data both on the top portfolio as well as the aggregate wealth portfolio based on data from the (universal) Parisian estate tax. We use the portfolios of the top-1% of decedents as well as for all decedents in the years 1912 and 1937. In particular, we distinguish three asset categories that are consistently available; real estate, business assets (including equity) and a residual category. We show the portfolios in figures C.14a and C.14b. Notably, before the wars, the aggregate portfolio of decedents looks very similar to the top-1% portfolio.[39] For the composition of income in figure 4, we use data from (Piketty, 2018) and classify 'investment

[39]Further examining the data of Piketty (2011) shows that this is a function of the fact that the portfolio of the "next nine" looks very similar to the top-1% portfolio. Only for the middle 40 do portfolios start to look meaningfully different.

income', 'agricultural income', 'industrial and commercial profits' and noncommercial profits' as business income, 'payments, wages, retirement pensions and annuities' as labor income and the residual as other capital income.
Then, we compute top percentile shares when applying destruction rates to both the stock of real estate as well as business assets. For World War 1, we use a destruction rate of around 11% for business assets as well as real estate following Piketty and Zucman (2014).[40] For World War 2, we use the same sources to estimate a rate of destruction of real assets of 23% and zero fore the remainder. Unfortunately, no consistent breakdown of war destruction across businesses and housing is available. However, given the limited difference of the top 1 portfolio from the aggregate wealth portfolio (Figure C.14), having destruction differ by asset class would not generate meaningful shifts in the wealth distribution. To compute the capital stock, we assume evenly spaced destruction during the years of the wars.

Japan. For Japan, we take information on the portfolio of top estates in 1935 from Moriguchi and Saez (2008). Information on the aggregate wealth portfolio is from the Japan historical statistical yearbook (Statistics Bureau of Japan, 1949 – 2023, Table 591, Statistical Yearbook 1949), which contains the composition of aggregate wealth as well as an estimate for direct destruction for each component of aggregate wealth. In both sources, we classify components into business assets, housing and other.[41] Figure C.14c shows the portfolio of the top estates as well as the aggregate wealth portfolio. While the rich are slightly tilted more towards business assets, they are not too different than the aggregate wealth portfolio. We then apply the destruction rates from the Statistical Yearbook of Japan, i.e. 22% of housing, 31% of business assets and 22% of other (including inventories etc). For the total wealth stock, this yields a rate of destruction of 25.61%, consistent with Wolff (1991) and Harrison (2000) who find similar values. To compute the capital stock, we assume that the full destruction happens in 1945.
Note that for Japan, we do not have data on the top wealth share (or even the top estate share). However, we can carry out simulations for differential destruction using data on just the portfolios of the bottom and the top of the wealth distribution, and assuming a value for the top wealth share. We assume a value of 40%, in line with the evidence for France and Germany pre-WW2 and higher than the top income share of 35%; changing this assumption leaves the resulting decline in top wealth shares unchanged in percent terms.[42] Doing this results

[40] Piketty and Zucman (2014) often mention a rate of destruction of 22%, but explain that half of this are losses on foreign bond holdings in France.

[41] Concretely, in Moriguchi and Saez (2008) we classify stocks, Agricultural land and businesses as business assets; residential land and houses and structures as housing and the residual as other. In Statistics Bureau of Japan (1949 – 2023, Table 591, Statistical Yearbook 1949), we classify "Building" as Housing, "Machinery and Equipment for Industry", "Industrial Facilities" (Electricity, Waterworks,...) and "Products" as Business Assets and all other assets as Other. We have experimented with other classifications, which yield similar results in terms of differential destruction.

[42] To see this, note that we can rewrite (19) as $sh_1^W(D) = \frac{(1-D)H_1+R_1}{(1-D)H+R} = \frac{W_1}{W}\frac{(1-D)H_1/W_1+R_1/W_1}{(1-D)H/W+R/W}$, i.e.

in a decrease of 3.1 % (1.3 percentage points).

Germany. Data on the portfolios and the destruction simulations is taken from Albers et al. (2022). In particular, the authors simulate the effects of destruction historically for both wars, taking into account the asset classes destroyed in both wars. Moreover, they make an adjustment for differential destruction along the distribution, to take into account that destruction affects the rich disproportionally more.[43] In numbers, the authors estimate a 5% loss of wealth due to territorial losses after the first world war (this is taken into account, because pre-war data refers to pre-1914 borders), and destruction of 17.5% of the capital stock in WW2. For the calculation of the capital stock, we apply the losses at the end of WW1 and evenly spaced in WW2.
Figures C.14d and C.14e compare the top-1% portfolio and the rest of the distribution. In Germany, we are able to break out agriculture and industry separately. However, one drawback is that equity claims are not broken out separately, so that a fraction of "other" likely represents claims on business assets as well. Before both wars, the top-1% portfolio is relatively well aligned with the aggregate wealth portfolio.[44]
For Germany before WW2, we can also compare both the income and the wealth portfolio of the top 1 and the aggregate, as we do for France in figure 4. Figure C.14f shows the resulting income portfolio in Germany in 1938.[45] Note that we cannot break out business income and other capital income for the 'total income' portfolio. The resulting picture is similar to France: The top and the aggregate differ very strongly in their income composition, with the top much more tilted towards business income.
Overall, both wars contribute to a reduction in wealth inequality through destruction, but only mildly. For World War 1, the estimated reduction in the top-1% wealth share is only around -0.6 percent, for World War 2 it is higher at 6.7%.

D Appendix: HANK Model

D.1 Evidence on Profits

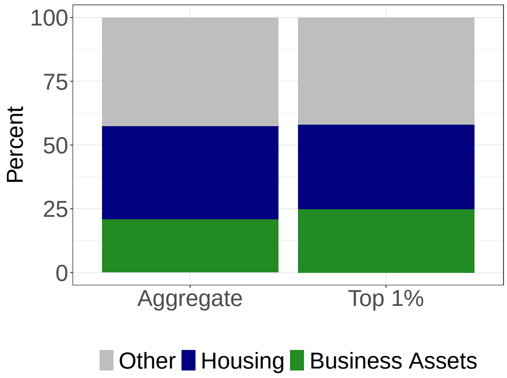
A key channel for the leveling in our estimated HANK is a decline in firm profits. We provide evidence on declining profits during war times in Section 4.4. Here, we describe the data used to construct firm profits. When constructing

separating the top wealth shares and the top wealth portfolio.

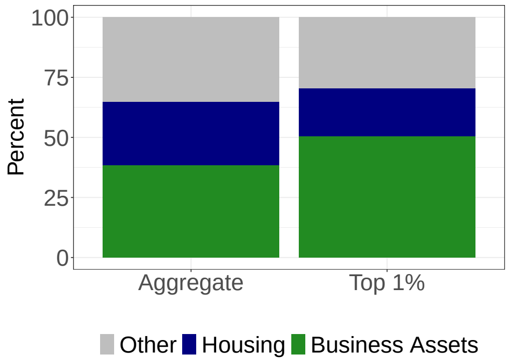
[43] We do not have sufficient data to make this adjustment for other countries.

[44] The share of "Industry" in the portfolio may appear low, especially before the second world war. This is because the portfolios for the second world war come from the year 1934, which is still heavily affected by the great depression.

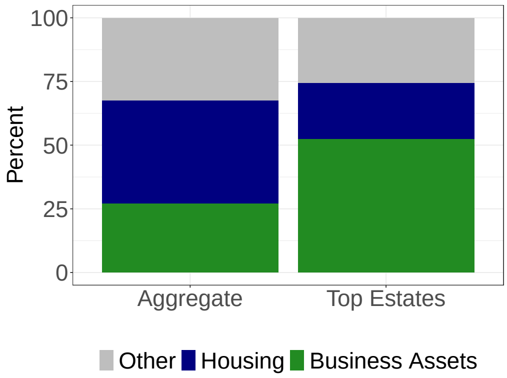
[45] In Germany, we use the data of Dell (2007) and classify Agricultural income, Industrial income and 2/3 of self-employment income as 'business income'.



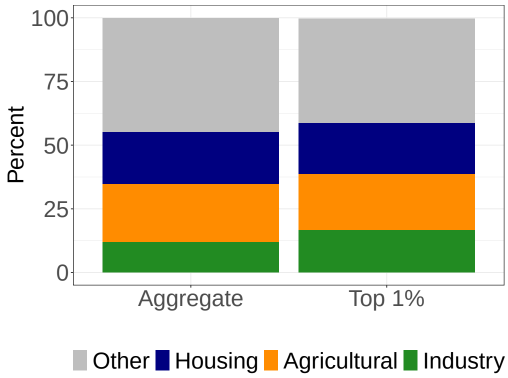
(a) Asset Composition France WW1



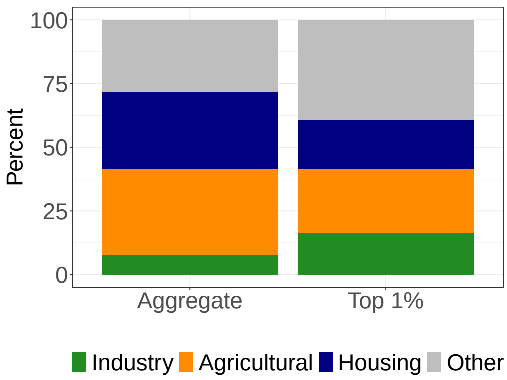
(b) Asset Composition France WW2



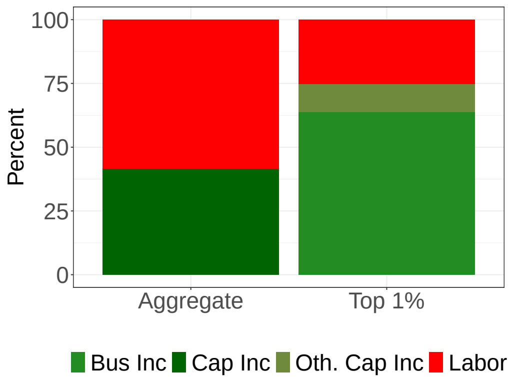
(c) Asset Composition Japan WW2



(d) Asset Comp. Germany WW1



(e) Asset Comp. Germany WW2



(f) Income Comp. Germany WW2

Figure C.14: Historical Wealth and Income Composition

Notes: This figure shows the composition of top incomes and wealth as well as the aggregate wealth or income composition prior to the wars. Panel C.14f shows the income composition for Germany, both for the top 1% and the aggregate. For details see the text.

profits, we aim to maximize our coverage of companies. Therefore, when possible, we take profits from national accounts. However, this is not possible in many cases, in which we are can only cover a subset of companies (for example, listed firms). When possible, we subtract profit taxes levied during the wars.[46] There are numerous issues related to the measurement of economic profits (see e.g. Barkai (2020) and Gutierrez (2017)). We make no attempt to correct for these. Instead, we directly show profits as reported in the source material, with no further computations or corrections. The concept of profits we use is consistent over time within countries around each war (but inconsistent across countries).

France. Data for profits in France come from Piketty and Zucman (2014), who source data from Villa (1994). We define profits as the sum of net of depreciation corporate profits and self-employment capital income and subtract the corporate tax. Figure D.15a shows each component of the calculation. In the first World war, there is a initial rise and then small decline in profits in France. Note that we do not have data on the corporate profit tax imposed in World War 1. However, the fact that profits do not decline much in World War 1 is consistent with a relatively flat top income share. In World War 2, corporate profits in France fall sharply at the start of the war and even turn negative. They then continue to remain low into the 1950's.

Germany. In Germany, we start from two comprehensive works on 'war profiteering' during world wars by economic historians; Baten and Schulz (2005) for World War 1 and Spoerer (1996) for the World War 2 . We extend these to the post-war period periods using the balance sheet of listed corporations.
Specifically, for WW1 we use the profit indices from Baten and Schulz (2005, Table 4), who track rates of real profits for a sample of large firms. They classify firms by their relatedness to wars (e.g. heavy industry is classified as very war related). The indices are normalized to 100 in 1913, as a comparison, we also report GDP. For World War 2, we use the return on equity from Spoerer (1996, Page 147, Table 34) up to 1942.[47] After World War 2, we use data on the profits of non-financial firms from Statistisches Bundesamt (1949-55). This annual publication reports the consolidated balance sheet of German listed firms and is the post-war continuation of the pre-war data. We take profits directly from the tables 'Gewinne und Verluste der Aktiengesellschaften nach Gewerbegruppen'. We divide profits by shareholder equity, which is reported in the same tables. We cannot compute an index of real profits, but only of the return on equity because only the second is available in the pre-war period.

[46] Although the data on income inequality is pre-tax, income taxes are levied on the payouts to firm owners after they pay corporate taxes.

[47] Spoerer (1996) reports the return on equity from the balance sheet both for the entire economy, and for a sample of companies for which he also collects profits as reported in corporate income tax statistics. We use balance sheet profits, consistent with what is available post-war. In 1940-41, we use the balance sheet profits for the firms in the smaller sample, as there is no balance sheet covering the entire corporate sector. As explained in Spoerer (1996), balance sheet profits are similar in his sample and the full corporate sector before 1940.

The data leave us with a gap from 1943–48 without information on profits. It is likely that profits were extremely low during this time period, both because of very high profit taxes of up to 80% by the Nazi regime at the end of the war (Banken, 2018), and the general economic depression in the post-war period. Figures D.15b and D.15c reports profit rates for both wars. In both wars profits decline sharply. In World War 1, profits drop by more than 40% for the industries not directly related to wars. In the second world war, there is an initial boom in corporate profits during the military buildup. However, after the destruction of the war has set in, profits after the second world war are extremely low abd do not catch up to their pre-war levels for a while.

Japan. For Japan, we collect data on the national accounts from the Japanese Statistical Yearbook (Statistics Bureau of Japan, 1949 – 2023, Table: National Income by Distributive Shares). We use the series on corporate profits and subtract the series on the corporation tax. Figure D.15d plots profits in Japan, expressed as a share of GDP, before and after taxes. While initially corporate profits are high during the war (similar to Germany), profits decline steeply at the end of the war years and almost turn negative post-tax.

United Kingdom. We take data on Profits from Piketty and Zucman (2014) ('Gross operating surplus of private non-financial companies'), who in turn rely on data from Mitchell (1988). For profit taxes, we take data from Ryland and Dimsdale (2017, Sheet A.27) ('Profit Taxes'). This allows us to calculate profits of U.K. nonfinancial firms as a percentage of GDP. We show profits before and after the profit tax in figure D.15e. After the wartime profit tax, corporate profits decline significantly during the war and the immediate aftermath.

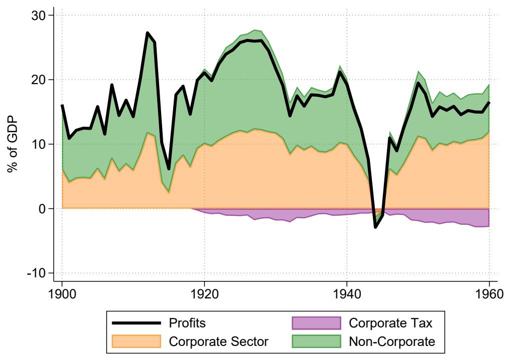
Netherlands. Data on profits during World War 2 come from the work of dutch economic historian Klemann (2002). He constructs profits for a large sample of dutch listed firms from corporate balance sheets and provides an index of aggregate profits from 1938 to 1948. Figure D.15f plots the index of profits together with an index of real GDP that is normalized to 100 in 1938 as well.

Finland We collect data for profits of cooperatives in Finland from the Finnish statistical yearbook (Statistics Finland, 1900 –, Table 139). Profits are available for Cooperatives, a form of privately held businesses owned by multiple partners. We use the net surplus of cooperatives without further adjustment. Figure D.15g reports profits as a percentage of sales, which are also available in the same table.

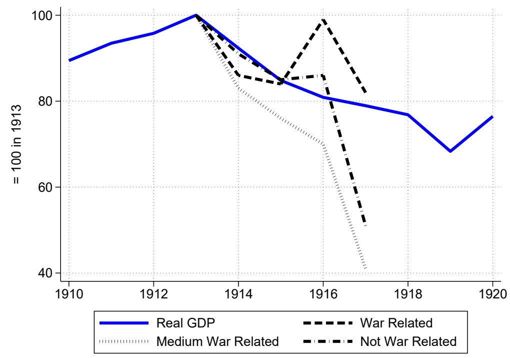
D.2 Additional Validation: Prices, Wages and Dividends

In the model, a key mechanism for the decline in income inequality is a decline in firm profits, which constitute the majority of income for the top earners. Figure D.16a shows impulse responses of the price and wage level (from Jordà et al. (2017)) using specification 1. Indeed, we find that in the data wages also

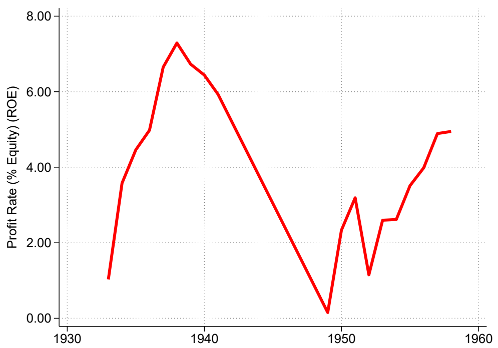
Figure D.15: Comparison of Corporate Profits during Wars



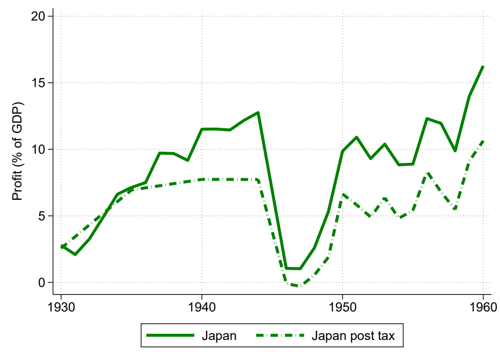
(a) France World War 2



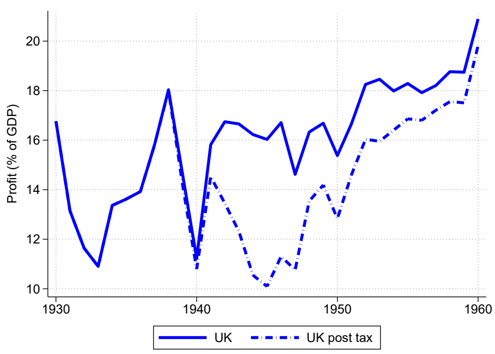
(b) Germany World War 1



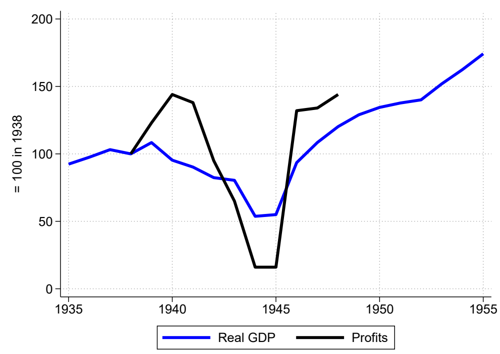
(c) Germany World War 2



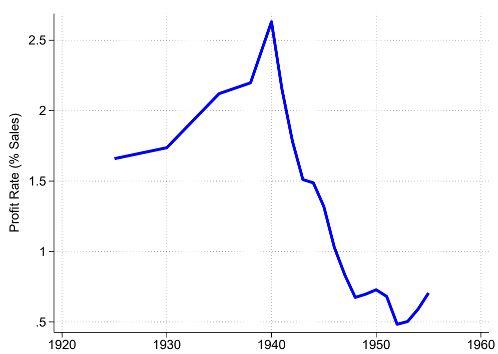
(d) Japan World War 2



(e) United Kingdom World War 2



(f) Netherlands World War 2



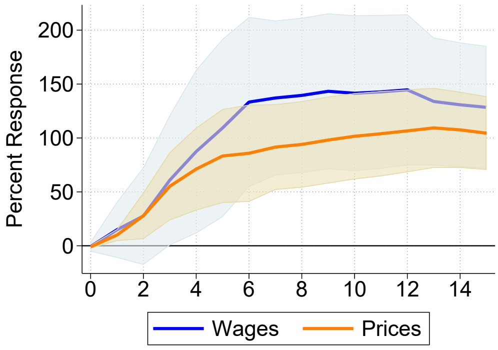
(g) Finland World War 2

Notes: This figure shows profits during war for the countries in our sample. For details see text.

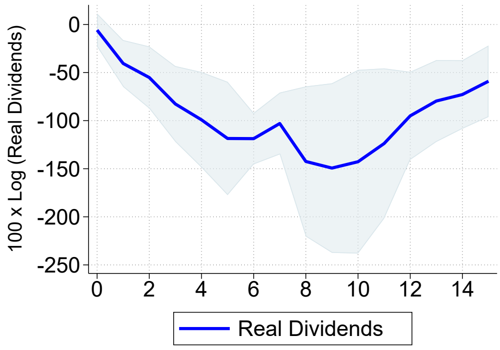
rise faster than prices.

Second, in addition to the profit data, we also construct data on real dividends across countries. We compute real dividends by multiplying stock market capitalization from Kuvshinov and Zimmermann (2022) with the price-dividend ratio from Jordà et al. (2019). Figure D.16b shows the estimated response of real dividends (log-transformed) to the wars using specification (1) in our sample. We find that war decreases dividend payouts sharply, by up to 150%. The decline in dividends far exceeds the decline in output (see figure B.5), so that dividends decline by more than overall income.

Figure D.16: Response of Prices, Wages and Dividends



(a) Response of Wages and Prices



(b) Response of Real Dividends

Notes: Panel a) the response of wages and prices in the data of Jordà et al. (2017) to the war shock computed using specification 1, the sample is restricted to the 18 countries in Jordà et al. (2017), for which data on wages is available. Panel b) shows the response of real dividends to the war shock. For the data on dividends, see Section D.2. Real dividends are in Logs, so that a drop by -150 log points correspond to a 78% decline in real dividends.

E Full Model Equations and Recursive Equilibrium

This appendix reproduces *all* structural equations—both those displayed in the main text and those omitted there for space—and then states a formal recursive equilibrium. Throughout, time is discrete, all variables are real unless noted otherwise, and expectations $\mathbb{E}_t$ are conditional on information at t.

E.1 Households

Worker–entrepreneur switching. Each household carries a discrete employment status $e_{it} \in \{0, 1\}$ (0 = worker, 1 = entrepreneur/rentier) with transition matrix

$$\Pr(e_{it} = 1 \mid e_{it-1} = 0) = \zeta, \qquad \text{(become entrepreneur)} \qquad \text{(H0a)}$$
$$\Pr(e_{it} = 0 \mid e_{it-1} = 1) = \iota, \qquad \text{(return to work)} \qquad \text{(H0b)}$$

and complementary probabilities of staying put. Entrepreneurs set $h_{it} = 0$ and receive firm profits Π_t^F for one period; workers draw labor efficiency h_{it} from the process below.

Idiosyncratic labor productivity.

$$\log h_{it} = \rho_h \log h_{it-1} + \epsilon_{it}^h, \qquad \epsilon_{it}^h \sim \mathcal{N}(0, \sigma_{h,t}^2). \tag{H1}$$

Preferences.

$$\mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \frac{[c_{it} - n_{it}^{1+\gamma}/(1+\gamma)]^{1-\xi} - 1}{1 - \xi}. \tag{H2}$$

Labor-supply condition.

$$n_{it}^{\gamma} = (1 - \tau_t - \tau_{i,t}^{\text{war}})\, w_t h_{it}. \tag{H3}$$

Bond schedule.

$$R(b_{it}, R_t^b) = \begin{cases} R_t^b, & b_{it} \geq 0, \\ R_t^b + \overline{R}, & b_{it} < 0, \end{cases} \tag{H4}$$

where $\overline{R} > 0$ is a penalty rate for unsecured borrowing.

Budget constraints. (i) Capital adjusters

$$c_{it} + b'_{it} + q_t k'_{it} = (1 - \tau_t - \tau_{i,t}^{\text{war}}) w_t h_{it} n_{it} + \frac{R(b_{it}, R_t^b)}{\pi_t} b_{it} + (q_t + (1 - \tau_{i,t}^{\text{war}}) r_t) k_{it} \qquad \text{(H5)}$$
$$+ \Pi_t^U \mathbf{1}_{\{e_{it}=0\}} + \Pi_t^F \mathbf{1}_{\{e_{it}=1\}}, \tag{21}$$

with controls (b'_{it}, k'_{it}).

(ii) Non-adjusters

$$c_{it} + b'_{it} + q_t k_{it} = (1 - \tau_t - \tau^{\text{war}}_{i,t}) w_t h_{it} n_{it} + \frac{R(b_{it}, R^b_t)}{\pi_t} b_{it} + (q_t + (1 - \tau^{\text{war}}_{i,t}) r_t) k_{it} \tag{H6}$$

$$+ \Pi^U_t \mathbf{1}_{\{e_{it}=0\}} + \Pi^F_t \mathbf{1}_{\{e_{it}=1\}}, \tag{22}$$

with control b'_{it}. Constraints: $b'_{it} \geq \underline{B}$ and $k'_{it}, k_{it} \geq 0$.

Bellman system.

$$V^a_t(b,k,h,e) = \max_{b',k'} \Big\{ u(\cdot) + \beta\, \mathbb{E}_t W_{t+1}(b',k',h',e') \Big\}, \tag{H7}$$

$$V^n_t(b,k,h,e) = \max_{b'} \Big\{ u(\cdot) + \beta\, \mathbb{E}_t W_{t+1}(b',k,h',e') \Big\}, \tag{23}$$

$$W_{t+1}(b,k,h,e) = \lambda V^a_{t+1}(b,k,h,e) + (1-\lambda) V^n_{t+1}(b,k,h,e).$$

Distribution dynamics. If $s = (b,k,h,e)$ and $s' = (b',k',h',e')$ and the adjustment indicator $J_{it} \sim \text{Bernoulli}(\lambda)$,

$$\mu_{t+1}(s') = \int \Big[\lambda\, \mathbf{1}_{\{b'=b^a(s),\, k'=k^a(s)\}} + (1-\lambda) \mathbf{1}_{\{b'=b^n(s),\, k'=k\}} \Big] f_H(h'|h) f_E(e'|e)\, \mu_t(ds), \tag{H8}$$

with f_H from (H1) and f_E from (H0a)–(H0b).

E.2 Firms

Wage-setting unions. Objective:

$$\max_{W_{jt}} \mathbb{E}_t \sum_{s=0}^{\infty} (\beta \lambda_w)^s \frac{W^F_{t+s}}{P_{t+s}} N_{t+s} \Big[\Big(\frac{W_{jt} \bar{\pi}^s_W}{W^F_{t+s}} - \frac{W_{t+s}}{W^F_{t+s}} \Big) \Big(\frac{W_{jt} \bar{\pi}^s_W}{W^F_{t+s}} \Big)^{-\zeta} \Big]. \tag{F1}$$

Wage Phillips curve:

$$\log \frac{\pi^W_t}{\bar{\pi}_W} = \beta\, \mathbb{E}_t \Big[\log \frac{\pi^W_{t+1}}{\bar{\pi}_W} \Big] + \kappa_w (mc^W_t - \mu^{W,-1}_t), \qquad \kappa_w = \frac{(1-\lambda_w)(1-\beta\lambda_w)}{\lambda_w}. \tag{F2}$$

Price-setting intermediates. Objective:

$$\max_{p_{jt}} \mathbb{E}_t \sum_{s=0}^{\infty} (\beta\theta)^s Y_{t+s} \Big[\big(\frac{p_{jt} \bar{\pi}^s}{P_{t+s}} - MC_{t+s} \big) \big(\frac{p_{jt} \bar{\pi}^s}{P_{t+s}} \big)^{-\eta} \Big]. \tag{F3}$$

Price Phillips curve:

$$\log \frac{\pi_t}{\bar{\pi}} = \beta\, \mathbb{E}_t \Big[\log \frac{\pi_{t+1}}{\bar{\pi}} \Big] + \kappa_Y (mc_t - \mu^{-1}_t), \qquad \kappa_Y = \frac{(1-\theta)(1-\beta\theta)}{\theta}. \tag{F4}$$

Production and factor prices.

$$Y_t = N_t^{\alpha}(u_t K_t)^{1-\alpha}, \tag{F5}$$

$$w_t^F = \alpha\, mc_t Z_t \Big(\frac{u_t K_t}{N_t}\Big)^{1-\alpha}, \tag{F6}$$

$$r_t + q_t \mathcal{D}_t \delta(u_t) = (1-\alpha)\, mc_t Z_t \Big(\frac{N_t}{u_t K_t}\Big)^{\alpha}, \tag{F7}$$

$$q_t[\mathcal{D}_t \delta_1 + \delta_2(u_t - 1)] = (1-\alpha)\, mc_t Z_t \Big(\frac{N_t}{u_t K_t}\Big)^{\alpha}. \tag{F8}$$

Capital-goods producers.

$$q_t\Big[1 - \phi \ln\frac{I_t}{I_{t-1}}\Big] = 1 - \beta\, \mathbb{E}_t\Big[q_{t+1}\phi \ln\frac{I_{t+1}}{I_t}\Big], \tag{F9}$$

$$K_t - (1 - \mathcal{D}_t\delta(u_t))K_{t-1} = \Big[1 - \frac{\phi}{2}(\ln\frac{I_t}{I_{t-1}})^2\Big] I_t. \tag{F10}$$

Profits distributed to households.

$$\Pi_t^U = (w_t^F - w_t)N_t, \qquad \Pi_t^F = (1 - mc_t)Y_t. \tag{F11}$$

E.3 Policy Rules

Monetary policy.

$$\log\frac{R_t^b}{\bar{R}} = \rho_R \log\frac{R_{t-1}^b}{\bar{R}} + \phi_\pi \log\frac{\pi_t}{\bar{\pi}_t} + \phi_y \log\frac{Y_t}{\bar{Y}}. \tag{P1}$$

Inflation-target dynamics.

$$\log\bar{\pi}_t = \rho_{\pi,1}\log\bar{\pi}_{t-1} + \rho_{\pi,2}\log\bar{\pi}_{t-2} + \varepsilon_t^{\pi}, \quad \varepsilon_t^{\pi} \sim \mathcal{N}(0,\sigma_\pi^2). \tag{P2}$$

Government purchases.

$$\log\frac{G_t}{\bar{G}} = \rho_G \log\frac{G_{t-1}}{\bar{G}} + (1-\rho_G)\theta_B^G \log\frac{B_t}{\bar{B}} + (1-\rho_G)\theta_Y^G \log\frac{Y_t}{\bar{Y}}. \tag{P3}$$

Payroll tax rule.

$$\log\frac{\tau_t}{\bar{\tau}} = \rho_\tau \log\frac{\tau_{t-1}}{\bar{\tau}} + (1-\rho_\tau)\gamma_B^\tau \log\frac{B_t}{\bar{B}} + (1-\rho_\tau)\gamma_Y^\tau \log\frac{Y_t}{\bar{Y}}. \tag{P4}$$

War-surcharge shock.

$$\log\frac{\tau_t^{\text{war}}}{\bar{\tau}^{\text{war}}} = \rho_{\tau^{\text{war}},1}\log\frac{\tau_{t-1}^{\text{war}}}{\bar{\tau}^{\text{war}}} + \rho_{\tau^{\text{war}},2}\log\frac{\tau_{t-2}^{\text{war}}}{\bar{\tau}^{\text{war}}} + \varepsilon_t^{\tau}, \quad \varepsilon_t^{\tau} \sim \mathcal{N}(0,\sigma_\tau^2). \tag{P5}$$

E.4 Market Clearing and Government Budget

$$
\begin{aligned}
B_{t+1} &= \mathbb{E}_t[\lambda b_t^a + (1-\lambda) b_t^n], && \text{(C1)}\\
K_{t+1} &= \mathbb{E}_t[\lambda k_t^a + (1-\lambda) k_t^n], && \text{(C2)}\\
Y_t &= C_t + I_t + G_t, && \text{(C3)}\\
B_{t+1} &= (1 + R_t^b) B_t + G_t - T_t. && \text{(C4)}
\end{aligned}
$$

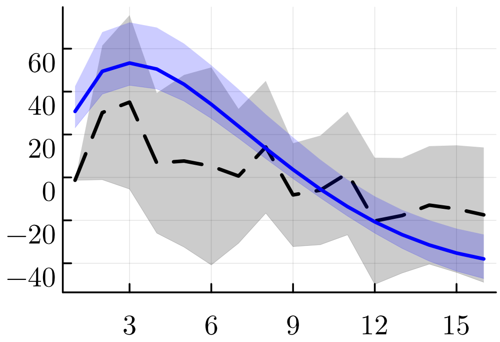
E.4.1 Recursive Competitive Equilibrium

A **recursive competitive equilibrium** is a set of

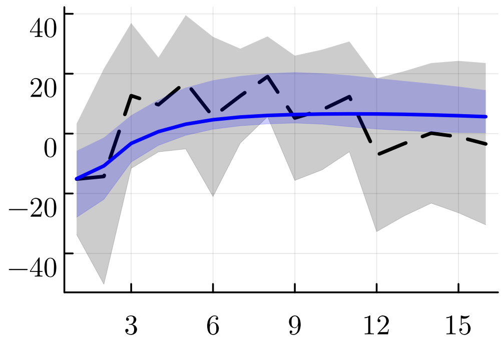
1. Household policy functions b^a, k^a, b^n, c, n and value functions V_t^a, V_t^n solving (H7);
2. Firm policies and prices satisfying (F1)–(F11);
3. Policy instruments $\{R_t^b, G_t, \tau_t, \tau_t^{\text{war}}, \bar{\pi}_t\}$ obeying (P1)–(P5);
4. A distribution $\mu_t(b, k, h, e)$ evolving via (H8);
5. Aggregate allocations and prices such that the market-clearing conditions (C1)–(C3) and the government budget (C4) hold for every t.

E.5 Additional Model Results

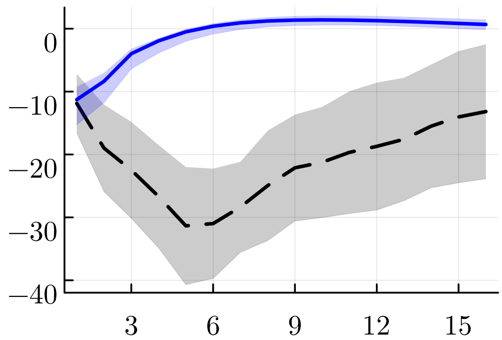
Figure E.17: Local Projection vs. Model: Additional Observables



(a) Government Spending



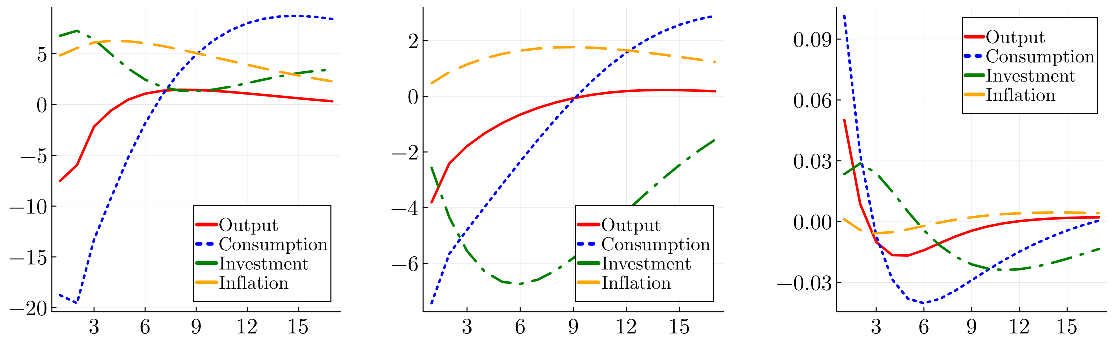
(b) Tax Revenues



(c) Output

Notes: Blue solid line: Baseline model estimated via IRF-matching. Black dashed line: Local-projection estimates. Gray shaded areas: 90 percent confidence bounds based on Newey and West (1987)-standard errors; blue shaded areas: 90 percent bands based on simulating 10,000 sets of IRFs using posterior draws. Y-axis: Percent deviation from steady state. X-axis: Years.

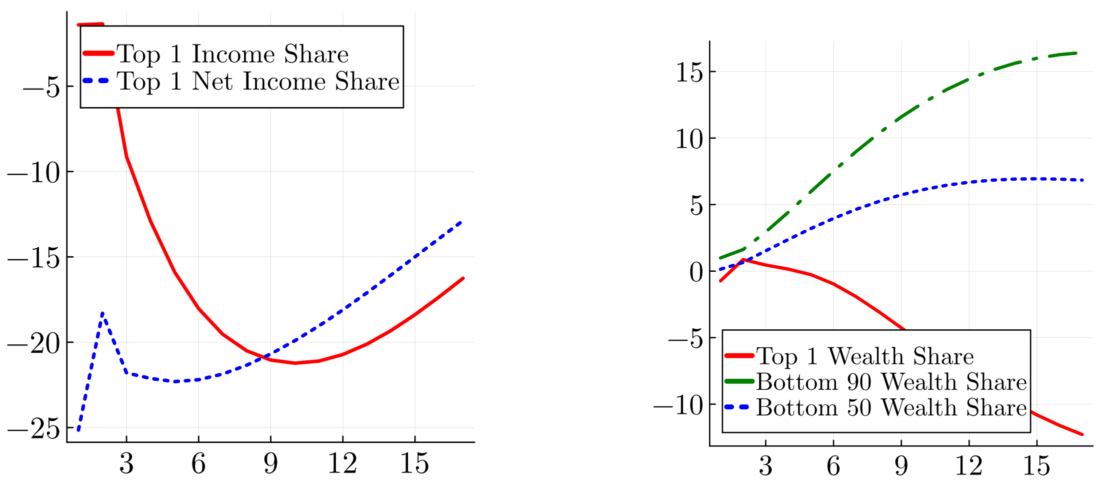
Figure E.18: Impulse responses



(a) Destruction shock (b) Taxation shock (c) Monetary shock

Notes: The panels show the aggregate effects for each of the three estimated shocks.

Figure E.19: Total Inequality Responses to the War Shock



(a) Incomes Shares (b) Wealth shares

Notes: Panel (a) shows the responses of the top-1 pre-tax (gross) income share in red and the top-1 post-tax (net) income share in blue. Panel (b) shows the responses of the share of wealth held by the top-1 in red, as well as the bottom 90 (in green) and bottom 50 (in blue).

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