War Reparations, Structural Change, and Intergenerational Mobility

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Abstract

This paper presents evidence that government industrial promotion can move labor out of agriculture into manufacturing and have long-term effects via increased human capital accumulation in the next generation. I use variation generated by the Finnish war reparations (1944-1952) that forced the largely agrarian Finland to give 5% of its yearly GDP in industrial products to the Soviet Union. To meet the terms, the Finnish government provided short-term industrial support that persistently raised the employment and production of the treated, skill-intensive industries. I trace the impact of the policy using individual-level registry data and show that the likelihood of leaving agriculture for manufacturing and services increased substantially in municipalities more affected by the war reparations shock. These effects were persistent: 20 years after the intervention, the reallocated workers remained in their new sectors and had higher wages. Younger cohorts affected by the new skill-intensive opportunities obtained higher education and were more likely to work in white-collar occupations by 1970. Finally, I link parents to children to study how the policy affected intergenerational mobility. I show that mobility in both incomes and education increased in the more exposed locations.

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1 Introduction

Structural transformation is a crucial element of economic development. Historically, countries have become rich as labor has moved from agriculture into more modern activities, where productivity and productivity growth are higher (Clark, 1940; Gollin et al., 2013; Rodrik, 2012). This transformation has been less prevalent in today's developing world, where different market failures can block the process of structural change, and a disproportionately large part of the labor force still works in agriculture. To solve these market imperfections, many states, motivated by influential early work in development economics (Lewis, 1955; Rosenstein-Rodan, 1943), have tried to expedite structural transformation by active industrial promotion.

Yet there is considerable debate and limited causal evidence on the effectiveness of such policies.[1] This is partly due to the endogeneity of policy assignment. As the policy-maker chooses certain sectors or places to promote, the evaluation of these interventions becomes difficult. Furthermore, even seemingly successful industrial support is subject to diminishing returns. For countries to move from middle- to high-income status, reallocating labor from agriculture into manufacturing is not enough, but industrialization also needs to promote further human capital accumulation. If the newly-formed industrial sectors instead lock workers in low-skill occupations that do not motivate future educational attainment (Atkin, 2016; Franck and Galor, 2018), the lasting effects of industrial promotion are unclear. In order to understand the long-term impacts of industrial promotion, also taking into account this endogenous skill acquisition, we need a plausibly exogenous policy shift and detailed individual-level data to track the effects over time and generations.

In this paper, I address both of these issues by exploiting a natural experiment induced by the Finnish war reparations to the Soviet Union following World War II, combined with rich intergenerational registry data. From 1944 to 1952, Finland, a country with 60% of its labor force still working in agriculture, had to export 5% of its yearly GDP in industrial products as a reparation for losses caused during the war. This episode introduces plausibly exogenous variation in temporary government policy as the Soviet Union dictated the structure of the indemnities.

The Soviet Union placed most of the reparations burden on relatively complex metal products such as ships, locomotives, cables, and engines – sectors where Finland had little previous experience. Figure 1 illustrates the stark difference between the reparations demanded, and the structure of the Finnish economy before the war. While

[1] See, for example, Harrison and Rodríguez-Clare (2009); Krueger (1990); Pack and Saggi (2006); Rodrik (2007, 2008); Wade (1990) for discussion.

metal industry products were responsible for over 60% of the war reparations, they only covered 14% of manufacturing output in 1943, and 2.3% of the value of pre-war exports. Despite the Finnish inexperience in this type of manufacturing, the Soviet Union demanded complex metal products as the Soviet production in these sectors was severely influenced by the ongoing war (Harrison, 2002; Rautakallio, 2014). The Soviet Union needed machinery to rebuild the economy but had trouble acquiring it from the world market (Rautakallio, 2014).

I proceed to show that this large policy experiment had a persistent impact on both the directly exposed workers and later generations. First, I employ newly-collected data and a difference-in-differences strategy to establish that the temporary government support permanently increased production and labor working in the treated industries relative to other Finnish manufacturing sectors. The temporary reparations shock led Finland to diversify from historically strong, but relatively low-skill paper and woodworking industries into more skill-intensive manufacturing. A falsification test using Norwegian industrial data shows that the same sectors did not develop similarly in a comparable nearby country.[2]

Second, I present evidence that the reparations fostered structural transformation, not by merely moving labor between the manufacturing sectors, but also by reallocating the workforce from lower-wage primary production (mainly agriculture) to higher wage manufacturing and services.[3] I do this by exploiting Finnish registry data and a shift-share instrument that allows me to study the individual-level impacts of the government intervention.[4] Using this empirical strategy, I show that older, already established workers were seven percentage points more likely to leave agriculture if their municipality received a one standard deviation larger share of the reparation shock.[5] Linking individuals over censuses, I find that the sectoral reallocation persisted at least 20 years after the intervention. I further document that workers that lived in the more exposed municipalities in 1939 had higher incomes than other workers in 1970. This result is consistent with industrialization yielding higher wages, as suggested by

[2]Norway is the closest country where comparable industrial statistics are available. Norway also had a similar GDP per capita as Finland in 1944.

[3]In 1938 male worker's average yearly wage in agriculture was 8383 markka, while in manufacturing the average yearly wage was 13929 markka or 66 % larger. This translates to approximately 1700 and 2700 today's US dollars.

[4]I construct these local labor market shocks for each Finnish municipality by calculating how large part of the workforce in 1939, before the treatment, worked in the war reparations industries and interact this with the reparations the industry was assigned. This set-up follows the existing literature (Acemoglu et al., 2016; Autor et al., 2013; Bartik, 1991).

[5]Old is over the age of 25 in 1950. This is the youngest cohort with industry information available in 1939. I can then observe if the individual left agriculture.

the early development literature (Clark, 1940; Lewis, 1955; Kuznets, 1957; Rostow, 1960), and more recent work by Gollin et al. (2013). The magnitude of this reduced-form impact on income is approximately 10% for a one standard deviation increase in the local reparations shock.

Having shown that the older generation of workers left agriculture for more modern sectors and obtained higher wages, I move on to the third and principal finding of the paper: the lasting intergenerational response to increased industrialization. I show that the increase in manufacturing led to better occupational and education outcomes for younger cohorts in more exposed places. A one standard deviation increase in the local reparations shock led to a 0.25 year increase in educational attainment for the affected cohorts. More importantly, the new skill-intensive opportunities incentivized the acquisition of higher education. I find that a standard deviation increase in the local reparations shock led to a 1.6 percentage point increase in the probability of having a university degree. This translates into nearly 40% increase relative to the population mean of 4.2%. The reparation payments also led to significant occupational upgrading. Younger cohorts in the more exposed places were significantly less likely to work in production and more likely to be white-collar workers as adults (measured in 1970). These occupational results are consistent with the evidence on higher educational attainment.

I then link parents to children and study how the experiment affected intergenerational mobility. I find that the educational and occupational gains of the younger cohorts are especially striking for the children of low-income parents. I go on to show that the war reparations led to higher upward income mobility in more affected places. Specifically, using the measures defined in Chetty et al. (2014), I find that a child of a father at the 20th percentile of the income distribution had approximately 2.5 percentile ranks, or 5%, higher income if their municipality was exposed to a one standard deviation higher war reparations shock. The increase in upward mobility is consistent with the increased occupation and education possibilities offered by industrialization.

These lasting results on the younger generations are likely to follow from the increased skill premium offered by the new industrialization. The war reparations shock seems to have been large enough to change children's expectations about their future possibilities. Although I cannot exhaustively rule out other mechanisms, I provide evidence that parent's improved income or increase in educational possibilities in the municipality are not driving the results. I follow the methodology of Ciccone and Papaioannou (2009) to show that the industries most affected by the war reparations were skill-intensive, as measured by the worker's average years of education. As an additional piece of evidence, I then restrict the treatment only to relatively low-skill war reparation industries and do not find that the increase in this type of manufacturing led to any statistically significant increase in educational attainment.

While the human capital and occupational upgrading can be rationalized by the requirements posed by the expedited industrialization, these results are by no means mechanical or obvious. Recent studies have shown that interventions that increase manufacturing could lead to a middle-income or manufacturing trap, holding back movement to more complex activities.[6] For example, Franck and Galor (2018) show that more industrialized places in France in the 1800s are less prosperous today. They argue that this is due to lower preferences for education among the children of the manufacturing workers in the low-skilled sectors. In relation to this, Atkin (2016) finds that the opening of new manufacturing plants in Mexico was associated with lower human capital investments, as the opportunity costs for schooling became higher. Similarly, Goldin and Katz (1997) describe how industrialization led to decreased educational attainment in the early 1900s U.S. The key difference between my results and the previous work is that the new industrial opportunities in Finland required higher skill levels, which plausibly encouraged further skill acquisition via increased returns to education.[7]

The importance of human capital accumulation for economic growth is well-established (Barro, 2001; Benhabib and Spiegel, 2005; Gennaioli et al., 2012; Mankiw et al., 1992; Nelson and Phelps, 1966). My results provide novel evidence that causation can run from increased high-skill opportunities to higher human capital investments, possibly leading to a virtuous circle of further educational attainment and economic growth. For example, Acemoglu (1997) provides a model of multiple equilibria in skill and technology to help guide this thinking. In his model, investment in technology that requires a certain skill level reduces the uncertainty in the related human capital investment, leading workers to forego wages for a higher pay in the future. This makes firms more willing to invest in new technology given the existence of a skilled workforce.[8] The results of this paper, showing increases in human capital

[6]The idea behind the middle-income trap is that at first a country experiences growth due to manufacturing because it can compete with lower wages, but when the wage level rises, the country gets stuck in a trap if there is no new innovation. Eichengreen et al. (2013) show that these types of growth slowdowns are mitigated by increased schooling.

[7]For example, Munshi and Rosenzweig (2006), Jensen (2012), and Oster and Steinberg (2013) find similar positive educational impacts from new high-skilled IT service job opportunities in India. The distinction between the present study and previous work is that I study the human capital impacts of large-scale industrialization promoted by the government.

[8]In the Acemoglu (1997), model firms are the ones offering the training. Since the model has perfectly

due to new opportunities, are consistent with such a model.

The overall conclusion is that the government promotion, focusing on skill-intensive sectors, likely affected short- and long-term growth by first reallocating labor to more productive sectors and by providing incentives for further investments in human capital. Shortly after the reparations payments, Finland started to catch up with its considerably richer neighbors.[9] A large share of this fast post-war growth is attributed to the structural change of the economy (Kokkinen et al., 2007) and increases in human capital (Kokkinen, 2012). The shift to more complex exporting was also possibly important, as Hausmann et al. (2007) and Hidalgo et al. (2007) show that the complexity of exports matters for the long-term development of countries.

This paper contributes to several literatures. A large body of work has studied temporary government action in shaping the structure of an economy (e.g. Amsden 1992; Hausmann and Rodrik 2003; Liu 2017; Pack and Saggi 2006; Robinson 2009; Rodrik 2007, 2008; Wade 1990).[10] I add to this literature by exploiting plausibly exogenous variation in government policy to study structural transformation. I also use unique registry data to study the intergenerational impacts of such interventions, unlike the existing industrial policy literature.

My findings closely relate to the theoretical literature focused on market failures, poverty traps, and multiplicity of equilibria (see, e.g., Acemoglu 1997; Azariadis and Stachurski 2005; Krugman 1991; Matsuyama 1991). Specifically, they relate to the idea that the government can correct for market failures that goes back to at least the Rosenstein-Rodan (1943) Big Push model, formalized by Murphy et al. (1989). In recent empirical work, Juhász (2014) finds that the short-term trade protection provided by the Napoleonic blockage helped develop the French garment industry. Lane (2017) shows that protected South Korean industries experienced a faster development after initial government action, and this impact propagated through the input-output network. Giorcelli (2016) finds that temporary management training associated with the Marshall plan in post-war Italy led to long-term productivity gains. My findings are in line with the empirical work by Nunn and Trefler (2010), who show consistent results that tariffs targeting skill-intensive sectors can be growth-promoting. They, however, do not find similar evidence of an increase in human capital or knowledge accumulation (as measured by patents).

My results are also linked to the work on the long-term impact of place-based

transferable utility, the results also hold if the worker buys the schooling.

[9]Both Sweden and Denmark had a nearly 40% higher GDP per capita than Finland in 1940.

[10]Harrison and Rodríguez-Clare (2009) provide a comprehensive summary of this vast empirical literature studying industrial interventions.

policies, e.g. Kline and Moretti (2013, 2014). This literature is, however, more focused on the spatial allocation of activity than sectoral allocation. The natural experiment I employ differs from this work, as the war reparations targeted specific sectors rather than specific locations. Furthermore, the industrial promotion was not directly accompanied by other large investments in infrastructure, education, or health. Lastly, I contribute to the literature studying intergenerational mobility in incomes and educational attainment (Card et al., 2018; Chetty et al., 2014; Chetty and Hendren, 2018). This is, to the best of my knowledge, the first study to show that the structural transformation of the economy can also promote intergenerational mobility.

The Finnish war reparations were a colossal undertaking and an important part of Finnish history. The episode has been extensively studied by historians and other scholars (Auer, 1956; Fellman, 1996; Harki, 1971; Kindleberger, 1987; Rautakallio, 2014). Nevertheless, my paper is the first quantitative assessment of the lasting economic effects of the war reparations. Even though I show that this government action permanently changed the structure of the Finnish economy, I do not claim any welfare benefits. It is hard to argue that free exports to the Soviet Union were the optimal usage of the post-war resources.

The rest of the paper is organized as follows. Section 2 discusses the historical background of the Finnish war reparations, and Section 3 introduces the various datasets used in this study. Section 4 presents the industry-level results and Section 5 the main individual-level results. Section 6 displays series of robustness and validity checks. Finally, Section 7 discusses the policy implications and briefly concludes the paper.

2 The Finnish War Reparation Payments

> *"Losses caused by Finland to the Soviet Union by military operations and the occupation of Soviet territory will be indemnified by Finland to the Soviet Union to the amount of three hundred million dollars payable over six years in commodities (timber products, paper, cellulose, seagoing and river craft, sundry machinery). "*
>
> 11th of Article of the 1944 Finnish-USSR Peace Treaty.

Ever since Germany printed money to pay for its debts after World War I, resulting in hyperinflation and great social turmoil, the allied powers adjusted their policies. The reparations resulting from the World War II were to be paid commodities instead of currency.

In September 1944 the Finnish delegation signed the Moscow Armistice that included a war reparation sum of 300 million dollars. Finland was close to complete military defeat and signed the peace treaty without knowing the exact structure of the reparations it needed to pay. The wording of the signed Finnish-USSR treaty only defined these commodities as “timber products, paper, cellulose, seagoing and river craft, sundry machinery”. As Finnish industrial production at the time was focused on timber and paper products, the structure of the final reparations came as a shock to the Finnish government. Only one-third of the reparations was in paper or timber products, and most were in more complex metal industry goods.

The reparations were different from the Finnish production and export structure of the time. The Soviet Union wanted the reparations in industrial products even though over half of the Finnish labor force still worked in primary production. A particularly disproportionate share of the reparations was assigned to metal products. The metal industry exports covered only 14% of industrial production and 2.3% of the pre-war exports but were responsible for over 60% of the war reparation. The Soviet Union had experienced large losses in their metal-industry production during the war, which in part explains the peculiar structure of the war reparations demands (Harrison, 2002; Rautakallio, 2014). As the Finnish production capability in these sectors was so underdeveloped, the Finnish government not only paid for the production but also the investments needed to produce the reparations products.

The Soviet Union required detailed knowledge about the Finnish production structure, including estimates of the production capacity for different goods, before it settled on its demands. The Finnish companies provided assessments of their production capacity, but these were not often taken into account in the Soviet demands. For example, the maximum yearly production capacity of cable, one of the largest reparation product groups, reported by the Finnish companies to the Soviets, was approximately 200 km. The Soviet Union, however, demanded a yearly production of 375 km of power cable, 200 km of other cable, and 4250 tons of copper wire. The Finns were only able to survive the first years by buying cable from Sweden and expropriating domestic copper (Auer, 1956).

The Finnish government had no say on the structure of the reparations, as the amount and the vague terms were already decided in the signed peace treaty. If the Finnish government had had any influence on the terms, it would have greatly preferred the structure of the reparations to focus on the well-established timber industry (Auer, 1956; Suviranta, 1948). The fact that the structure of these reparations was not open to negotiation is well summed up by a letter the Finnish government received from a high-ranking engineer Antonenko in charge of organizing the reparations:

> *"You [the Finnish government] have asked to negotiate about the war reparation payments. I personally do not understand what there is to negotiate. Finland has signed a peace treaty, in which it has committed to carrying out certain indemnities to the Soviet Union. Finland can either carry out these reparations or it will be occupied."*

The initial organization of the reparations was the following: each year, for a period of 6 years, Finland was to ship out 50 million dollar's worth of merchandise. In 1945, the payment time of the reparations was increased to eight years, and in 1948 the remaining reparations were halved unilaterally by the Soviet Union.[11] The final sum of reparations shipped by Finland in the years 1944-1952 was 226.5 million dollars in 1938 prices (Rautakallio, 2014). However, this alleviation of the terms was mostly useful only for the remaining timber products that Finland was more likely to be able to deliver (Auer, 1956).

The burden to the Finnish state was considerable. The reparations took on average 4% of the GDP for eight years and at worst 27% of government expenditures in 1946 (Rautakallio, 2014). Largest single items exported were ships, locomotives, engines, cable, and machinery for factories. For example, the amount of ships built in Finland rose from 14 in the period 1924-1938 to 581 during the reparations. Overall, Finland shipped nearly 400 000 cargo carriages of war reparations items to the Soviet Union from 1944 to 1952. The Soviet Union required the quality of the production to meet the international standard, which meant that the Finnish production did not only need to scale up but increase in complexity. [12]

Historians often consider the actual burden to the government to be significantly higher than 226.5 million dollars (Rautakallio, 2014).[13,14] The companies producing the reparations received production costs and a "reasonable" profit. This means that the

[11]The reduction was possibly made to help the Finnish communist party in the elections of 1948. However, the reparations of Romania and Hungary were also reduced at the same time (Kindleberger, 1987).

[12]Because single companies were often too small to handle the larger orders, they had to cooperate to be able to produce the required items. One famous and illustrative example of a war reparation product is the PT-4 steam locomotives, a joint project of three Finnish conglomerates.

[13]226.5 million dollars in 1938 translates into approximately 4 billion dollars in 2018.

[14]As the reparations were to be paid in products, the valuation became an important question. The Soviets demanded that the reparations were to be priced in US pre-war prices, which removed the inflation during the War and added almost a third to the reparations. Finally, the Soviets gave in and added inflation increases to the 1938 prices, 10% to consumption goods and 15% to capital goods. These agreed prices were still significantly below the current 1944 prices.

government also subsidized in full all the capital needed to produce the reparations products. The reparations orders were undoubtedly a good deal for the producing companies.[15] The producers were also generally more optimistic than the government about their capacity to produce these goods. However, given the gravity of the war reparations, even some the managers of the benefiting factories were worried about the size of the undertaking. Wilhelm Wahlforss, the manager of the single largest war reparation producing company Wärtsilä said in 1947:[16]

> *"The strain on the metal manufacturing is higher than it can accomplish. There has been too much optimism relating its capacity in certain circles since the beginning."*

The Finnish government set up a large government bureau called Sotakorvausteollisuuden valtuuskunta (Soteva) overseeing and organizing the war reparations effort. Soteva decided on the orders and helped with the coordination and communication between the producing companies and the Soviets. It also provided engineering and legal help to the companies trying to implement new technologies. Soteva was a sizable organization with over 500 employees and extremely involved in the production, providing continuous help to the companies. The Soviet Union also set up its own organization in Finland called Karelia to oversee the quality of the production. The quality requirements came from the Soviets and were extremely specific and strict. If one item of the cargo shipment at the border was not up to the code, the Soviets declined the entire shipment.

In 1952, Finland became the only country after the World War II to pay its reparations in full. This was because on the incentive side, there existed a credible threat that the Soviets would invade if the reparations were not paid in their entirety.[17] In addition to the incentives, the Finns survived as the demand for timber was high after the war and Finland benefited from the good terms of trade. Finland also received many favorable loans from Sweden, the United States and the Bank of International Settlements to help with the reparations.[18] Furthermore, Finland survived because the Soviet Union alleviated the reparation terms in 1945 and 1948.

[15] This type of production would incentivize rent-seeking, however the Finnish government investigations carried out after the reparations found no proof of excess profits (Auer, 1956).

[16] Cited in Joukio (2015).

[17] The reparations were part of the armistice between Finland and the Soviet Union, which would be invalid if the reparations were not completed. Moreover, during the Teheran conference, Stalin had stated the war reparations as one of his terms for peace. Stalin expressed that if Finland would not complete the payments in time, the Russian army would invade parts of Finland (Kindleberger, 1987)

[18] Many of these loans were given in goodwill and would probably not be achievable in normal times. However, Finland did not receive any Marshall Aid because of Soviet pressure.

When the reparation payments started in 1944, Finland was a lower middle-income country. Bolt et al. (2018) calculate that the Finnish real GDP per capita was 4366 $ in 1944. This is slightly smaller than the standard of living in Vietnam, Moldova or India in 2016, and a figure achieved by Sweden in 1922, Denmark in 1900, and by the United States already in 1879.[19] In 1940, Finland was still mainly an agrarian nation, with over 60% of the labor force working in the primary sector. This figure had dropped to 10% by 1970, as Finland quickly became a more modernized nation, while converging to the EU average income (Kokkinen et al., 2007).

3 Data

In this section, I briefly describe the main datasets used in this study. The data collection and creation are further described in the online appendix.

Manufacturing industry panel data. I collect a new dataset of Finnish industrial production and harmonize these data over years. In the end, I have a balanced panel of 163 industries in the Finnish version of the International Standard Industrial Classification of All Economic Activities (ISIC) at the four-digit level. The data on these industrial outcomes are drawn from Statistics Finland's publications for industrial statistics for the years 1934-1970. Unfortunately, after 1970 there is a change in the industry classification and the mapping of industries becomes significantly more difficult, so I end my industry-level examination here.

These collected data do not contain primary sector or services. The manufacturing census includes information on the main variables of interest, labor force and production in every industry group for every year. These data also include a rich set of pre-treatment 1943 and 1938 variables that I can use as controls. I deflate all values to be in 1935 Finnish marks.

Reparation products shipped. Data on the reparation products shipped to the Soviet Union come from Statistics Finland's Foreign trade publications 1944 - 1952. These data contain the value and amount of products shipped, classified by the Finnish product classification (Tavaralaji). I map the value of reparations products to the relevant industries in order to measure the intensity of treatment for each industry. I perform this mapping using concordances provided by Statistics Finland and the United Nations Statistics Division. I provide a further description of this mapping in the data appendix. I deflate all values to be in 1935 Finnish marks.

[19] Values in 2011 international dollars.

Municipality level variables. I follow Sarvimäki (2011) and measure the labor share in manufacturing and primary production for the years 1930 and 1940 using Statistics Finland's publication Finnish Population by Industry 1880-1975. This publication provides the share of workers in five large industry groups for each decade. These industry groups are primary, manufacturing, construction, transport, and services. I take the average income taxes paid in 1930 and 1938 from the Statistics Finland's Income and Property publication. I further collect baseline information on arable land, number of cows, and number of tractors from the Agricultural census of 1930 and 1940.

1950 census individual data. I use the 1950 census microdata collected and digitized by Statistics Finland. Out of the original individual cards, a 10% sample was digitized by selecting every tenth folder. These data were linked by Statistics Finland to the social security numbers of the respondents, facilitating the linking to later information. The 1950 census contains the basic individual variables, such as, age, sex, municipality of residence, and industry in 1950. These data also include information on the municipality and industry of the respondent in 1939 to compensate for the missed census in 1940. The 1939 information allows me to identify if the person has left agriculture between 1939 and 1950, and calculate municipal industry shares in 1939. Unfortunately, these data do not contain information on wage or income.

1970-1985 census individual data. I use the 1970-1985 full census information from Statistics Finland. I can link people in these data to their 1950 information using their social security numbers. I use 1970 wage, industry, and educational attainment information to asses the long-term individual impact. These data also include information on family linkages which allows me to link parent-child outcomes. The same individual-level data are used in Sarvimäki et al. (2018).

Export data. I collect information on all products shipped from Statistics Finland's Foreign trade publications for the pre-treatment period 1930- 1939. These data contain the value and amount of products shipped. I can map these exports to 3-digit industries. Later Finnish export information for the years 1962-1980 is taken from the UN Comtrade database in SITC rev.1.

4 Industry-Level Analysis

In this section, I compare the reparations producing industries with other manufacturing industries with similar baseline characteristics. I show that the short-term government action permanently increased the production and labor force in the affected industries. I show that this policy also lead to an increased capacity in the relatively high-skilled industries.

4.1 Industry-level Empirical Strategy

The empirical analysis at the industry level is based on estimating difference-in-differences in outcomes by the reparations paid. The main estimating equation takes the form:

$$Y_{it} = \beta_t Reparations_i + \gamma_i + \delta_t + \theta_t \mathbf{X}_i + \varepsilon_{it} \quad (1)$$

Here Y_{it} is the outcome variable, value of production, labor force, or value added in industry i at time t, in logarithmic scale. The dependent variable $Reparations_i$ is either a dummy for whether or not the industries were treated, or the logarithm of the sum of the reparations paid.[20]

In this fully flexible estimation, the coefficients (β_ts) tell the yearly estimated differences in industries by their reparations treatment, relative to the omitted base year 1943. γ_i presents the industry fixed effects to control for any time invariant industry-specific factors. Year effects δ_t control for common time effects. Finally, ε_{it} presents the error term. I further add control variables interacted with year effects $\theta_t X_i$, which allows the effects of each control to vary flexibly over time. These industry-level controls include a set of pre-treatment variables visible in Table A.1: share of skilled labor, power-to-labor ratio, as well as logarithms of average wage, amount of labor and lagged outcome variable, log value of production, in the base year 1943 and the pre-war year 1938.[21] In this way, I allow the differentially treated industries to experience systematically different changes along these observable dimensions after 1944.

The main identifying assumption of this difference-in-differences strategy is that, absent the reparations payments and the resulting government intervention, the treated and non-treated industries would have developed similarly. Some further notes on the estimation. The standard errors are clustered at the industry level to account for possible heteroskedasticity and autocorrelation.[22] To simplify the presentation of the flexible estimates, I pool years together and estimate the coefficients (βs) as an average

[20] In the logarithmic treatment I keep zero values unchanged.

[21] Especially, controlling for the size of the industry is important, as the same size of a reparations burden is different for different size industries.

[22] As I only have 24 treated industries, clustering at the industry level could be problematic due to the small number of effective clusters. To account for this concern, I also report 95% confidence intervals estimated using Wild bootstrap in the online appendix. These are similar to the baseline confidence intervals, and always exclude zeros in the periods after the treatment. The standard errors are also always smaller if I do not cluster at the industry level.

effect for these longer time periods. I allow the controls to still vary for each year. All these estimated flexible differences are reported relative to the omitted base year 1943.

4.2 Long-Term Industry Results

I start the empirical analysis by comparing the differences in reparation paying and nonpaying industries in the pre-treatment year 1943. This is a balance check to further show that these reparations were not allocated only to the largest industries. I present summary statistics and pre-treatment 1943 levels as well as 1934-1943 changes by treatment status in Table A.1. The treated industries seemed to be larger in 1943 than the non-treated industries, with statistically significant differences in total labor force and power used per labor. The identification strategy in this section does not depend on differences in levels but on the lack of trends in the variables as presented in column (5). I also flexibly control for these pre-treatment baseline variables in my future specifications.[23]

The basic difference-in-differences results from equation (1) for the sample period 1934-1970 are presented in Table 2, where the war reparations payments had a statistically significant long-term impact on the size of the exposed industries. The impact sizes are increasing over time. The difference in production between the reparations paying and non-paying industries relative to 1943 is 85% (0.619 log points) in the 1960s. The same difference in the labor force is 67% (0.514 log points).

In the second panel of Table 2, I examine the intensity of this treatment. Some of the industries were hit by larger shocks than others. I find that a one standard deviation increase in the logarithm of reparations paid (≈6.3) led to approximately a 25% (0.22 log point) increase in production and a 20% (0.18 log point) increase in the labor force in the 1960s.

Prior to the reparations payments, the treated and non-treated industries are estimated to have similar changes in the outcomes, that is there are no visible pre-trends. This gives validity to the parallel paths assumption of my difference-in-differences estimation. The estimates have similar sizes when controlling for pre-treatment characteristics. These main results are also presented graphically in the event-study Figure 2. Here the start (1944) and the end (1952) dates of the reparations payments are highlighted.[24]

[23]If I leave out the established timber and paper industries from the examination, I find that only the relative wage was higher in the treated industries before the war reparations started.

[24]From these flexible results we learn something about the dynamics of the response. After the initial jump and the war reparations payments, visible in Figure 2 , the effect persists but there is a clear flattening

These long-term results may not be surprising. In addition to the large demand shock, the government paid all the capital investments that the exposed industries needed to be able to meet the Soviet demand. As access to capital was limited in Finland during the period, and even the government had trouble acquiring funds, these capital investments by the government were likely to be extremely helpful in expanding production. The investments were also industry-specific, in contrast to investments in, for example, education or infrastructure, and gave the exposed sectors large competitive advantages relative to the other manufacturing sectors in Finland. There is also likely to be inertia in the labor force due to industry-specific human capital investments and habit formation, explaining part of the observed persistence. Furthermore, the war reparations possibly offered opportunities for exploration and learning-by-doing that would not have been available without the reparations (Hausmann and Rodrik, 2003; Harrison and Rodríguez-Clare, 2009). And finally, the experience gained exporting was certainly valuable for the exposed companies.[25] Similar lasting positive impacts of temporary promotion are found in previous work for example by Lane (2017), Giorcelli (2016) and Juhász (2014).

4.3 Industry Human Capital Intensity

These reduced-form results could follow from only increasing the capacity in the established timber and paper industries. The concern is then that the intervention did not increase the labor force in the more skill-intensive manufacturing but only increased the size of the already strong timber and paper production. To show that the new type of high-skill intensive manufacturing also increased, I estimate equation (2) where I divide the treated industries into larger 2-digit groups.[26]

$$Y_{it} = \sum_{s} \beta_s \left(Sector_s \times Reparations_i \times post \right) + \gamma_i + \delta_t + \theta_t \mathbf{X}_i + \varepsilon_{it} \tag{2}$$

In equation (2), the coefficients (β_ss) show the treatment effects in the larger 2-digit $Sector_s$. The $Reparations_i$ variable is again a dummy for whether or not the industries were treated. The treated industries that produced war reparations are divided into 11

off in between 1953-1960. The capacity remains higher than before the reparations but there is no growth during this period relative to other manufacturing industries. However, after 1960, a clear increase is visible in the reparations paying industries. This could be due to the fact that the production followed some larger global trends or that it took some time for the Finnish production to adjust to compete in the global market.

[25] See for example Atkin et al. (2017) for evidence of exposure to exporting.

[26] I group the industries into 2-digit groups because I can measure the human capital intensity at this level of aggregation.

larger 2-digit groups. I interact the treatment with a *post* indicator variable for years after 1943, and report these basic difference-in-differences results for all sectors.

I present these industry-specific estimates in Figure A.1. Here it is visible that the industry groups 35-39, were the only ones with a robust statistically significant growth relative to the non-treated industries.[27] Even though the estimates in industry groups 35-39 are often not statistically distinguishable from the estimates of the other treated groups, it is clear that the impact is not entirely driven by the previously established timber and paper production in industry groups 25-27.

The industries in sectors 35-39, can be classified as high-skill intensive, which means that the war reparations did not only expand manufacturing but also promoted more complex production in Finland. To show that these industries were actually more high skilled, I use a measure of human capital intensity taken from Ciccone and Papaioannou (2009). They use 1980 U.S. microdata and calculate the average years of schooling in each industry. I map these U.S. numbers into the Finnish classification and plot the average values of schooling by sectors in Figure 3.[28] There is a clear pattern that sectors 35-39 are on average more high-skilled than groups 25-34. Ciccone and Papaioannou (2009) argue that these industries are skilled-labor augmenting, which means that there are increased opportunities for more skilled workers in these sectors.

I corroborate the U.S. numbers by performing a similar exercise using Finnish 1980 census microdata and calculate the average years of schooling for each larger sector. These descriptive numbers presented in Figure 3 are measured after the war reparations payments in Finland so they could be outcomes of the policy. However, the Finnish sector-specific human capital intensity measures are similar to the Ciccone and Papaioannou (2009) values from the U.S. as sectors 35-39 seem to have on average, higher levels of schooling. The increased opportunities in these sectors could then increase the perceived returns to schooling.

5 Individual-Level Analysis

In this section, I study the individual-level impacts of this policy. I take advantage of the rich registry data available in Finland and follow individuals from 1939 to 1970. I start by defining a shift-share measure of how much a region was affected by the war reparations

[27]The results using the logarithm of the reparations paid are almost identical and reported in the online appendix.

[28]Unfortunately, the industry classifications in Ciccone and Papaioannou (2009) are not perfectly comparable between the United States and Finland. But the assigned U.S. 3-digit groups are close to the assigned Finnish 2-digit codes.

shock and the resulting government intervention. I then divide the sample into two parts, those younger and older than 25 in 1950. I show how these different cohorts respond differently to the increased possibilities created by industrialization. The first, older generation was more likely to leave agriculture for manufacturing, meaning that the government intervention promoted structural transformation. The younger cohorts again became more educated and worked in higher skilled occupations 20 years after the experiment ended. These results are consistent with increased returns to schooling arising from the new industrial opportunities. Finally, I link parents to children to study how the policy affected intergenerational mobility. I show that mobility in both incomes and education increased in the more exposed locations.

5.1 Location Treatment Intensity and Baseline Differences

In order to study the causal impact of the war reparations on individuals, I construct a municipal-level measure of the intensity of the treatment in each location. I follow the large existing literature (Acemoglu et al., 2016; Autor et al., 2013; Bartik, 1991) and calculate a Bartik-instrument as the sum of interactions of the industry labor shares in the municipality and the industry reparations shock:

$$Bartik_m = \sum_i \frac{L_{im}}{L_m} \frac{Reparations_i}{L_i} \tag{3}$$

I use the 1939 industry and municipality information available in the 1950 census to measure how large a part of the labor force in a certain municipality worked in the exposed sectors before the reparation payments started. In (3), $\frac{L_{im}}{L_m}$ is the share of workers in a 2-digit industry in a municipality in 1939. $Reparations_i$ is the total amount of reparations assigned to this industry. I follow Autor et al. (2013) and scale the industry shock with the initial labor force working in the industry L_i.

As the reparation production was in large part a massive extension of the existing manufacturing base, not completely new factories, this measure is a good indicator of which municipalities were more exposed to the reparation payments. The large issue with using this measure is that it is highly correlated with overall manufacturing. In Figure 4, I map the measured shocks and the overall share of manufacturing in 1940 for each Finnish municipality side by side. The strong correlation would mean that I only compare individuals in more industrialized places with those in less industrialized places in the following estimations. To keep the sample balanced at the baseline, I control for the initial 1940 employment share in manufacturing and agriculture in all future regressions following Autor et al. (2013).[29]

To assess the endogeneity of the $Bartik_m$ variable, and the validity of my identification strategy, I follow Hornbeck and Naidu (2014) and estimate the following equations (4) and (5) at the municipal level:

$$Y_{m(1940)} = \beta Bartik_m + \gamma_r + \eta \mathbf{X}_m + \varepsilon_m \tag{4}$$

$$Y_{m(1940)} - Y_{m(1930)} = \beta Bartik_m + \gamma_r + \eta \mathbf{X}_m + \varepsilon_m \tag{5}$$

This is to show that, conditional on the baseline controls, the exposed municipalities were not demonstrably different before the reparation payments started. The outcome is either the pre-treatment 1940 levels or the 1930-1940 changes in the observed municipal characteristic. $Bartik_m$ is the measure of reparations treatment intensity. These balance test results are presented in Table 3. Prior to the reparations, the exposed and non-exposed municipalities are estimated to have had similar levels and changes in most outcomes.

Unfortunately, many complicated municipal mergers after the 1950s make comparing long-term differences at the municipal level extremely difficult and noisy.[30] This is partly why I use this 1939 municipal-level treatment at the individual level. More importantly, however, the focus of this study is to follow individuals over time and over generations. The place-based information is not enough to study these individual impacts as people are likely to move.

5.2 Individual-Level Empirical Strategy

I use Finnish individual-level registry data to study the long-term impact of this government intervention. The main source of data in this section is the 1950 census of which 10% exist in digitized format. The 1950 census includes information on the industry and municipality of the individual in 1939. I identify the impact of this policy on individuals assigning the treatment variable to their municipality of residence in 1939. This way the people have not sorted to the more exposed places. The youngest people in my sample are then 11 years old in 1950. I limit my examination in the

[29] I also use a more data-driven approach to validate this selection of controls. I also use LASSO to identify the best predictors for the $Bartik_m$ variable.

[30] The number of municipalities drops from 548 in 1950 to 311 in 2017. These municipal mergers are often complex as municipalities are split among many units. Tracking these separations over time would require finer detail data waht is currently available. In future work I will focus more on these location-based impacts of the policy.

baseline part to workers under the age of 45 in 1950, as these workers are more likely still in the labor force in 1970, when I measure the long-term impacts.

I begin the individual-level examination by studying the impact of the reparations shock to the industry in which the individual worked in 1950. I estimate the following equation:

$$Y_{im} = \beta Bartik_m + \gamma_r + \eta \mathbf{X}_m + \theta \mathbf{X}_i + e_{im} \tag{6}$$

Here the outcome Y_{im} is a dummy variable, measuring if the person i worked outside of primary production in 1950, worked in manufacturing in 1950, or worked in services in 1950. $Bartik_m$ is the variable derived in the previous part, measuring how exposed the municipality in which the person lived in 1939 was to the war reparations production. β is the coefficient of interest. I add municipal control variables $\mathbf{X}_m$ to account for the initial differences in the total production structure.[31] I also add 11 Finnish region fixed effects to take into account any region specific variation. These municipal-level variables are assigned to worker's 1939 municipality. I also control for individual fixed effects for sex and age $\mathbf{X}_i$. I estimate equation (6) separately for two samples. I study separately the whole population and only the workers who were working in primary production in 1939. In the second group, I identify the actual departure from agriculture and not just the municipal averages in employment structure.

Using the $Bartik_m$ measure instead of the actual war reparations production helps with the identification. The worry would be that the government assigned reparations production to the locations it wished to develop more. There is no record of this kind of preferential assignment, but the fact that $Bartik_m$ is measured using pre-treatment labor shares means that the places had a observed comparative advantage in the industries more exposed to the reparations payments.[32]

I then link the individual to the next available Finnish census from 1970 to study the persistence of the impacts. As Finland has registry data and the observations are assigned personal numbers, if the person is alive, I match over censuses with near certainty. I estimate the same equation (6) with the same sample, but now the Y_{im} variable is the 1970 industry of the individual. As the 1970 census information includes information about earnings, I also estimate the long-term wage impacts of the reparations shock using the same equation (6).

[31] The most intuitive control variable is the 1940 manufacturing share following Autor et al. (2013). In the main estimations, I use controls chosen by LASSO from a rich set of pre-treatment variable levels. The chosen variables are 1940 manufacturing share, 194 agriculture share.

[32] In the online appendix I run the regression separating the shock by industries and industry shares following the recent work by Borusyak et al. (2018) and Goldsmith-Pinkham et al. (2018)

To study cohort differences in the response to the policy, I estimate the effect separately for those already in the labor force in 1950 (26-45) and those who are only entering the labor market (11-25). To study the cohort differences, I estimate the following equation (7):

$$Y_{im} = \beta_1 (Bartik_m \times Young) + \beta_2 (Bartik_m \times Old) + \gamma_r + \eta \mathbf{X}_m + \theta \mathbf{X}_i + e_{im} \quad (7)$$

Here, Y_{im} is the education or occupation of the individual in 1970. Young is a dummy variable indicating if the person is under 25 and old is an indicator for the person being aged 26-45 in 1950. When estimating the equation (7) on education outcomes, the coefficient β_2 can be taken as a falsification test, as the shock should not affect the educational outcomes of the older cohorts.

The identifying assumption in the individual-level examination is a conditional independence assumption $Cov(Bartik_m, \varepsilon_{im} \mid \mathbf{X}_m) = 0$. This means that given the controls, the individuals in the exposed places were not expected to have different outcomes than the less exposed individuals without the reparations shock. This identifying assumption is supported by the balance test in Table 3, where I show that conditional on the baseline covariates, there are no differences in other observables in 1940 and there are no differential pre-treatment trends at the municipality level 1930-1940. In the following individual-level estimations, I cluster the standard errors at the level of the 1939 municipality, where the treatment varies. [33]

5.3 Individual-Level Results: Older Cohorts

In this section I focus on how the older cohorts (over 25 in 1950) who are already part of the workforce respond to the government intervention expanding industrial production. I choose these cohorts because I can find their industry in 1939 and then identify sectoral reallocation. In Panel A of Table 4, I present the estimated impacts of the local reparations shock on a person's industry in 1950. Here the outcomes are dummies for working in agriculture, manufacturing or services.[34] The first column presents the estimates of working in agriculture for all workers. Here a one standard deviation increase in the reparations shock lowers the probability of working in agriculture by

[33] As there might be a correlation in the error terms across similar treated places affecting inference (Adão et al., 2018), as a check I divide the treatment into 50 groups and cluster standard errors at the group level. This exercise leads to similar levels of statistical significance suggesting little correlation in the error terms in this dimension.

[34] Agriculture also includes other primary production such as forestry. Services also include government services and transport services.

nearly 10 percentage points. In the second column, I restrict the sample to those who I know worked in agriculture in 1939, which means that I can identify the departure from agriculture. The estimated impact in this subsample is approximately 7 percentage points.

I estimate where the workers ended up and find that in the entire population, a standard deviation increase in the local war reparations shock lead to a 4 percentage point increase in the probability of working in manufacturing and a 5 percentage point increase in the probability of working in services. An increase in the service labor suggests that the increased demand in manufacturing lead to spillovers to the service sector as well. In the subsample of agricultural workers, a one standard deviation increase in the local reparations shock caused a 4 percentage point increase in probability of working in manufacturing in 1950. This is a large impact compared to the mean of only 7.3%. Similarly, in this subsample, also the service labor increased by 2.2 percentage points.

These estimates mean that the war reparations caused a considerable structural transformation in Finland. To illustrate the magnitudes of the estimates, I perform a simple back-of-the-envelope calculation of how much of the share of the Finnish labor force working in agriculture and manufacturing in 1950 can be explained by the war reparations. I first calculate the shares of people working in manufacturing and agriculture for each municipality (Y_m). Then, I calculate counterfactual shares as the actual share minus the estimated impact of the shock multiplied by the reparations shock or $Counterfactual_m = Y_m - \beta Bartik_m$. This is done using the estimates (β) for entire the population taken from Table 4. I then use the municipal population weighted averages of these values to find the industry shares for the entire counterfactual Finland. According to the calculations, the share of the population working in agriculture would have been 45% instead of 39% and the population working in manufacturing would have been 19% instead of 23% without the reparations payments. In other words, the share of labor in manufacturing would have been around 13% smaller in 1950 without the war reparations. In 1940 the share of labor in manufacturing was 14% according to the official statistics, so if we assume this as the baseline level,[35] the change in manufacturing between 1940 and 1950 would have been 5 percentage points instead of 9 percentage points without the intervention. This means that the war reparations can explain 4/9 or nearly half of the Finnish manufacturing labor share

[35]These 1940 numbers are not completely comparable with the 1950 individual-level figures because they come from different source data collected by the Finnish clergy. I also use a sample of prime-age workers, meaning that the number in the official statistics is actually smaller than the comparable number would have been. Then, the war reparations would explain higher share of the growth.

growth between 1940 and 1950.

As the year 1950 was during the war reparations production and following government promotion, these results might not be surprising. Next I focus on the long-term impacts of this policy on affected individuals. I link the workers over censuses to first study the impact of the policy on the industry of the workers in 1970. In Panel B of Table 4, I show that the workers exposed to a one standard deviation higher war reparations shock were still 6 percentage points more likely to work outside of agriculture in 1970. From the following columns, we see that more of this labor is now working in services than in manufacturing with estimated impacts of a 2.4 percentage point increase in the probability of working in manufacturing and a 4.7 percentage point increase in probability of working in services. Similar estimates are visible for the workers who I can identify as agricultural workers in 1939; however the share working in manufacturing is relatively larger in this subgroup.

As a large body of literature has argued that agriculture is less productive than manufacturing (e.g. Gollin et al. (2013)), I study the impacts of this structural change on long-term wages. In Table 5, I present the estimated reduced-form impacts of the reparations shock on income and wages for people living in the exposed municipality in 1939. As discussed in Sarvimäki et al. (2018), taxable income offers a better comparison between agricultural and non-agricultural incomes than wage earnings, so I use these more conservative estimates as my preferred outcome of interest.

I measure income as levels, logs (without zeros), and using inverse hyperbolic sine transformation. I again divide the sample in all workers and in those working in agriculture in 1939. According to my preferred specification, the impact of a one standard deviation increase in the Bartik variable is associated with an increase of 1970 incomes by 218 Finnish markka in the whole population. This is approximately a 14% increase relative to the mean of 1601. In the subsample of those who were agricultural workers in 1970, the estimated impact of a one standard deviation increase in the Bartik measure is 122 Finnish markka, or 10% relative to the mean.

These reduced-form impacts might seem relatively small given the large differences between agricultural and manufacturing earnings observed around the world (Gollin et al., 2013). However, one should keep in mind that the estimates in Table 5 are reduced-form estimates of increased industrialization and not of departure from agriculture. If one were to make the strong assumption that the intervention only affected the incomes by reallocating labor across sectors, these reduced-form estimates would need to be scaled by the hypothetical first stage estimates from Table 4, resulting to considerably larger estimates.[36]

Next I will study the distributional impacts of the policy to see how inclusive were these benefits of industrialization. From Hicks et al. (2017), we know that those who depart from agriculture and go to manufacturing are on average more skilled than the rest of the population. Similarly, Nakamura et al. (2016) show that high-skill individuals reap larger benefits from leaving a place with many primary production opportunities. This previous work would suggest that the gains from new opportunities would perhaps not be equally distributed to the entire population and the new industrialization could lead to a higher income inequality by benefiting only few. Overall, the link between industrialization and income inequality is not an obvious one and goes back to the seminal work by Kuznets (1955).

To study these distributional impacts, I estimate a simple quantile regression on income.[37] The results of the estimation presented in Table A.2 suggest that the benefits were rather equally distributed along the income distribution with the impacts for the highest 0.9 quantile being some 3 times higher than the impacts for the 0.3 quantile. However, the differences in the 0.9 quantile were nearly 10 times higher than the 0.3 quantile for those with an agricultural background in 1939. This means that the OLS estimates in Table A.2 for previously agricultural workers hide distributional impacts.

The overall relatively stable impacts across the distribution would suggest that the war reparations, and the following industrialization, still provided the type of inclusive growth and likely did not substantially increase the income inequality. I will return to these themes in section 5.5 when I study how the policy affected intergenerational mobility.

5.4 Individual-Level Results: Younger Cohorts

I then turn to study the outcomes of the younger cohorts, aged 11-25 in 1950. As the increasing manufacturing opportunities plausibly offer these younger generations more options than the older, I will estimate how the increase in industrialization affected the occupational and educational choices of these cohorts.

I start the exploration by studying the occupations of the exposed cohorts in 1970. I divide the occupations into four larger groups by socioeconomic rankings provided by Statistic Finland.[38] The groups are agricultural occupations, blue-collar production

[36] The reduced-form income estimates are also in line with the previous estimates for gains from leaving agriculture in Finland provided in Sarvimäki et al. (2018).

[37] Due to the large amount of zeros, it is impossible to estimate the impact on the lower quantiles.

[38] I study occupations instead of industries as the skill upgrading is easier to see using occupation data.

occupations, white-collar office occupations, and executive occupations. I present the estimated impacts of the war reparations shock on occupational choice separately for the older and younger cohorts in Table 6. For the older cohorts, the policy expedited structural transformation as workers left agriculture for production and middle-class office work. Those exposed at a younger age were affected however differently. The increased industrialization made these cohorts less likely to become production workers and agricultural workers and instead they became middle-class office workers and executives. The impact sizes are such that a one standard deviation increase in the Bartik shock is associated with a 3 percentage point decrease in the probability of being a production worker, which corresponds to approximately 9% of the mean. Likewise these younger cohorts were 1.9 percentage points more likely to be in executive occupations which corresponds to a 26% increase relative to the mean. I present these estimates and 95% confidence intervals for production and executive occupations by 5-year cohorts graphically in Figure 6. Here the striking pattern is even more evident, the cohorts older than 30 in 1950 (older than 24 in 1944 when the reparations started) were 5 percentage points more likely to become production workers if exposed to the industrialization shock, where the younger cohorts were approximately 3 percentage points less likely to be production workers. The older cohorts again were not more likely to become executives if exposed to the war reparations, where the younger cohorts were.

These results suggest that the exposed places were not subject to any kind of middle-income manufacturing trap or lock-in effects, where the increase in industrial opportunities would crowd out future occupational upgrading that requires education. The likely mechanism for these results is that the increase in new high-skill opportunities, measured by average years of schooling in section 4.3, incentivized further human capital accumulation through new opportunities or higher returns to education.

To study this mechanism, I link the census data on individual degrees and study how the exposure to the war reparations as a child and young adult affected future human capital accumulation. I again estimate the impacts of the war reparations separately for the younger and older cohorts and present the resulting estimates in Table 7. As the reparations shock should not affect the educational attainment of the older cohorts, the non-significant estimates for this group can be taken as a further falsification test. The younger exposed cohorts, on the other hand, increased their years of education by .26 years for each standard deviation increase in the Bartik-variable. The impacts on higher education were larger. The effect on completing a post-secondary degree was 2.6

percentage points, or 13% relative to the mean. Likewise, the impact of a one standard deviation increase in the Bartik-variable on completing a university degree or a graduate degree was 1.6 percentage points (38% to the mean) and 0.9 percentage points (nearly 50% to the mean).

I present the main estimates for years of education and completing a university degree graphically in Figure 6. Here the reparations shock is interacted with 5-year cohorts. The shock had no statistically significant effect for cohorts older than 25 in 1950 (older than 24 in 1944 when the reparations started), but had larger and statistically significant impacts on the older cohorts.

5.5 Intergenerational Impacts and Upward Mobility

In this section, I show that the new industrial opportunities benefited especially those coming from less-fortunate backgrounds. In his seminal work, Kuznets (1955) argues that industrialization will lead to lower income inequality because it expands professional and income opportunities, what he calls service income, more to the lower-income population than to the higher-income elites. Kuznets' original paper is worth quoting at length:

> "The service incomes of the descendants of an initially high level unit are not likely to show as strong an upward trend as the incomes for the large body of population at lower-income levels. ... [S]ubstantial part of the rising trend in per capita income is due to interindustry shift, i.e., a shift of workers from lower-income to higher-income industries. The possibilities of rise due to such interindustry shifts in the service incomes of the initially high-income groups are much more limited than for the population as a whole: they are already in high-income occupations and industries and the range for them toward higher paid occupations is more narrowly circumscribed."

To estimate such impacts on intergenerational mobility, I link the parent war reparations shocks to the outcomes of their children. Specifically, I link within household children (aged 0-20 in 1950) to the head of the household.[39] Using these data, I estimate the following equation:

$$Y_{im} = \beta_g BartikParent_m + \gamma_r + \eta \mathbf{X}_m + \theta \mathbf{X}_i + e_{im} \tag{8}$$

[39] This is 80% male. I can only assign the treatment to one parent as they might come from different municipalities. I can link to the municipality of the child in 1939 following the previous section, and get both parents, but this will restrict me sample to those over the age of 11 in 1950.

Where $BartikParent_m$ tells the reparations shock assigned to the municipality of the parent in 1939. Here, Y_{im} tells the years of education, income, or executive occupation of the individual. I study intergenerational mobility by interacting the treatment variable with the educational attainment and occupation of the parent.[40] I have to use these proxy measures for parent wealth because the earliest individual-level income data is from the 1970s. The coefficients β_gs tell how much the initial shock to industrialization affects the future generations in each parent occupation or education group g. I control for the parent age, sex, occupation and education. I also add municipal control variables $\mathbf{X}_m$ to account for the initial differences in the municipalities.

Figure 7, panel A presents the estimated impacts by four parent educational groups.[41] Individuals whose parents had no, or only had 6-year primary education benefited greatly from the new industrialization.[42] A one standard deviation increase in the parent reparations shock lead to .3 years higher schooling, 150 markka higher average income, and 1.7 percentage point increase in holding an executive occupation for those whose parent had no schooling. I do not find any statistically significant effects for those whose parents had more than 9 years of education. The estimates on years of schooling show that the war reparations led to an upward mobility in education as studied for example in Card et al. (2018).

Figure 7, panel B plots the estimated impacts by parent occupational groups. The same pattern emerges as in Panel A. Individuals whose parents worked as farmers or were unemployment experienced gains from industrialization. A one standard deviation increase in the $BartikParent_m$ variable lead to .4 years higher schooling, 200 markka higher average income, and nearly five percentage point increase in holding an executive occupation for those whose parents were unemployed in 1939. I find similar size estimates for those whose parents were farmers. I also find positive and statistically significant, but smaller impacts for those whose parents worked in blue-collar or white-collar occupations. The effects for the children of managers are noisy, because of the small sample size in this group (approximately 200 parents).

I take this analysis further. I follow the previous literature by Chetty et al. (2014) and rank the children and their parents into 100 equal-sized groups in the national income distribution.[43] Let R_{im} show the percentile rank of the child i in the national income

[40] I restrict the parents to be older than 30 so that the parent education would be less endogenous. The occupational status is measured in 1939 before the war reparations.

[41] Here, I interact the $BartikParent_m$ measure by the parent educational attainment.

[42] Approximately 20% of the parents in my sample reported to not have completed 6-year primary education. Finland passed compulsory education law as late as in 1921.

[43] If there are several equal values, these are assigned the median rank of the values following Chetty et al. (2014). For example, if there are 10% of zeros these are all assigned to the 5% rank.

distribution in 1985. I measure the percentile income rank of parent P_{im} in the first year I have income data available, 1971. As P_{im} is measured after the war reparations, and affected by the treatment, these results should be interpreted with caution. Because older cohorts tend to have higher incomes, I measure the income ranks within the cohort. The main reason to use the percentile ranks, instead of log incomes, is that the ranks allow the inclusion of zero incomes.

Figure 8, presents the estimates for income and income rank in 1985 by parent income decile interacted with the $BartikParent_m$ measure. Those whose parents were in the lower income groups benefited more from the war reparation payments. A one standard deviation increase in the $BartikParent_m$ variable led to a nearly four percentile ranks higher income for those with parents in the lowest income decile.

6 Validity and Robustness

6.1 Separating Impacts by Industry Skill Intensity

I separate the war reparations shock by industry skill intensity, measured by average years of schooling, to see if the rise human capital accumulation is due to increase in manufacturing or increase in high skill manufacturing opportunities.[44] This exercise will help us to understand the possible mechanisms behind the lasting impacts. Table A.3 reports the estimated impacts on human capital accumulation with low and high skill Bartik-variables interacted with age groups. We see that the main result remains, as the young people in the more high-skill exposed places attain more human capital. I do not find any statistically or economically significant impact on the young people living in the exposed less skill-intensive regions.

The results on low skill, mostly timber and paper, production are in line with the previous work by (Atkin, 2016), showing that an increase in low skill production might not motivate future human capital accumulation.[45] Strong positive impacts for the younger cohorts in the high skill intensive areas support the increase in perceived returns to schooling narrative.

[44] I separate the treated industries roughly into a high skill (35-39) and low skill (25-34) and measure local level shock using these industry groups.

[45] Atkin (2016) finds adverse effects of industrialization on education as the opportunity cost for education increases.

6.2 Parent Income

One likely channel explaining these human capital results is increased parent income, facilitating children's higher education. I attempt test this mechanism by controlling for the parent's income in the sample where parents are matched to children. These estimates are, however, hard to interpret because both the child's education and parent's income are outcomes of the war reparation shock.[46] Keeping this caveat in mind, I find in that the Bartik measure is still a large and statistically significant predictor of later education after controlling for parent incomes. Conditioning on parent income in Table A.4 decreases the Bartik estimates by approximately 30%. If we take these estimates at face value, it would mean that other channels like an increase in perceived returns to education explain 70% of the impact.

6.3 Distance to New Universities

I show that the estimated increase in higher education is not due to new universities in the exposed regions. One possible mechanism to explain the higher educational attainment is that the industrial owners lobbied for new universities in these places. After the war reparations, six new universities were opened in Oulu (1959), Tampere (1960), Vaasa (1968), Lappeenranta (1969), Joensuu (1969), and Kuopio (1972). I estimate equation 7 controlling for distance to the closest new university. Similarly to the Bartik-variable, I interact the distance to university with young and old indicators, allowing impacts to vary by cohorts. I present the results from this estimation in Table A.5, where distance to new university times young has a statistically significant impact on educational attainment, but adding this covariate does not affect the coefficient of the Bartik-variable. This shows that the main mechanism is not the increase in availability of higher education in the places highly exposed to the war reparations. Furthermore, this exercise helps to understand the magnitude of the war reparations shock. According to Table A.5, a one standard deviation increase in the Bartik variable has the same impact on acquiring an undergraduate degree as opening a new University 200 kilometers closer.

[46] This is a bad control-regressions with many issues. Please see Angrist and Pischke (2008) for discussion.

6.4 Falsification Exercise with Norwegian Industrial Data

As a further validity check, I show that the war reparation industries did not grow faster than other industries in Norway. One concern with my empirical assessment is that the entire Europe was rebuilding after the war, and it could have been that the Soviet rebuilding needs were correlated with the needs of Western Europe. Given this possibly great and disproportional demand for metal sector products, it is possible that these industries would have grown faster than other industries even without any government intervention. I can not directly test this hypothesis , but I can test it indirectly by running a falsification exercise using Norwegian data.

I focus on Norway for two reasons. The first is availability and comparability of the data.[47] The second is that Norway is a realistic counterpart to Finland, as a small and poor Nordic country. The treatment also happens well before the Norwegian oil boom of the 1970s so the countries should be comparable over the period of study.

To complete this falsification exercise, I collect a separate new dataset covering the manufacturing production in Norway at the 4-digit level for the years 1934-1969.[48] I assign the same treatment to the Norwegian industries, and using these data estimate the same fully flexible model (1) as I did with the Finnish industrial data. I perform the analysis also for nearly the same time period of 1934-1969. I present the results for this falsification exercise in Table A.6, where the estimated coefficients do not have any consistent signs and the estimates are statistically insignificant. The results from this exercise suggest that the same industries did not develop significantly faster in Norway relative to other manufacturing and the war reparation producing industries were not destined to grow after WWII in Europe.

7 Discussion

This paper shows that the forced war reparations ended up being a relatively successful from of government industrial intervention leading to economic development. In this section, I discuss some possible reasons behind its success and what kind of policy

[47]Swedish industrial statistics are not comparable over time, which makes constructing a panel impossible. Danish industrial statistics have similar issues, but mostly they are not comparable with the Finnish industrial statistics. The datasets used in this study are, to the best of my knowledge, the only existing panels of harmonized industrial statistics covering the period 1935-1970 at the 4-digit level.

[48]The Finnish and Norwegian datasets are not completely comparable because of slightly different industrial codes between countries. However, the industries exposed in Finland match well with the data in Norway, but the control industries differ. The creation of the Norwegian dataset is further detailed in the online appendix.

lessons we can learn from this study.

First, it is important not to dismiss the political economy aspects of industrial promotion. The Finnish state was developmental and tried to support the companies in their war reparations effort to the best of its ability. This is often not the case, and attempts to promote certain sectors are prone to corruption and elite capture (Robinson, 2009). Even though Finland was, with today's standards, a lower middle-income country, the fundamentals for growth were in place. Finland was a democratic state with stable established institutions, such as property rights, often regarded as necessities for growth (Acemoglu et al., 2005). Finland also had a relatively large state with enough bureaucratic power to carry out this intervention. State capacity is often regarded as a big hurdle to implement government interventions (Besley and Persson, 2011).

These political economy considerations mean that this experiment would probably not be replicable in many of today's low-income countries with poor institutional quality. However, many middle-income countries, such as Brazil, India, or Botswana, have an institutional quality and state capacity comparable to Finland in 1944, and for example 40% of the Indian labor force still works in agriculture.[49]

Second, the incentive structure for both the government and the companies expanding their production discouraged corruption and rent-seeking. As the Russian threat of invasion was credible, companies were not prone to seek excess profits. As effective incentive structure would obviously be difficult to replicate.

Otherwise, the Finnish experience is in many ways straight out of the industrial policy playbook. The Finnish government promoted entire sectors, often asking companies to work together, leading to economies of scale. The production was not dictated by the bureaucrats, but the government and the companies worked together in what sociologist Peter Evans calls embedded autonomy (Evans, 2012). The Finnish state had a considerable amount of power or autonomy, but it did not need to be omniscious, as the companies provided feedback on what worked.[50] Furthermore, the incentive structure was in sticks and carrots, the importance of which is discussed for example in Rodrik (2009). The companies received large, often profitable, orders but they also had to abide to the strict Soviet quality requirements and shipping times. The promotion was overall large enough and credible enough to change the expectations of the companies and workers.[51]

[49]Finland had experienced a devastating civil war in 1918 and had introduced compulsory education as late as in 1921.

[50]See Scott (1998) for examples of failures due to such state planning.

[51]This relates to the theoretical work of multiple equilibria in development (Azariadis and Stachurski,

Comparable direct industrial promotion is currently banned by the the World Trade Organization. The ban of direct industrial interventions has led some countries like China to circumvent these rules and resort to less targeted, and perhaps less effective, policies such as exchange rate manipulation to promote their manufacturing industries.

There are also problems when expanding the lessons from this study even to the relatively similar middle-income countries of today because of changes in manufacturing. Even though historically the development process has almost always gone through industrialization, this type of economic growth might be increasingly harder to achieve. As shown in Rodrik (2016), countries become deindustrialized at lower income levels than they used to. Rodrik (2016) argues that this is because globalization and new labor-saving technologies in manufacturing have made this old path into development harder to achieve.

The findings of this paper suggest that the type of sectors the government promotes is important for long-term growth. Recent policy work, discouraged by the outlined challenges in manufacturing, has suggested that lower-income countries should promote sectors like tourism and flower cutting instead.[52] This is possibly beneficial in the short-term if the productivity in these sectors is higher than in agriculture, but the prospects of this type of production promoting long-term growth are more questionable.

7.1 Concluding Remarks

The war reparations Finland payed to the Soviet Union 1944-1952 aided the structural transformation of Finland. This temporary intervention permanently increased production and the labor force in the exposed, skill-intensive, industries. The war reparations also promoted structural transformation by incentivizing people to leave agriculture for more modern sectors, which increased their long-term incomes.

The experiment facilitated investments needed to increase the manufacturing base rapidly, and likely helped to solve coordination failures by focusing resources on specific sectors. The Finnish rapid development after World War II was likely a type of input-led growth, where labor reallocated from less productive sectors into more productive ones. As discussed in Krugman (1994), this type of growth is subject to diminishing returns and the growth cannot continue without innovation. However, the intergenerational results of this paper show that the shock did not only increase initial manufacturing labor opportunities but also led to further development by incentivizing human capital accumulation.

2005; Krugman, 1991; Matsuyama, 1991; Murphy et al., 1989).

[52]See, for example, Newfarmer et al. (2018)

The government subsidized reparation production aided new industries, structural change, and human capital accumulation in a country with GDP per capita at the same level as Vietnam or India today and over half of the population working in agriculture. This experience of the Finnish war reparations illustrates opportunities and challenges for government action to spur structural transformation in today's developing countries. A deeper understanding of the exact market failures and precise, often case specific, mechanisms behind successful government industrial promotion remain an important area for future research

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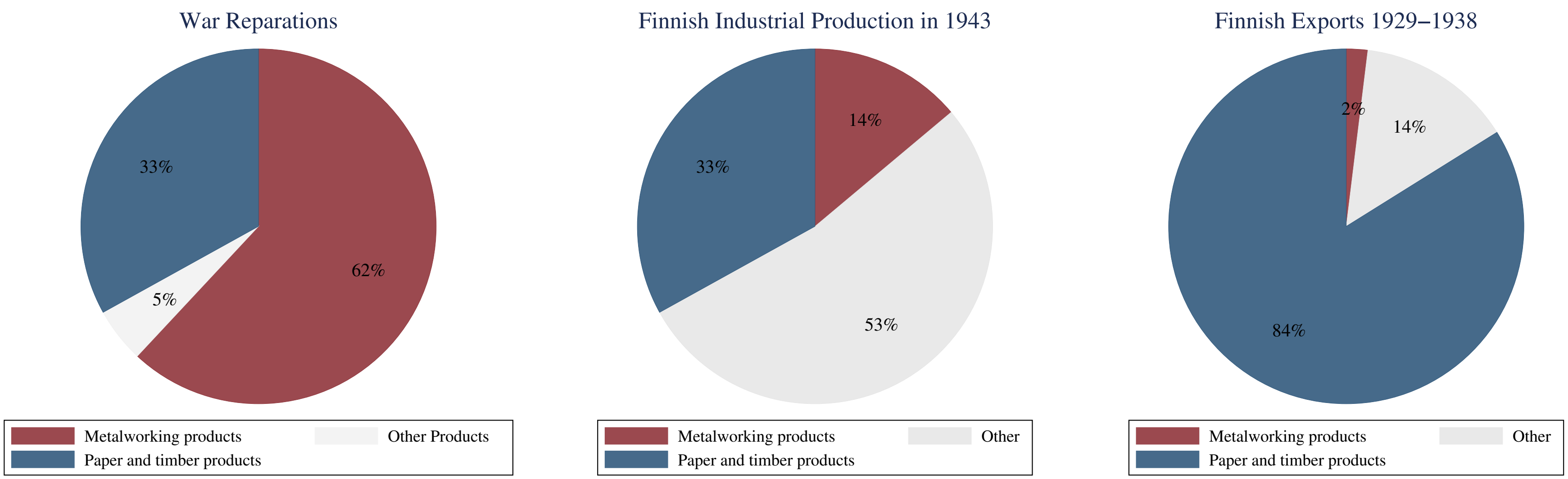
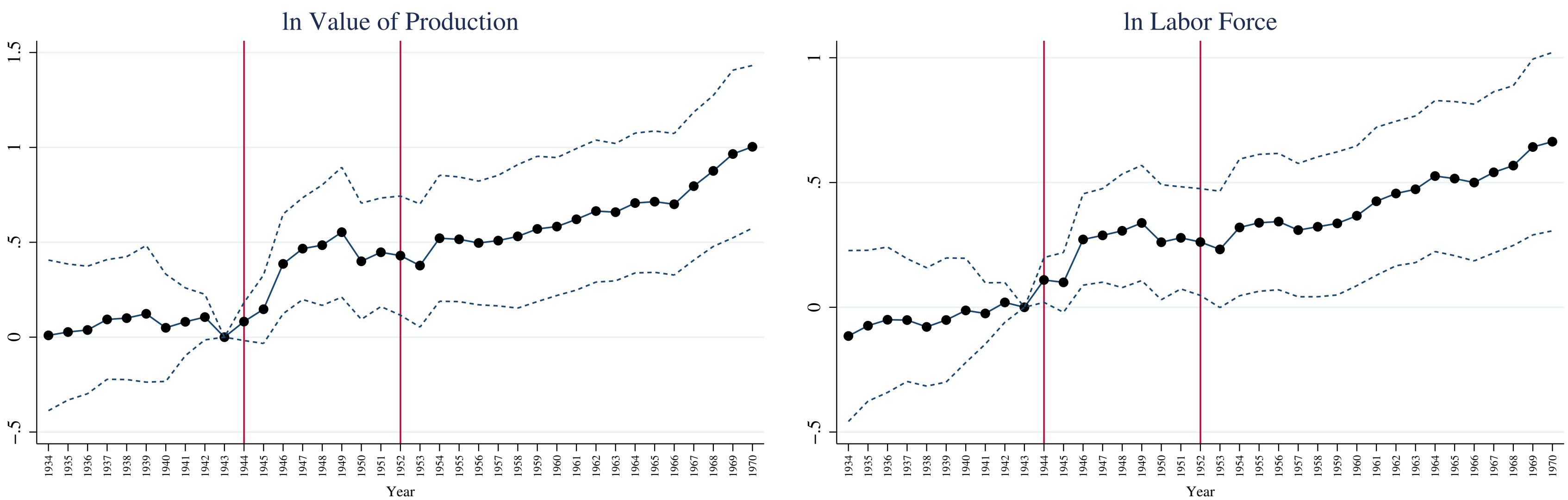
Figure 1. War Reparations Relative to Finnish Production Structure



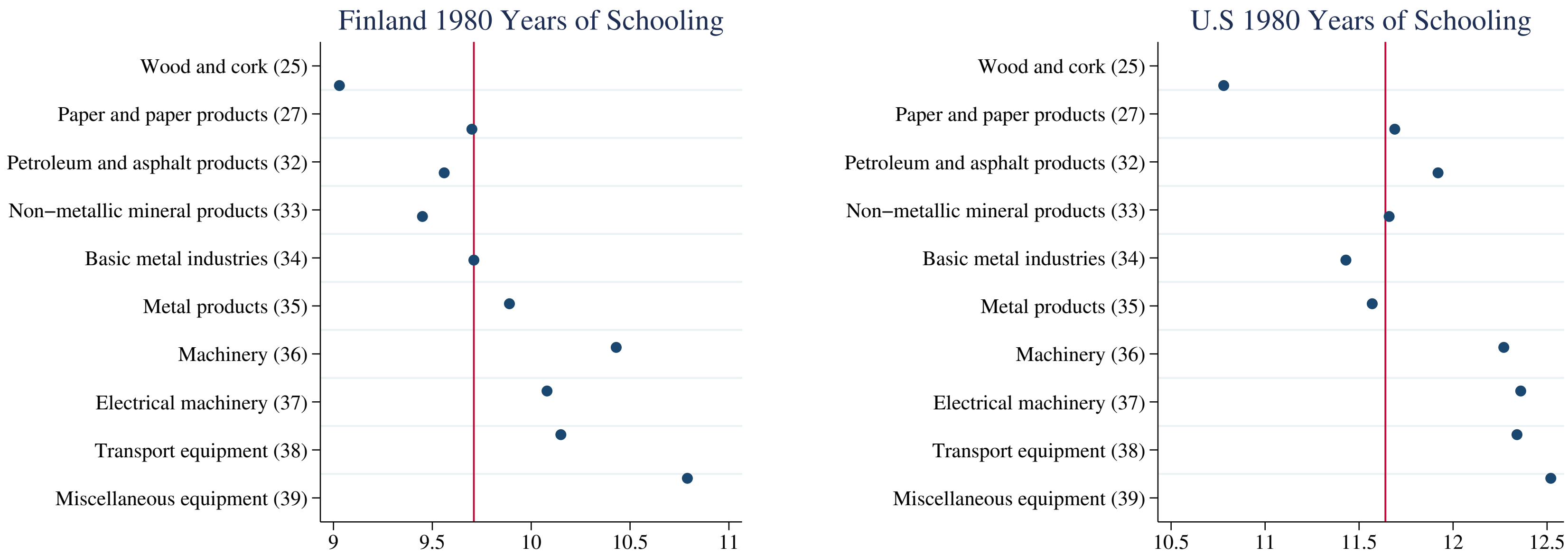
Notes: Figures present the percentages of values. The first pie chart documents the structure of the war reparation payments Finland was ordered to pay in 1944 in three large industry groups. The following charts relate these values to the Finnish production structure. The values of Finnish industrial production are within manufacturing that comprised 14% of the Finnish labor force. Data are taken from Auer (1956) and the Finnish Statistical Yearbook 1943.

Figure 2. Estimated Differences in Outcomes by War Reparations Treatment, Relative to 1943



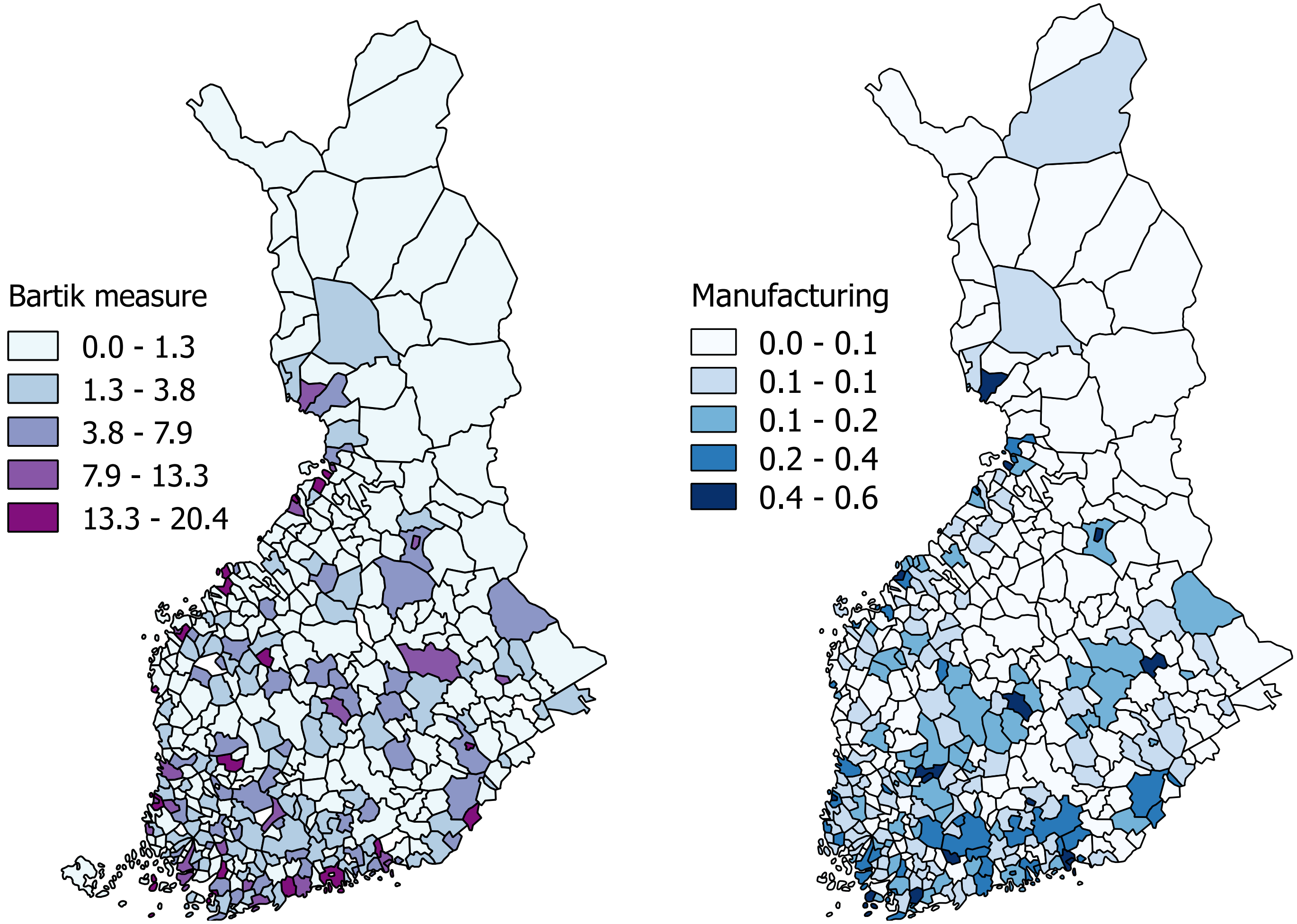
Notes: The graphs present estimated differences-in-differences coefficients (β_t) from equation (1). Outcome is regressed on war reparations treatment dummy interacted with year effects, the model also includes year fixed effects and industry effects, as well as 1943 baseline controls for industry log average wage, log value of inputs, share of white-collar workers, and power used per worker interacted with year fixed effects. Differences are estimated relative to 1943. The dashed lines present 95% confidence intervals, based on industry-level clustered standard errors. Unit of observation is 4-digit industry. The vertical lines present the start and end of the war reparations payments.

Figure 3. Average Years of Schooling by 2-digit Sectors



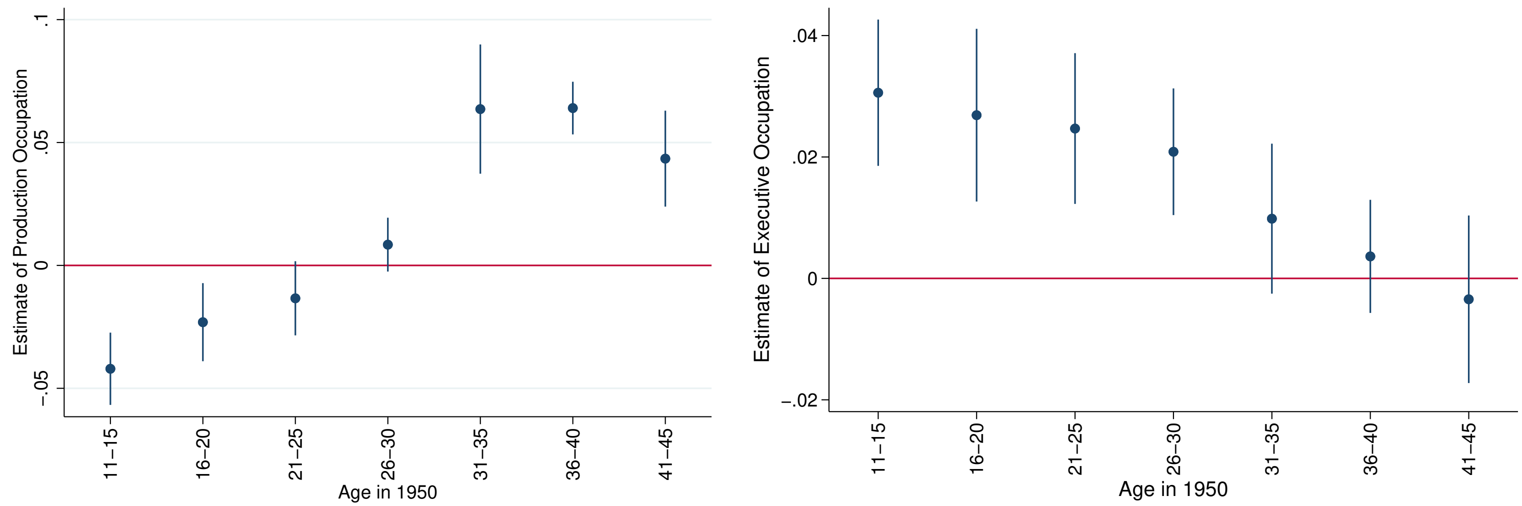
Notes: The graphs present the average years of schooling in 2-digit industry groups. Years of schooling are calculated from Finnish census microdata for the years 1950 and 1980. The 1980 U.S. industry specific years of schooling are from Ciccone and Papaioannou (2009) translated into the Finnish industry groups. The vertical lines present the mean values of schooling in the entire manufacturing sector in the given country-year.

Figure 4. Geographical Distribution of the War Reparations Shock and Manufacturing



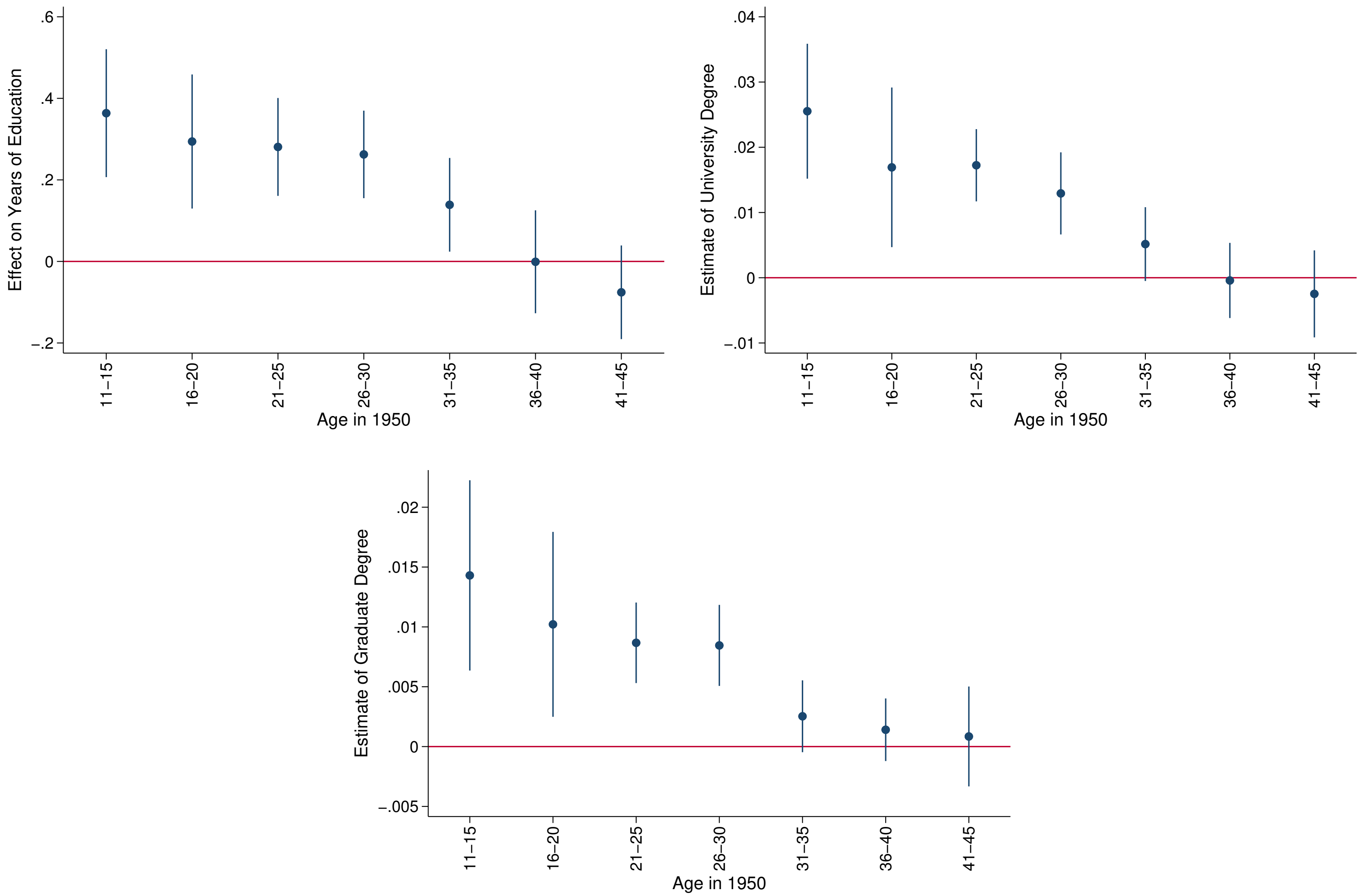
Notes: The left-hand map presents the war reparations shock of Finnish municipalities measured using the $Bartik_m$ variable, where labor shares are calculated using the pre-treatment 1939 shares. The right-hand map presents the baseline 1940 manufacturing labor shares controlled in the estimations.

Figure 5. Impact of the War Reparations Shock on Occupations in 1970, by Cohorts



Notes: The graphs present the estimated impacts of the local war reparations shock interacted with age in 1950 on occupation in 1970. All regressions include the baseline municipal-level controls of agricultural share and manufacturing share in 1940, age and sex fixed effects, 11 region fixed effects, and urban fixed effects. The lines present 95% confidence intervals, based on standard errors clustered at the municipality of 1939 level.

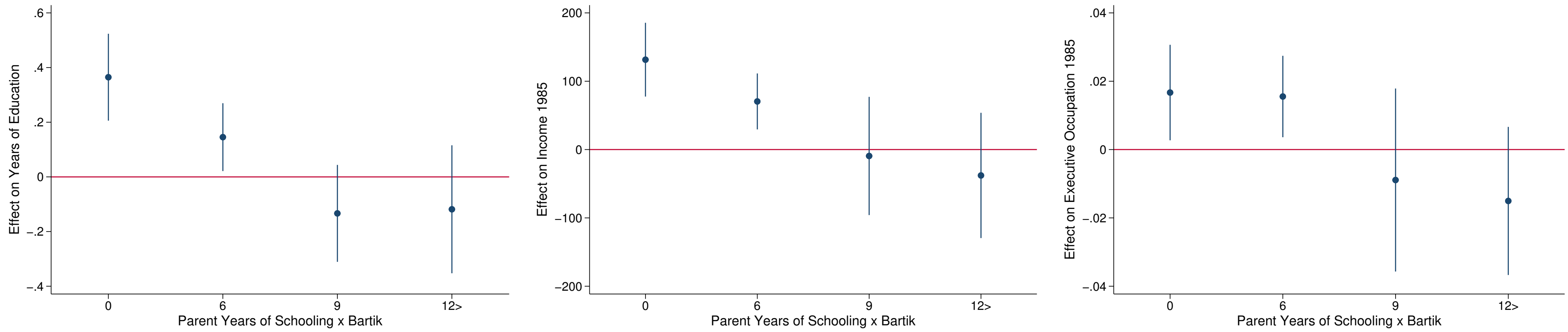
Figure 6. Estimated Impact of the Local War Reparations Shock on Education, by Cohorts



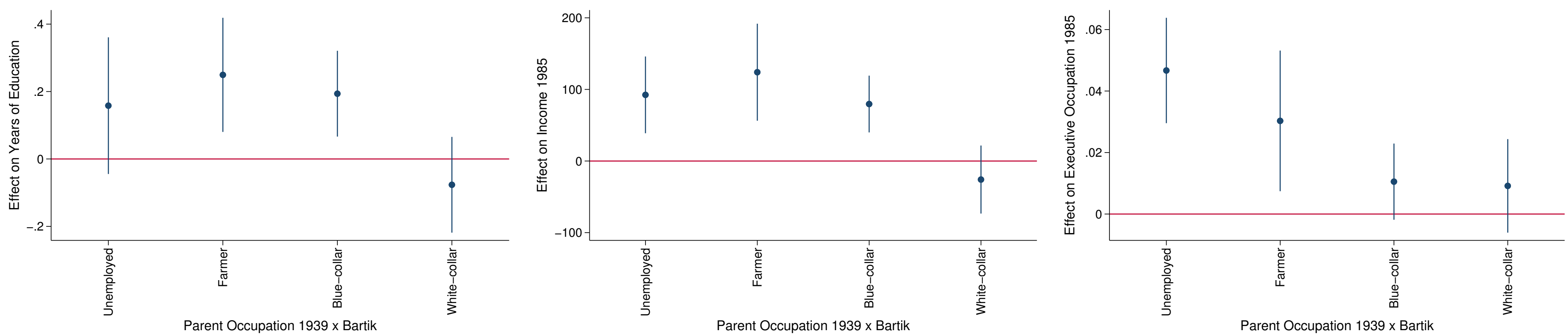
Notes: The graphs present the estimated impacts of the local war reparations shock interacted with age in 1950 on education in 1970. All regressions include the baseline municipal-level controls of agricultural share and manufacturing share in 1940, age and sex fixed effects, 11 region fixed effects, and urban fixed effects. The lines present 95% confidence intervals, based on standard errors clustered at the municipality of 1939 level.

Figure 7. Estimated Impact of the Local War Reparations Shock, by Parent Income Status

Panel A: Parent education

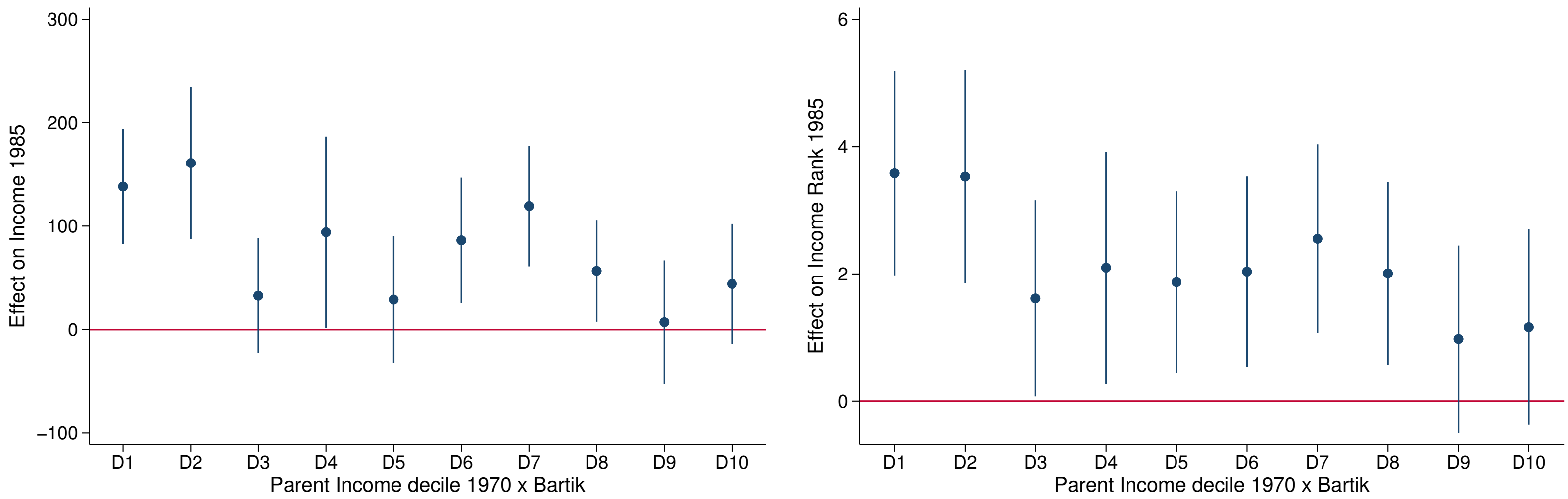


Panel B: Parent occupational status 1939



Notes: The graphs present the estimated impacts of the local war reparations shock interacted with parent education on child outcomes in 1985. All regressions include the baseline municipal-level controls of agricultural share and manufacturing share in 1940, age and sex fixed effects, parent education and occupation fixed effects, age and sex fixed effects, 11 region fixed effects, and urban fixed effects. The lines present 95% confidence intervals, based on standard errors clustered at the parent municipality of 1939 level.

Figure 8. Estimated Impact of the Local War Reparations Shock on Income, by Parent Income Decile in 1970



Notes: The graphs present the estimated impacts of the local war reparations shock interacted with parent income decile in 1970 on child income in 1985. All regressions include the baseline municipal-level controls of agricultural share and manufacturing share in 1940, age and sex fixed effects, parent income decile fixed effects, age and sex fixed effects, 11 region fixed effects, and urban fixed effects. The lines present 95% confidence intervals, based on standard errors clustered at the parent municipality of 1939 level.

Table 1. Highest Treated Industries

Code	Industry	Reparations in millions	Value of Production 1943 in millions
3812	Steel ship building and repairing	1961	313
3630	Manufacture of other machinery and their parts	1189	558
2713	Sulphite pulp mills	305	436
3811	Other ship building and repairing	285	2.5
3752	High power machine manufacturing	247	37
2511	Woodworking	183	663

Notes: The table presents the industries in the highest treated quartile. The reparations share shows the value of total reparations products produced by an industry over 8 years, scaled by 1943 production. Basically all ships produced over the war reparations period were exported to the Soviet Union. Code corresponds to the Finnish version of United Nations International Standard Industrial Classification of All Economic Activities (1949). All values are in 1935 Finnish marks.

Table 2. Estimated Differences in Outcomes by Reparations Treatment, Relative to 1943

Panel A: Extensive margin

	ln Value of Production			ln Labor Force		
	(1)	(2)	(3)	(4)	(5)	(6)
1934-1942 x Treatment	0.090	0.045	-0.005	0.022	-0.080	0.005
	(0.104)	(0.126)	(0.025)	(0.097)	(0.102)	(0.019)
1944-1952 x Treatment	0.333***	0.336***	0.309***	0.192**	0.200**	0.260***
	(0.104)	(0.110)	(0.116)	(0.074)	(0.078)	(0.090)
1953-1960 x Treatment	0.433***	0.443***	0.350**	0.280**	0.322***	0.329***
	(0.144)	(0.157)	(0.158)	(0.120)	(0.119)	(0.122)
1961-1970 x Treatment	0.652***	0.689***	0.552***	0.456***	0.540***	0.491***
	(0.165)	(0.177)	(0.184)	(0.151)	(0.141)	(0.156)
N	5994	5994	5994	5994	5994	5994
Controls 1943		✓	✓		✓	✓
Controls All			✓			✓

Panel B: Intensive margin

	ln Value of Production			ln Labor Force		
	(1)	(2)	(3)	(4)	(5)	(6)
1934-1942 x ln(Reparations)	0.003	0.002	-0.000	-0.001	-0.005	0.000
	(0.006)	(0.007)	(0.001)	(0.005)	(0.006)	(0.001)
1944-1952 x ln(Reparations)	0.019***	0.021***	0.019***	0.011**	0.013***	0.016***
	(0.006)	(0.007)	(0.007)	(0.004)	(0.005)	(0.005)
1953-1960 x ln(Reparations)	0.023***	0.027***	0.021**	0.014**	0.019***	0.019***
	(0.008)	(0.009)	(0.009)	(0.007)	(0.007)	(0.007)
1961-1970 x ln(Reparations)	0.034***	0.042***	0.032***	0.023***	0.032***	0.028***
	(0.009)	(0.010)	(0.011)	(0.009)	(0.008)	(0.009)
N	5994	5994	5994	5994	5994	5994
Controls 1943		✓	✓		✓	✓
Controls All			✓			✓

Notes: The unit of observation is a 4-digit industry. The time interacted treatment is a dummy indicating if a industry produced reparations or the logarithm of the value of the reparations shipped. Time invariant controls are pre-treatment 1943 and 1938 characteristics interacted with year effects. Controls include skilled worker share, log average wages and power-to-labor ratio, ln(labor) and ln(value of production). Period of study 1934-1970 and the reparations payments started in 1944. Robust standard errors in parentheses, clustered at the industry level. *** 1%, ** 5%, * 10% significance level.

Table 3. Baseline Municipality Characteristics, by Reparations Shock

		Differences by Reparations Shock			
		1940 levels		1930-1940 changes	
	Pre-treatment 1940 mean	Within-region	Controls	Within-region	Controls
ln(Population)	8.13 (.99)	0.241** (0.065)	0.004 (0.025)	0.166 (0.159)	0.002 (0.003)
Share of Population in Primary	.67 (.25)	-0.426** (0.055)		-0.112* (0.066)	-0.002 (0.002)
Share of Population in Manufacturing	.11 (.11)	0.524*** (0.09)		-0.040 (0.057)	-0.002 (0.002)
Share of Population in Services	.05 (.04)	0.105* (0.066)	0.001 (0.001)	0.001 (0.023)	0.000 (0.000)
Share of Population in Construction	.02 (.02)	0.30*** (0.06)	0.001 (0.000)	-0.011 (0.015)	0.000 (0.000)
Share of Population Swedish	.12 (.29)	0.033 (0.03)	0.006 (0.005)	-0.030 (0.022)	-0.001 (0.000)
Average income tax	19.32 (3.81)	0.09 (0.06)	0.027 (0.082)	-0.08** (0.04)	-0.038 (0.033)
ln(Arable Land)	8.35 (1.20)	0.031 (0.03)	-0.017 (0.026)	0.040 (0.03)	-0.006 (0.019)
Cows Relative to Population	.42 (.18)	-0.183** (0.064)	-0.003 (0.003)	-0.016 (0.092)	0.003 (0.001)
Tractors Relative to 1000s Population	2.59 (3.61)	-0.002 (0.003)	-0.000 (0.000)	-0.001 (0.002)	0.000 (0.000)
ln(Area)	6.17 (1.16)	-0.00 (0.058)	-0.021 (0.019)		
Latitude	6910.79 (191.04)	-0.03 (0.02)	-0.04 (0.04)		
Number of Municipalities	518				

Notes: The unit of observation is municipality. The table presents the coefficients and standard errors of regressing standardized observable variables with the standardized treatment variable, and region and urban fixed effects. In the second column, I also control for the 1940 manufacturing share and the 1940 agricultural share. The second column presents the baseline specification. Robust standard errors are in parentheses, *** 1%, ** 5%, * 10% significance level.

Table 4. Impact of the Reparations Shock on Individual Industry in 1950 and 1970

Panel A: Outcomes in 1950

	Agriculture 1950		Manufacturing 1950		Services 1950	
	(1)	(2)	(3)	(4)	(5)	(6)
Bartik	-0.098***	-0.074***	0.040***	0.043***	0.053***	0.022*
	(0.013)	(0.013)	(0.006)	(0.008)	(0.013)	(0.012)
N	93287	27038	93287	27038	93287	27038
Sample	All	Agriculture 1939	All	Agriculture 1939	All	Agriculture 1939
Y mean	0.383	0.800	0.229	0.073	0.353	0.113

Panel B: Outcomes in 1970

	Agriculture 1970		Manufacturing 1970		Services 1970	
	(1)	(2)	(3)	(4)	(5)	(6)
Bartik	-0.061***	-0.048***	0.024***	0.033***	0.047***	0.032**
	(0.010)	(0.014)	(0.007)	(0.008)	(0.010)	(0.013)
N	84867	24675	84867	24675	84867	24675
Sample	All	Agriculture 1939	All	Agriculture 1939	All	Agriculture 1939
Y mean	0.242	0.501	0.164	0.083	0.337	0.182

Notes: The unit of observation is an individual. the sample equals individuals aged 25-45 in 1950. The outcomes are dummies measuring the industry in which the person works in 1950 or 1970. Bartik is a municipality-level measure of the reparations shock assigned to the person's municipality in 1939. In the even columns, the sample is restricted to only those who were working in agriculture in 1939. All regressions include the baseline municipal-level controls of agricultural share and manufacturing share in 1940, age and sex fixed effects, 11 region fixed effects, and urban fixed effects. Robust standard errors are in parentheses, clustered at the municipality of 1939 level. *** 1%, ** 5%, * 10% significance level.

Table 5. Impact of the Reparations Shock on Income, Measured in 1970

Panel A: Wage earnings 1970

	Earnings 1971		Log Earnings 1971		IHS Earnings 1971	
	(1)	(2)	(3)	(4)	(5)	(6)
Bartik	203.709***	118.468***	0.140***	0.160***	0.373***	0.297***
	(32.308)	(24.829)	(0.021)	(0.040)	(0.065)	(0.082)
N	84867	24675	41107	9638	84867	24675
Sample	All	Agriculture 1939	All	Agriculture 1939	All	Agriculture 1939
Y mean	979.014	531.703	7.181	6.717	3.819	2.895

Panel B: Taxable income 1970

	Income 1971		Log Income 1971		IHS Income 1971	
	(1)	(2)	(3)	(4)	(5)	(6)
Bartik	207.036***	119.085***	0.114***	0.089***	0.247***	0.191***
	(37.282)	(27.429)	(0.019)	(0.027)	(0.060)	(0.059)
N	84867	24675	59215	17131	84867	24675
Sample	All	Agriculture 1939	All	Agriculture 1939	All	Agriculture 1939
Y mean	1364.742	1014.891	7.139	6.909	5.463	5.276

Notes: The unit of observation is an individual. The sample equals individuals aged 25-45 in 1950. The income of a person is measured in 1970. Bartik is a municipality-level measure of the reparations shock assigned to the person's municipality in 1939. In the even columns, the sample is restricted to only those who were working in agriculture in 1939. Log transformation in columns (3)-(4) drops out the zero values. In columns (5)-(6) the values are transformed using inverse hyperbolic sine. All regressions include the baseline municipal-level controls of agricultural share and manufacturing share in 1940, age and sex fixed effects, 11 region fixed effects, and urban fixed effects. Robust standard errors are in parentheses, clustered at the municipality of 1939 level. *** 1%, ** 5%, * 10% significance level.

Table 6. Impact of the Reparations Shock on Occupations 1970, by Cohorts

	Agriculture	Production	White-collar	Executive
	(1)	(2)	(3)	(4)
Bartik x (30-45 in 1950)	-0.064***	0.056***	0.020***	0.004
	(0.010)	(0.007)	(0.008)	(0.004)
Bartik x (under 30 in 1950)	-0.044***	-0.021***	0.042***	0.026***
	(0.010)	(0.006)	(0.006)	(0.006)
N	153305	153305	153305	153305
Y mean	0.272	0.339	0.172	0.073
$\beta_1 = \beta_2$ (p-val)	0.000	0.000	0.016	0.000

Notes: The unit of observation is an individual. The sample equals individuals aged 11-45 in 1950. The sample is divided into those under 25 and those above 25 in 1950. Occupation is measured in 1970 using Statistics Finland's classifications for socio-economic groups. Bartik is a municipality-level measure of the reparations shock assigned to the person's municipality in 1939. All regressions include the baseline municipal-level controls of agricultural share and manufacturing share in 1940, age and sex fixed effects, 11 region fixed effects, and urban fixed effects. Robust standard errors are in parentheses, clustered at the municipality of 1939 level. *** 1%, ** 5%, * 10% significance level.

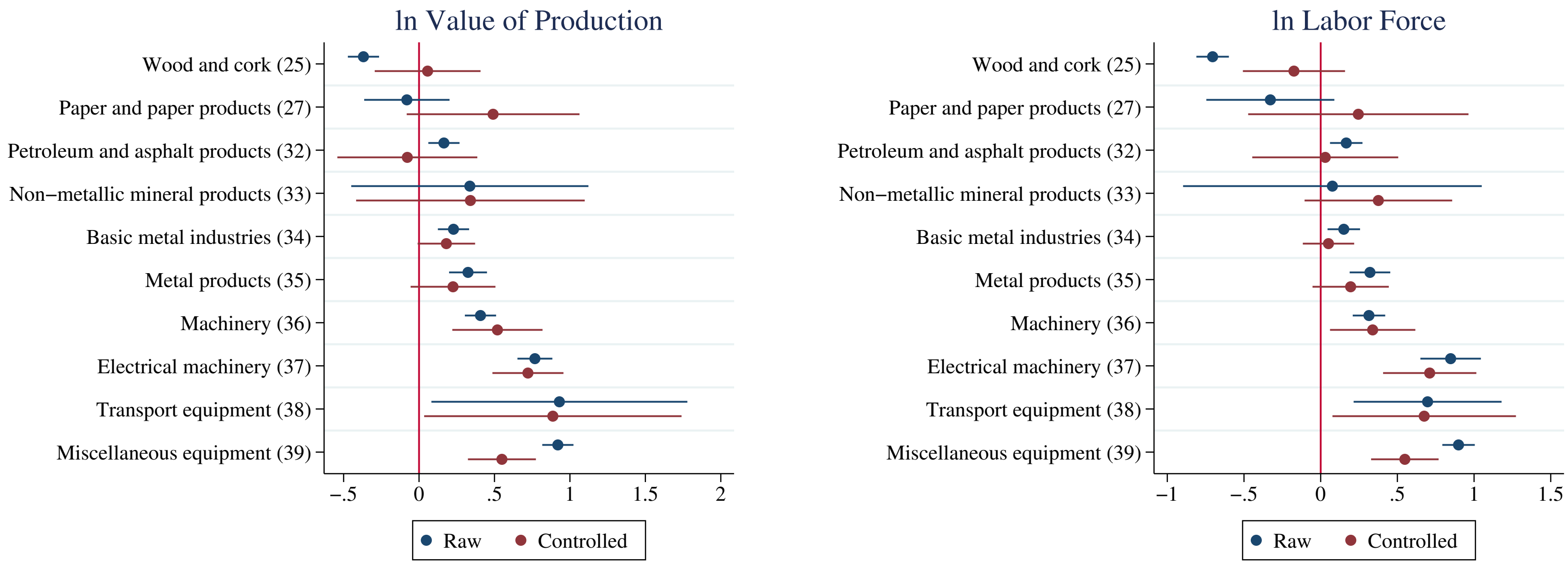
Table 7. Impact of the Reparations Shock on Education, by Cohorts

	Years of Education	Degree	Undergraduate	Graduate
	(1)	(2)	(3)	(4)
Bartik x (30-45 in 1950)	0.024	0.004	0.001	0.002
	(0.058)	(0.005)	(0.003)	(0.001)
Bartik x (under 30 in 1950)	0.299***	0.030***	0.018***	0.010***
	(0.064)	(0.006)	(0.004)	(0.003)
N	153305	153305	153305	153305
Y mean	7.407	0.203	0.043	0.018
$\beta_1 = \beta_2$ (p-val)	0.000	0.000	0.000	0.001

Notes: The unit of observation is an individual. The sample equals individuals aged 11-45 in 1950. The sample is divided into those under 25 and those above 25 in 1950. Degree indicates that the person had a post-secondrary degree. Undergraduate indicates that the person had a university degree, and graduate indicates that the person had a post-graduate degree. Bartik is a municipality-level measure of the reparations shock assigned to the person's municipality in 1939. All regressions include the baseline municipal-level controls of agricultural share and manufacturing share in 1940, age and sex fixed effects, 11 region fixed effects, and urban fixed effects. Robust standard errors are in parentheses, clustered at the municipality of 1939 level. *** 1%, ** 5%, * 10% significance level.

8 Appendix Figures and Tables

Figure A.1. Estimated Impact of the War Reparations Treatment by 2-digit Sectors



Notes:The graphs present estimated differences-in-differences coefficients (β_s) from equation (2). the unit of observation is 4-digit industry. Sectors are allocated into larger 2-digit industry groups. Outcome is regressed on war reparations treatment dummy interacted with post indicator and 2-digit sector indicator. Post is a dummy indicating time after 1944, meaning that the presented estimates are relative to the pre-treatment period 1934-1943. The model also includes year fixed effects and industry effects, as well as 1943 baseline controls for industry log average wage, log value of inputs, share of white-collar workers, power used per worker, log labor force and log value of production. The lines present 95% confidence intervals, based on industry-level clustered standard errors.

Table A.1. Baseline Industry Characteristics and Balance

	All Industries (1)	Control Industries (2)	Treated Industries (3)	Difference in levels (3)−(2) (4)	Difference in trends 1934-1943 (5)
ln(Value of Production)	17.063	16.940	17.769	0.829*	0.011
	(1.647)	(1.535)	(2.082)	(0.359)	(0.177)
ln(Labor Force)	6.018	5.887	6.773	0.886**	0.072
	(1.511)	(1.414)	(1.836)	(0.328)	(0.179)
ln(Establishments)	2.402	2.348	2.715	0.367	0.015
	(1.192)	(1.155)	(1.369)	(0.263)	(0.093)
ln(Value of Inputs)	15.673	15.569	16.272	0.703	0.023
	(3.367)	(3.230)	(4.098)	(0.745)	(0.224)
Power Used/Labor Force	3.985	3.153	8.768	5.615***	2.614
	(7.296)	(4.803)	(14.393)	(1.557)	(1.362)
White Collar Share	0.104	0.105	0.098	-0.007	-0.015
	(0.064)	(0.065)	(0.056)	(0.014)	(0.012)
ln(Average Wage)	9.268	9.248	9.381	0.133*	0.020
	(0.254)	(0.262)	(0.159)	(0.055)	(0.039)
Number of Industries	162	138	24	162	162

Notes: The unit of observation is industry. Baseline industry characteristics in 1943 values. Columns (2)-(3) report average values of variables by treatment group, standard deviations are in brackets. Column (3) reports the baseline differences between levels in the control group and the treatment groups in 1943. Column (4) reports the differences in changes 1934-1943 between the control group and the treatment groups. Standard errors are in parentheses, *** 1%, ** 5%, * 10% significance level.

Table A.2. Impact of the Reparations Shock on Income in 1970, by Quantiles

Panel A: Taxable income 1970 (All)

	Income Quantile			
	0.3	0.5	0.75	0.9
Bartik	130.502***	230.322***	251.287***	374.354***
	(25.208)	(40.166)	(46.093)	(79.936)
N	65998	65998	65998	65998

Panel B: Taxable income 1970 (Agriculture)

	Income Quantile			
	0.3	0.5	0.75	0.9
Bartik	26.917**	123.895***	205.737***	220.270***
	(11.745)	(30.967)	(36.358)	(63.622)
N	19307	19307	19307	19307

Notes: he unit of observation is an individual. The sample equals individuals aged 25-45 in 1950. The income of a person is measured in 1970. Bartik is a municipality-level measure of the reparations shock assigned to the person's municipality in 1939. All the regressions include the baseline municipal-level controls of agricultural share and manufacturing share in 1940, age and sex fixed effects, 11 region fixed effects, and urban fixed effects. Robust standard errors are in parentheses, clustered at the municipality of 1939 level. *** 1%, ** 5%, * 10% significance level.

Table A.3. Impact of the Reparations Shock on Education, by Cohorts and Industry Skill

	Years of Education	Undergraduate	Graduate
	(1)	(2)	(3)
High-skill Bartik x Old	0.025	0.001	0.002
	(0.060)	(0.003)	(0.002)
High-skill Bartik x Young	0.275***	0.018***	0.010***
	(0.081)	(0.004)	(0.002)
Low-skill Bartik x Old	-0.025	-0.002*	-0.000
	(0.030)	(0.001)	(0.001)
Low-skill Bartik x Young	0.083	0.002	0.001*
	(0.055)	(0.001)	(0.001)
N	153305	153305	153305
Y mean	7.407	0.043	0.087
$\beta_1 = \beta_2$ (p-val)	0.000	0.000	0.000
$\beta_2 = \beta_4$ (p-val)	0.052	0.000	0.000

Notes: The unit of observation is an individual. The sample equals individuals aged 11-45 in 1950. The sample is divided into those under 25 and those above 25 in 1950. Degree indicates that the person had a post-secondrary degree. Undergraduate indicates that the person had university degree, and graduate indicates that the person had post-graduate degree. Bartik is a municipality-level measure of the reparations shock assigned to the person's municipality in 1939. Industries are divided into high and low skill by average years in schooling shown in Figure 3. All regressions include the baseline municipal-level controls of agricultural share and manufacturing share in 1940, age and sex fixed effects, 11 region fixed effects, and urban fixed effects. Robust standard errors are in parentheses, clustered at the municipality of 1939 level. *** 1%, ** 5%, * 10% significance level.

Table A.4. Impact of the Reparations Shock on Education, Controlling for Parent Income

	Years of Education			Degree			Undergraduate		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Bartik	0.290***	0.187*	0.220**	0.029***	0.018**	0.020***	0.016***	0.009**	0.011**
	(0.110)	(0.099)	(0.094)	(0.009)	(0.007)	(0.007)	(0.005)	(0.004)	(0.004)
Parent income 1970		0.050***			0.005***			0.004***	
		(0.006)			(0.001)			(0.000)	
Parent income rank 1970			0.027***			0.003***			0.002***
			(0.001)			(0.000)			(0.000)
N	27727	27727	27038	27727	27727	27038	27727	27727	27038
Y mean	8.549	8.549	8.549	0.157	0.157	0.157	0.076	0.076	0.076

Notes: The unit of observation is an individual. The sample equals individuals aged 11-20 in 1950 linked to their parents in the same household. Degree indicates that the person had a post-secondrary degree. Undergraduate indicates that the person had university degree. Bartik is a municipality-level measure of the reparations shock assigned to the person's municipality in 1939. Parent income is measured post-treatment in 1970, which makes it a "bad control". All regressions include the baseline municipal-level controls of agricultural share and manufacturing share in 1940, age and sex fixed effects, 11 region fixed effects, and urban fixed effects. Robust standard errors are in parentheses, clustered at the municipality of 1939 level. *** 1%, ** 5%, * 10% significance level.

Table A.5. Impact of the Reparations Shock on Education, Controlling for Distance to Universities

	Years of Education		Degree
	(1)	(2)	(3)
Bartik x (30-45 in 1950)	0.018	0.004	0.000
	(0.055)	(0.005)	(0.003)
Bartik x (under 30 in 1950)	0.312***	0.031***	0.019***
	(0.063)	(0.006)	(0.004)
Distance to New University x Old	-0.031	0.001	0.000
	(0.057)	(0.004)	(0.003)
Distance to New University x Young	-0.197***	-0.015***	-0.007***
	(0.051)	(0.004)	(0.003)
N	153305	153305	153305
Y mean	7.406	0.087	0.043
$\beta_1 = \beta_2$ (p-val)	0.000	0.000	0.000

Notes: The unit of observation is an individual. The sample equals individuals aged 11-45 in 1950. The sample is divided into those under 25 (young) and those above 25 (old) in 1950. Degree indicates that the person had a post-secondrary degree. Undergraduate indicates that the person had a university degree, and graduate indicates that the person had a post-graduate degree. Bartik is a municipality-level measure of the reparations shock assigned to the person's municipality in 1939. Distance to university is the distance between municipality centroids in hundreds of kilometers. All regressions include the baseline municipal-level controls of agricultural share and manufacturing share in 1940, age and sex fixed effects, 11 region fixed effects, and urban fixed effects. Robust standard errors are in parentheses, clustered at the municipality of 1939 level. *** 1%, ** 5%, * 10% significance level.

Table A.6. Falsification Exercise with Norway. Estimated Differences in Outcomes by Reparations Share, Relative to 1943

	ln Value of Production			ln Labor Force		
	(1)	(2)	(3)	(4)	(5)	(6)
1934-1942 x Treated	0.085	0.032	-0.057	-0.006	-0.046	-0.064*
	(0.070)	(0.091)	(0.039)	(0.060)	(0.079)	(0.038)
1944-1952 x Treated	0.073	0.046	-0.012	-0.014	-0.044	-0.053
	(0.074)	(0.091)	(0.077)	(0.054)	(0.072)	(0.068)
1953-1960 x Treated	0.141	0.119	0.006	-0.022	-0.000	-0.026
	(0.173)	(0.183)	(0.185)	(0.138)	(0.155)	(0.159)
1961-1969 x Treated	0.237	0.242	0.109	0.008	0.083	0.065
	(0.196)	(0.212)	(0.201)	(0.164)	(0.171)	(0.179)
N	4931	4931	4931	4931	4931	4931
Controls 43		✓	✓		✓	✓
Controls All			✓			✓

Notes: The unit of observation is industry. The time interacted treatment shows the value of total reparations produced by an industry scaled by 1943 production of the industry. Controls include baseline year 1943 and 1938 characteristics interacted with year effects. These controls are skilled worker share, log mean wage, ln(Labor) and ln(Production). Period of study 1934-1969. Robust standard errors in parentheses, clustered at the industry level. *** 1%, ** 5%, * 10% significance level.