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Charlotte Bartels
DIW Berlin

Felix Kersting
Humboldt University Berlin

Nikolaus Wolf
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Charlotte Bartels
DIW Berlin

Felix Kersting
Humboldt University Berlin

Nikolaus Wolf[1]
Humboldt University Berlin

Abstract

We study the dynamics of income inequality, capital concentration, and voting outcomes before 1914. Based on new panel data for Prussian counties and districts we re-evaluate the key economic debate between Marxists and their critics before 1914. We show that the increase in inequality was strongly correlated with a rising capital share, as predicted by Marxists at the time. In contrast, rising capital concentration was not associated with increasing income inequality. Relying on new sector×county data, we show that increasing strike activity worked as an offsetting factor. Similarly, the socialists did not directly benefit from rising inequality at the polls, but from the activity of trade unions. Overall, we find evidence for a rise in the bargaining power of workers, which limited the increase in inequality before 1914.

JEL Codes: D31, D63, J31, N30

Keywords: Income Inequality, Concentration, Top Incomes, Capital Share, Germany

[1]Corresponding Author: Nikolaus Wolf, (nikolaus.wolf@wiwi.hu-berlin.de)

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1 Introduction

Are there factors amplifying or moderating income inequality that can be generalized across modern economic history? The debate about inequality, its drivers and political consequences in late 19 th century Europe shows a striking similarity to today's discussions. Today and back then, the focus was on accelerating capital accumulation in the hands of the wealthy, impoverishment of the working class and political polarization. In a long-run perspective, the recent increase looks like the return to an old pattern of high inequality within countries, similar to the situation before 1914 as prominently put forward by Piketty (2014).

Understanding causes and consequences of income inequality has again become a central goal among economists as income inequality started to rise again in many developed countries since the 1980s. The close relationship between the rising capital share and income inequality (functional and personal income distribution) is now well-documented for the United States and many other countries.[1] Autor et al. (2020) link the recent fall of the labor share to the rise of super star firms with high markups and a low labor share of value added.[2] Instead, Stansbury and Summers (2020) argue that a decline in the bargaining power of workers resulted in a redistribution of product market rents from labor to capital owners. Another large strand in the literature has explored the political consequences of rising economic inequality, from its effects on political polarization (McCarty et al., 2006) to the role of government intervention (Blanchard and Rodrik, 2021).

We look at the period before 1914 when a very similar increase in inequality led to similar debates among economists. First, based on strictly comparable within-country variation, we show that the increase in inequality went hand in hand with a rising capital share. Second, we show that rising capital concentration did not mechanically translate into rising income inequality. Instead, sectors and counties with high capital concentration featured high strike activity, typically demanding higher wages. We can show that successful strikes were associated with a reduction in top income inequality, and even a decline in absolute top incomes. Emphasizing the inequality-moderating role of institutions and unions in particular, we speak to Farber et al. (2018) who demonstrate that unions were crucial to reduce income inequality in the US in the mid-1930s and late 1940s. Moreover, our evidence can be read as the historical counterpart to Stansbury and Summers (2020), showing the rise of worker power and its impact on the income distribution. Third, we

[1] See, for instance, Atkinson (2009); Piketty (2014); Milanovic (2017); Piketty and Zucman (2014); Hoffmann et al. (2020); Karabarbounis and Neiman (2013).

[2] Two recent studies challenge the diagnosis of a secular decline of the labor share showing that the recent fall of the labor share is driven by the recent capitalization of intellectual property products (IPP) in the national income and product accounts (NIPA) (Koh et al., 2020) or the rise in housing values (Gutiérrez and Piton, 2020).

find that the socialist party did not directly gain from rising inequality. Instead, we argue that unions played an important role to translate rising income inequality into more votes for the socialist party.

For our analysis, we provide new panel data on income inequality, capital accumulation, capital concentration and socialism across Prussian regions between 1874 and 1913. We use regional tax statistics to determine top income shares. By combining tax statistics and national accounts, we obtain regional capital shares. Based on the firm census, we calculate average firm size to measure market concentration. We use vote shares in general elections, strike activity, and membership in trade unions to capture regional support for socialism. Therefore, we newly digitized data on the universe of strikes in Prussia for several years and membership in free trade unions. Together, our data also allows investigating the relationship between income inequality, capital share, firm size and socialism during the heydays of the industrialization in Germany.

A major benefit of our setting is that it allows us to investigate the dynamics of inequality within one common institutional framework. We mainly rely on panel fixed effects regressions to reduce the potential impact of latent variables. Thereby, we can rule out time-invariant unobserved heterogeneity by including district-fixed effects, general time trends by adding year-fixed effects, and region specific time trends by relying more flexible region×year fixed effects. When we analyze the role of strikes as offsetting factor for increasing income inequality, we use industry×county data which allows us to use both, industry and county fixed effects.

We place our analysis in the historical context of the famous "Revisionism debate" between prominent economists at the time, notably Orthodox Marxists and their critics before 1914. Arguably, the debate on the observed increase of inequality during Germany's industrialization and its political repercussions shaped all later discussions about income inequality in a capitalist economy – notably Kuznets (1955), who argued that inequality would first rise with economic development and then fall, did so in response to the Orthodox Marxist prediction.[3] At the center of the "Revisionism debate" before 1914 was the Orthodox Marxist prediction that capitalist development will necessarily lead to more inequality, growing economic, social and political conflict and ultimately to socialism. Based on Karl Kautsky's writings – the leading theoretical Marxists of the Second International (Gronow, 2016) –, we formulate three hypotheses, which were at the core of the debate: first, capitalist accumulation leads to arising share of capital in total income and growing inequality; second, there will be a growing concentration of capital in a few hands adding to further income inequality, and third, rising inequality strengthens political support for the radical left due to a growing mass of impoverished workers. The revisionists around

[3]He drew his conclusions from the same Prussian income tax data that we use in this paper (based on earlier work by S. Procopovitch and K. Helfferich).

Eduard Bernstein questioned these claims. Both sides in the debate grounded their arguments on statistical evidence from the German statistical office and other contemporary official statistics. Using the same sources but relying on modern statistical techniques we investigate this debate.

Our study is related to several strands in the literature. We speak to the literature in economic history on the development of income inequality during the industrialization. A recurring topic is the discussion of long-run changes in the income distribution – from increasing inequality in the first phase of the classical Lewis model, during Engels' pause or along the Kuznets curve to constant or declining inequality in later phases of development (Lewis, 1954; Allen, 2009; Kuznets, 1955). Similarly, Galor and Moav (2004) suggest a theory of long-run development, where the transition from physical to human capital accumulation would change the relation between economic growth and inequality.[4] We show how the relationship between capital concentration and income inequality changed over time, due to a rise in worker power.

With our new panel data source on income inequality across regions, we add historical evidence to the increasing number of long-run top income share series for countries around the world since the seminal contribution of Piketty (2001, 2003).[5] These studies use income tax statistics to measure the concentration of income within the topmost part of the distribution for one country. Apart from a few exceptions, these long-run series only cover the 20^{th} century as most countries introduced modern income tax systems at the beginning of the 20^{th} century. German income tax statistics offer the unique possibility to go back to the 19^{th} century and produce series covering the era of industrialization. Thereby, we contribute to this literature a *regional* top income share series for 28 Prussian districts and more than 400 counties from 1874 to 1913.[6] Regional series for the United States have been used to study causes and consequences of inequality. For example, the US state top income series is used by Aghion et al. (2018) to study the relationship between top incomes and innovation. Boustan et al. (2013) collect decadal data on income distribution and expenditures and revenues from 1970 to 2000 for cities and school districts in the US to analyze the effect of inequality on taxation and public expenditure.

Finally, our study is related to a literature testing Marxist predictions using statistical methods (Weisskopf, 1979; Desai, 1991; Cockshott et al., 1995; Hauner et al., 2018). The existing literature focuses on the declining rate of profit, Marxist value theory or

[4]Related to this approach are empirical investigations whether industrialization was skill-enhancing or not, see, for instance, recent contributions by Lafortune et al. (2019) and De Pleijt et al. (2020).

[5]Amongst many others, Piketty (2003) estimated the series for France, Atkinson and Salverda (2005) for the Netherlands and the United Kingdom, Alvaredo and Saez (2009) for Spain, Roine and Waldenström (2008) for Sweden, Piketty and Saez (2003) for the United States, Bartels (2019) for Germany, and Alfani et al. (2020) for pre-modern Germany. The estimated shares are collectively available at the World Inequality Database (wid.world).

[6]Up to this date, regional inequality series only exist for the United States (Frank et al., 2015) covering the period from 1917 to the present, and for Norway (Modalsli, 2018) focusing on the 1860s.

Marxist theories of imperialism (for a recent overview see Basu, 2017). In contrast, we consider Marxist ideas about the relation between the capital share, capital concentration, income inequality and socialism. With this, we arguably ignore several aspects of Marx's writings deemed crucial by the Marxist literature, such as the labour theory of value. More generally, we are treating Marxist ideas as generally falsifiable hypotheses (in the spirit of Popper 2011, ch. 20), which can be questioned. But our aim is to test the contemporary interpretation of Marx by Orthodox Marxists such as Karl Kautsky, which indeed considered Marx's work as a body of empirically testable theories (Kautsky, 1899a and Kautsky 1901) and the counter-arguments of the revisionists. Given that Kautsky was the leading theorist of the SPD before 1914 (certainly after the death of Friedrich Engels in 1895), and the SPD the only notable Marxist political party in the German Empire, we think that our approach is well justified.

Our paper is organized as follows. Section 2 introduces the main variables of our regional panel data-set. In Section 3, we briefly discuss the "Revisionism debate" between Orthodox Marxists and revisionists as the historical context for our data. Based on this we formulate three testable hypotheses. In Section 4, we present our main results on the relationship between capital share and income inequality, between capital concentration and income inequality, and between income inequality and socialism. We conclude in Section 5 with a verdict – who was right in the Revisionism debate? –, and put our findings into the current context.

2 Income Inequality, Concentration, and Socialism in 19th Century Germany

The German Empire was characterized by a dynamically growing economy with, simultaneously, increasing social and political tensions. Between 1850 and 1910, Germany developed from a backward economy into Europe's industrial core. Industrial production soared, labour productivity in manufacturing was at par or even higher than in the United Kingdom at the turn of the century (Broadberry and Burhop, 2007). Real GDP per capita roughly doubled between 1871 and 1913 (Pfister, 2020). This rapid industrialization was accompanied by increasing income inequality (Bartels, 2019). Alongside industrialization, the political landscape in Germany changed fundamentally. Socialism became a rising force in German politics in the second half of the 19^{th} century, as in other parts of Europe. Despite attempts to oppress the socialist movement with the so-called socialist laws (*Sozialistengesetze*) (1878-1890), the socialist party became the strongest party in Germany in the first decade of the 20^{th} century. While these aggregate developments are well documented in economic history, we highlight the remarkable variation across Prussian regions, particularly between rural and industrialized districts and counties. Our main

concepts, measures, time periods and regional coverage are summarized in Table 1. In the following, we describe our data sources, the construction of our main measures and present the trends in income inequality, capital accumulation, capital concentration, and socialism.

Table 1: Prussian Inequality Panel, 1874-1913

Concept	Measure	Time Period	Region
Income Inequality	Top Income Shares	1874-1913	28 Districts
	Top Income Shares	1891-1913	435 Counties
Capital Accumulation	Capital Share	1891-1913	28 Districts
Capital Concentration	Mean Firm Size	1875,1882, 1895,1907	435 Counties
Socialism	SPD votes	1874-1912	224 Constituencies
	Union Membership	1896-1906	435 Counties
	(Successful) Strikes	1899-1905	21 Sectors $\times$ 435 Counties

Income inequality Our central measure of income inequality is the top income share. The choice of our inequality measure is pre-determined by the high quality of income tax data in Prussia providing detailed information on the income distribution within the taxpaying population (compared to the poor quality or lack of annual wage and poverty statistics at the time). The Prussian statistical office annually published tabulations with the number of taxpayers per income bracket, often listing more than 100 income brackets. These statistics are on the district-level and also differentiate between rural and urban municipalities within each district. Digitizing these fine-grained statistics allows us to cover 28 harmoniously defined administrative districts in Prussia between 1874 and 1913.[7] Using the income distribution in rural and urban municipalities in each district, which is recorded since 1891, and census data on the rural/urban population within each county, we can estimate inequality measures for 435 counties in Prussia between 1891 and 1913. The share of the population included in income tax statistics varies both across districts and over time (see Appendix Figure E.1).[8] The richer the district, the higher the share of taxpayers. Across all districts/counties, at least 20% of the population was subject to income taxation. Thus, the top decile of the income distribution is consistently captured over time and across districts/counties so that we can compute the income share of the top 5% and of smaller groups at the top.

We measure income inequality by the share of total income accruing to a particular

[7]Our harmonized district Hannover includes Aurich, Hildesheim, Stade, Lüneburg, Osnabrück. Our harmonized district Königsberg/Gumbinnen includes Gumbinnen, Königsberg, and Allenstein. Our harmonized district Brandenburg includes Berlin and Potsdam. We drop Sigmaringen because data are only available for a subset of our period.

[8]In Prussia, income taxation for top income earners was introduced in 1851 and extended to the entire population in 1874. See Appendix A and Spoerer (2004, Chapter 2.2) for details on Prussian income tax regimes in the 19$^{\text{th}}$ century.

fraction of the population such as the top 5%, the top percentile or the bottom 95%. Income shares are obtained by applying the Pareto interpolation method commonly used in the top income share literature since the contributions of Piketty (2001, 2003). The first step is to compute the income threshold and average income of a top income group. Dividing the cumulative income above the income threshold of the top x% by an external reference total income gives the share of income accruing to the top x% in district d in year t.[9]

$$\text{Top x\% Share}_{dt} = \frac{\text{Top x\% Total Income}_{dt}}{\text{Total Personal Income}_{dt}} \tag{1}$$

We estimate the top income share in a Prussian county c as the county's urban/rural population-weighted average of the rural and urban top income share within the district. I.e., the higher the urban population share in a county, the closer is the county's top share to the urban top share of the district. Urban top income shares systematically exceed rural top income shares.

Between 1874 and 1913, income inequality increased in both rural and industrial districts. Figure 1a displays the evolution of the top 1% income share in rural, mixed and industrial districts.[10] We categorize districts according to their employment share in agriculture in 1882. Rural districts were mostly located in the East of Prussia (today's Poland and Russia), while industrial districts were mostly located in the center and West of Prussia including the districts of Düsseldorf, the Ruhr area, Cologne, Aachen and Wiesbaden in the West, but also Berlin and Brandenburg in the center. Two differences between rural and industrial districts should be noted. First, income inequality in industrial districts is substantially higher than in rural districts. Second, the timing of the inequality increase diverges. In industrial districts, the top 1% income share increased from about 17% in the 1870s to more than 20% in 1900, and then fluctuated around this elevated level until 1913. In contrast, rural districts saw a mild increase from 10% to 11% until the 1890s and then a rapid increase from 11% to more than 13% between 1900 and 1913. Income inequality in Prussia's industrial districts compares in size to other countries like France, United Kingdom and Sweden, where the top 1% captured around 20% of total income at the eve of World War I and the United States with a top 1% share of about 18% of total income (see `https://wid.world/`). However, income inequality in Prussia as a whole was low in international comparison because of the more equal income distribution in rural districts.

[9]Total income is the sum of taxed and tax-exempt income. We estimate tax-exempt income following Hoffmann and Müller (1959), who produced historical national accounts for Germany 1851-1957. Appendix Figure D.1 displays the evolution of total reference income per capita in Prussian administrative districts. The total reference population is the sum of tax units and tax-exempt; both are given in the Prussian income tax statistics. We provide further details on reference total income in Appendix D and total population in Appendix E.

[10]Appendix Figure F.1 displays the development of the top 1% income share separately for each district.

Previous studies analyzing inequality for the 19th century often focus on land inequality, e.g., Cinnirella and Hornung (2016) and Ziblatt (2008).[11] However, our results presented in Figure F.2 show that land inequality is not a reliable proxy for income inequality during this period: Our top 1% income share negatively correlates with land inequality computed by Cinnirella and Hornung (2016) in 1882 and also the land share of large landholdings. While land was extremely concentrated in East Prussia, top incomes of the East Prussia's landowning elite (the supposedly wealthy Prussian *Junkers*) were comparably low, both in comparison to lower incomes in East Prussia and in comparison to top incomes of the industrial elite in the West of Prussia. At the same time, land was less concentrated in the West of Prussia and, hence, the measure of landholdings inequality low. Similarly, Becker and Hornung (2020) find that inequality measured with the voting weights in the Prussian three-class franchise and land inequality were negatively correlated. Our results provide a new and different perspective on inequality during the industrialization period highlighting the role of industrial incomes of the entrepreneurial elite from increasingly large firms in the West as opposed to agricultural income of the noble, landowning elite in the East of Prussia.

Capital accumulation We measure capital accumulation by the share of capital income in national income. Capital income is the sum of interest, distributed profits (=dividends), undistributed profits (=retained earnings) and capital gains. We calculate the capital share from the income-side. Our main data source are income tax statistics recording capital income from interest and distributed profits, which we supplement with undistributed profits, self-employment capital income and government's capital income from additional data sources. Income tax statistics represent the most accurate data source for aggregate income during the German Empire, which is also underlined by the fact that other pre-1913 German national income series are based on the same income tax data (e.g. Hoffmann and Müller (1959)).[12] Since 1891, Prussian income tax statistics documented the income composition of top income earners (roughly the top 1%) on the district level.[13] We use the capital income recorded in income tax statistics as an estimate for capital income

[11] Cinnirella and Hornung (2016) measure concentration of landownership as the ratio of landholdings larger than 300 PM (circa 75 ha) over the total number of landholdings per county. Ziblatt (2008) calculates a Gini coefficient over the distribution of land ownership for different bins.

[12] Pfister (2020) is a recent contribution estimating a national income series, 1851-1913, from the income-side based on factor incomes. He focuses on improving the estimate of agricultural incomes in national income and also draws on Prussian tax data.

[13] More precisely, tax statistics record the income composition of income earners with incomes exceeding 3000 RM distinguishing between four income categories: capital income, income from renting and leasing, income from trade, business and mining, and, finally, employment income. Keeping in mind that these incomes accrue to roughly the top 1% of income earners, we count all income types as capital income (and not as labor income) except employment income. We might overestimate capital income in richer districts compared to poorer districts, because more taxpayers cross the 3000 RM income threshold in richer districts so that their capital income is recorded in the income composition statistics. However, our district fixed effects address such systematic differences.

from interest and distributed profits. We argue that capital income almost exclusively accrued to this top group so that the income composition data miss a negligible share of capital income. We add undistributed profits using the share of undistributed profits in total profits as estimated for Prussian corporations by Hoffmann and Müller (1959)[p.28]. According to their estimates, this share reached about 35% in 1891 and 1913, but varied with the business cycle. We add the capital share of self-employment income following Bengtsson and Waldenström (2018).[14] Finally, we add government's capital income. In order to compute district government capital income, we compute the share of Prussian government capital income in national income as documented by Hoffmann and Müller (1959) and apply this share to district income. National income is the sum of total private income (see Footnote 7), government's capital income and undistributed profits.

$$\text{Capital Share}_{dt} = \frac{\text{Capital Income}_{dt}}{\text{National Income}_{dt}} \tag{2}$$

Between 1891 and 1913, the capital share increased in rural and mixed districts and fluctuated around an elevated level in industrial districts, as shown by Figure 1b. As noted for income inequality, capital share levels are substantially higher in industrial districts than in rural districts. We also see that the capital share increased in the more rural districts until 1913 but stagnated after 1900 in the more advanced districts, very similar to our findings for the share of top incomes. Appendix Figure F.3 compares our capital share for Prussia as a whole to the capital share for the entire German Empire as estimated by Bengtsson and Waldenström (2018) and Pfister (2020) and shows that our estimate documents the same trend over time, but on a slightly lower level.

Capital concentration Our measure of capital concentration is constructed using data on employment and the number of firms. These data are available for 1875, 1882, 1895, and 1907. We divide the number of employees by the number of firms in each district and county. Hence, our measure of capital concentration increases from one year to the next as a growing number of employees is working in a smaller number of firms.

$$\text{Firm Size}_{dt} = \frac{\sum \text{Employees}_{dt}}{\sum \text{Firms}_{dt}} \tag{3}$$

Between 1875 and 1907, capital concentration increased sharply both in rural and industrial districts, as displayed in Figure 1c. This universal trend is in contrast to the diverse trends documented for income inequality and capital shares across district types.[15]

[14] Bengtsson and Waldenström (2018) compute the capital share of self-employment income as 0.33 × share of self-employed × total labor income using national self-employment shares from Hoffmann (1965). We use Hoffmann (1965) national self-employment data by sector and compute district self-employment shares by weighting national sector self-employment shares with the district sector employment shares.

[15] We also construct a measure of profit concentration among highly-profitable firms using corporate tax

The level of capital concentration was higher in industrial districts. Note that these statistics were blamed for painting a nostalgic picture of the German economy based on small workshops, where even within one firm each small workshop was counted separately, understating increasing capital concentration among big businesses in Germany (Tooze, 2007).[16] Hence, our measure of capital concentration must be conceived as a lower bound.

Socialism To capture regional support for socialism, we use vote shares for the socialist party, membership in unions, and strike activity. We use general elections for the national parliament (*Reichstag*) as the electoral laws of states were often much less democratic like the three-class franchise in Prussia.[17] The *Reichstag* elections were held directly in single member constituencies with representatives elected by a majority, following the principle of 'one man, one vote'. Suffrage covered basically all men above 25 excluding those under tutelage, in bankruptcy, or on poor relief. While the German Empire was a monarchy, elections were much more than just tests of opinion: The *Reichstag* could propose laws or refuse to agree to laws proposed by the executive, and most importantly, the executive required parliamentary support, e.g. for trade policy and the budget (except the military).[18] *Reichstag* elections were held in 226 constituencies in 1871, 1874, 1877, 1878, 1881, 1884, 1887, 1890, 1893, 1898, 1903, 1907, 1912. The *Sozialdemokratische Partei Deutschlands* (SPD) (and its predecessors) was the only political representative of socialism in Germany.[19]

Between 1871 and 1912, political support for the SPD exploded, as can be seen from Figure 1d. While the success was limited in the 1870s and 1880s with average vote shares below 10%, vote shares rapidly increased since the abolition of the anti-socialist law[20]

statistics, which are available since the introduction of corporate taxation in 1891. One should note, that corporate taxation since 1891 disproportionately increased the tax burden of the new industrial elite with respect to the old landed elite because firm owners were taxed twice on the corporate and on the personal level (Mares and Queralt, 2020). The Half-Squared Coefficient of Variation is declining until 1900 and then sharply increases (see Appendix Figure F.6). We do not make further use of this measure for three reasons. First, only a negligible share of firms were incorporated so that the concentration of corporate profits is not representative for capital concentration in Prussia. Second, several districts have less than ten corporations in total. Third, the tax reform of 1906, which introduces limited liability companies (*GmbHs*) and a higher tax rates for this legal form, creates a serious break in the series. The introduction of limited liability firms increased the number of corporations two- to three-fold in all parts of Prussia.

[16]Tooze (2007, p.59) concludes: "The entire repertoire of Imperial statistics was thus moulded around the interests of German business. Inquiries to which business objected were boycotted." This changed only with the outbreak of WWI.

[17]Becker and Hornung (2020) analyze the political economy of Prussia's three-class franchise.

[18]However, the *Reichstag* did not have the power to elect the chancellor nor his fellow ministers, which were chosen directly by the emperor. The emperor also had the right to dissolve the parliament and was able to call for new elections at any time.

[19]In 1863, Ferdinand Lassalle founded the first socialist mass party in Germany, the *Allgemeine Deutsche Arbeiterverein* (ADAV). In 1869, the *Sozialdemokratische Arbeiterpartei* (SDAP) led by August Bebel und Wilhelm Liebknecht emerged, with a more radical orientation that was strongly influenced by Marx and Engels. In 1875, both parties merged and formed the *Sozialistische Arbeiterpartei Deutschland* (SAP).

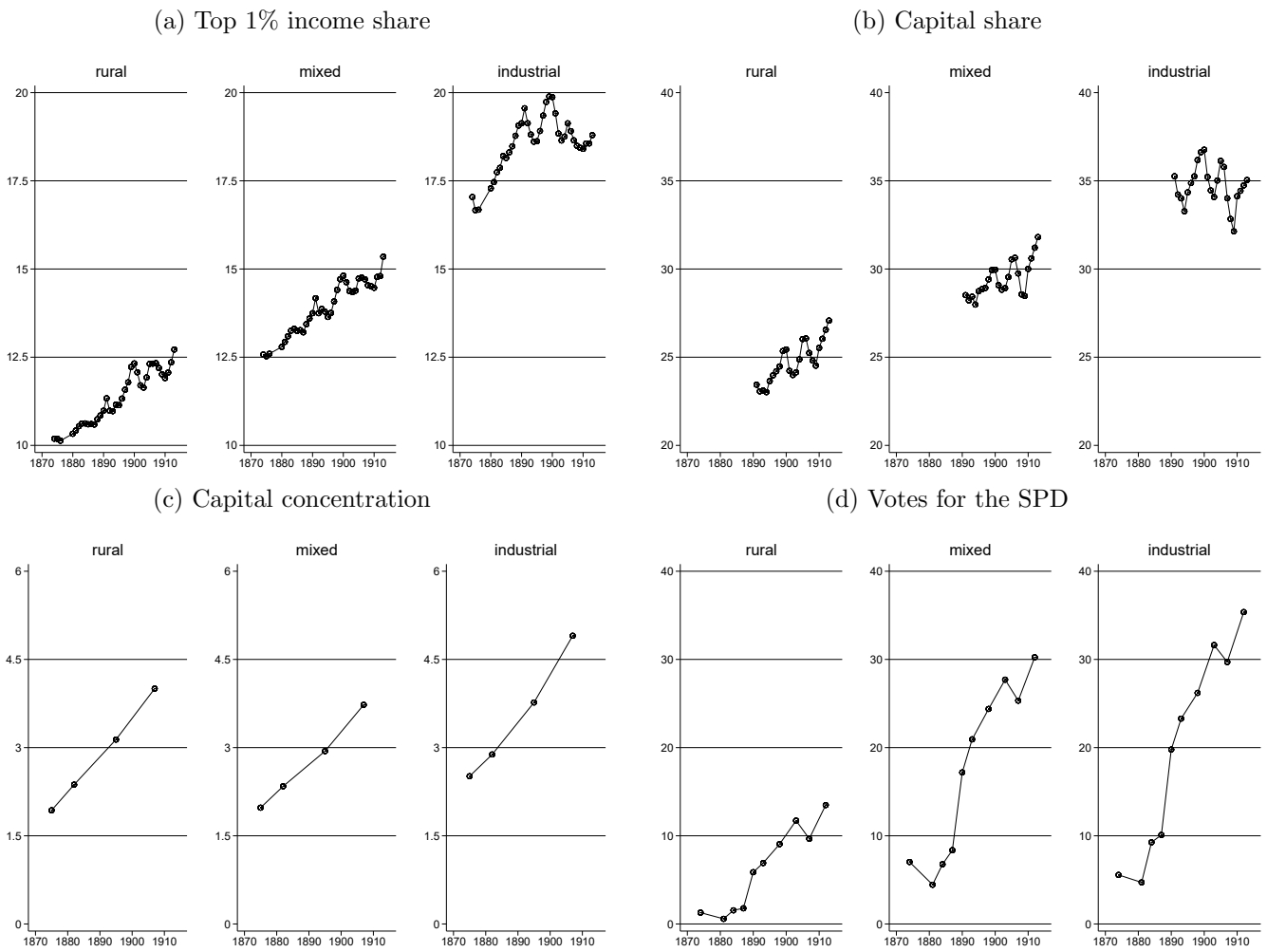
[20]The rising success of socialist parties and trade unions led to more oppression in the form of Bismarck's

in 1890 and the publication of the *Erfurter Programm* in 1891, particularly in industrial districts. In rural districts, the average SPD vote share increased from near zero to almost 15% in 1912. In industrial districts, the average SPD vote share increased from below 10% to almost 30%. The SPD became the strongest party in terms of vote share in 1890 and the strongest party in terms of MPs in 1912.

We also analyze union membership and strikes to directly capture socialist activity. We digitized a previously unused source that lists every single strike by sector and location for all years between 1899 and 1905. We georeference these entries and construct a county×sector data-set. Our data set covers 21 sectors and more than 10.000 observations. For our analysis, we link these data to the firm census, also available on the county×industry level In addition, we digitized union membership data on a county level. Between 1896 and 1906, union membership steadily and sharply increased, while (successful) strikes show a volatile but overall rising trend between 1899 and 1905 (see Appendix Figure F.7). Table F.8 shows firm size and strike occurence across counties by sector. For example, in the construction sector with an average firm size of 5, strikes occurred in half of the counties.

Sozialistengesetze (1878-1890), which banned the socialist party and trade unions. However, individual supporters could still run for parliament and be elected into office.

Figure 1: Main variables by district type



Notes: The graphs shows the top 1% income share (a), capital share (b), capital concentration (c), and votes for the SPD (d) by district type. Districts with more than 50% employment in agriculture in 1882 are classified as rural (left panel), districts with between 40% and 50% employment in agriculture in 1882 are classified as mixed (middle panel), and districts with less than 40% employment in agriculture in 1882 are classified as industrial (right panel). The categorization of each district is listed in Appendix C.
Sources: See Appendix B.

3 Orthodox Marxism and the Revisionism Debate

The relations between income inequality, capital shares, concentration and socialism were hotly debated at the time. While the socialists gained massively at the polls, internal struggles emerged within the socialist movement between the Orthodox Marxists on one side and and more pragmatic, reform-oriented activists on the other. The former had their stronghold within the main party organization, the latter dominated the trade unions. The *Erfurter Programm* from 1891[21] was an effort to guide the party after the abolition of the anti-socialist laws. The program was largely based on earlier drafts, written by Karl Kautsky on theoretical foundations and a long-run strategy, and by Eduard Bernstein on the short-term tactical objectives. The theoretical part was influenced by the writings of Karl Marx and Friedrich Engels and took its starting point from a sharp criticism of rising inequality and capital concentration. But shortly after its publication, a struggle emerged within the socialist movement between Orthodox Marxists on one side and more pragmatic, reform-oriented activists on the other.

The *Erfurter Programm* and Kautsky's interpretation of Marx in *Karl Marx' oekonomische Lehren* (Kautsky, 1886) are significant as they represent more broadly what was later to be called "Orthodox Marxism" and characterized the Second International (1889-1916). In particular, Kautsky's commentary to the *Erfurter Programm*, published in 1892, was widely circulated and read well beyond Germany. While we cannot even scratch the surface of the writings of Marx and the exegesis of his works by Marxists and non-Marxists, we focus instead on key aspects of Orthodox Marxism as formulated by Kautsky and by the critique it encountered from the Revisionists around Eduard Bernstein. At the centre of Orthodox Marxism lies a notion of historical materialism, where economic conditions determine the cultural and political structure of society in a way that can be empirically tested ("scientific Marxism"). The main predictions of Kautsky's historical materialism are that capitalist development will inevitably lead to growing economic, social and political conflict and ultimately to socialism. More specifically, let us formulate three such predictions that can be confronted with empirical evidence:

1) A higher capital share increases income inequality.

In his commentary to the *Erfurter Programm*, Kautsky (1892, p.76) argues that while workers suffer economic exploitation, the rate of profit will tend to decline but the volume of capital will increase faster. Hence, income from capital will increase, while income from labour will stagnate. This is derived from his reading of Marx' writing on capital accumulation. More directly, Marx (1867, Ch.23) refers to the English income tax statistics for the years 1853-1864 to illustrate the "general law of capital accumulation". He shows

[21] For an English translation, see SPD (1984).

that over these years incomes from taxable profits have increased much more than total taxable incomes. Hence, the share of capital in total income will increase and lead to a rise in income inequality.

2) Capital concentration increases income inequality.
Kautsky (1892, p.83) argues that capitalist production has the tendency to concentrate all capital into fewer and fewer hands, and ultimately to become the private property of a single person or corporation. This concentration of capital (or "centralization") will lead to a further increase in income inequality. This is based on his reading of Marx (1867, Ch.23), who used again the English income tax statistics to show that for the years 1864 and 1865 taxable incomes from profits were highly concentrated and increasingly so. Marx stated that "[...] with the development of the capitalist mode of production, there is an increase in the minimum amount of individual capital necessary to carry on a business under its normal conditions.[...] Centralisation would reach its extreme limit if all the individual capitals [...] were fused into a single capital." (Marx, 1867, Ch.23). By closer inspection, we can split this prediction into two parts, namely (2.a) the prediction of increasing capital concentration and (2.b) the prediction that rising capital concentration will lead to increasing income inequality.

3) Income inequality (notably the immiseration of workers) fosters support for socialism.
Kautsky (1892, p.108ff) and again Kautsky (1899a, p.1) argues that it is the growing misery of the working class, i.e., an increase in absolute poverty, alongside the concentration of capital, which will inevitably result in a political regime change towards socialism. This was rooted in his reading of Marx: "Along with the constantly diminishing number of the magnates of capital [...] grows the mass of misery [...]; but with this too grows the revolt of the working class [...]." (Marx, 1867, Ch.23). Again, this hypothesis can also be split into two, namely (3.a) the prediction of an ever increasing immiseration of workers and (3.b) the prediction that this immiseration (or at least an increase in income inequality) translates into growing political support for socialism.

In the years following the *Erfurter Programm*, several members of the SPD started to question if Marxism could be a viable guidance for the party. The most notable proponent of this critique was Eduard Bernstein. The dispute was mainly about the "empirical validity of the economic laws of capitalist development and the Marxist prognosis about the increasing centralisation of capital and the growing proletarianisation of (...) the population (...)" (Gronow, 2016, p.36).

Bernstein challenged all three predictions of Orthodox Marxism and did so on the

basis of recent statistical evidence. The debate started in 1896 with an exchange of arguments between Ernest Belfort Bax and Eduard Bernstein in the weekly *Die Neue Zeit*, the leading journal of theoretical Marxism at the time, founded and edited by Kautsky (Tudor and Tudor, 1988, p.11). In 1898, Bernstein formulated a summary of his positions, which culminated in his statement "I frankly admit that I have extraordinarily little feeling for, or interest in, what is usually termed 'the final goal of socialism.' This goal, whatever it may be, is nothing to me; but the movement is everything." (cited after Tudor and Tudor 1988, p.19). This sparked a heated debate involving Bax, Alexander Parvus, Rosa Luxemburg, and Georgi Plekhanov arguing against Bernstein, but also Konrad Schmidt in his support (Tudor and Tudor, 1988, p.19ff). It was only at the party conference in Stuttgart in 1898 that Kautsky joined the debate with a sharp rebuttal of Bernstein, which was widely accepted as the official position of the SPD. In the following years, Bernstein and Kautsky clarified their positions in two books (Bernstein 1899, Kautsky 1899a), which will be our focus. So, what exactly was Berstein's revisionism, and how did Kautsky respond?

On the most general level, Bernstein questioned the Marxist prediction that capitalism will lead to ever-increasing inequality, capital concentration ("centralization") and political revolution. To start with the first prediction, Bernstein (1899, pp.49f) provides evidence from the English, French, Prussian and Saxon income statistics for various years in an attempt to show that the number of middle to high income tax payers has increased, and more generally that capital accumulation was not necessarily associated with any dramatic increase in income inequality or polarization into few rich and many poor. Instead, he argued that there was evidence for a growing middle class and an increasingly differentiated society (Bernstein, 1899, p.51). Moreover, Bernstein doubted that there was evidence in favour of a rising capital share, but could not show this. In his reply, Kautsky (1899a, p.91) showed that Bernstein had used the data selectively, and provided for example a comparison for the years 1876 and 1890 to show that income inequality had indeed increased.

Next, Bernstein (1899, p.58) challenged the prediction of an ever-increasing concentration of capital, using statistical evidence from the occupation and industry census of 1882 and 1895. He showed that the large majority of employees was still working in small and medium-sized enterprises. While Bernstein conceded a tendency towards larger factories, he argued that this was sector-specific and countered for example by the spread of capital ownership in joint stock companies. In his reply, Kautsky clarified that the question of capital concentration was crucial for his concept of Orthodox Marxism: "The concentration of capital sets the historical task: the introduction of a socialist social order. It produces the forces to accomplish this task, the proletarians, and it creates the means of doing so: social production."(Kautsky 1899a, p.54, translation from Gronow 2016). In

his reply to Bernstein, Kautsky revised the statistical evidence and highlighted that employment in small enterprises actually decreased in relative terms. Kautsky also discussed the evidence from income tax statistics to argue that incomes in the highest tax brackets had increased most strongly between 1876 and 1890. Overall, he concluded: "If ever a theory was splendidly confirmed, it was the theory by Marx in the data of the German occupation and industry census." (Kautsky 1899a, p.68, own translation).

Finally, Bernstein questioned the prediction that capitalist development would lead to immiseration of the working class and foster ever-growing political support for socialism among workers. Given the (in his view) weak evidence for other Marxist predictions, and instead evidence for a broadening middle class, the SPD should not rely on any imminent collapse of capitalism, but rather on the role of trade unions, cooperatives and pragmatic work to improve the political and economic conditions for the working classes (Bernstein, 1899, p.168ff). In fact, he argued that the SPD could only succeed if it would change into a democratic party working for social reforms (Gronow, 2016, p.51). In his response, Kautsky had to modify his earlier statements about a deterministic path towards socialism, see, e.g., Kautsky (1892, p.110). He stressed that it would be impossible to "statistically calculate when society has become ripe for socialist production. This production will not merely be a product of economic development, but also of the class struggles arising from this development" (Kautsky, 1899b, translation from Gronow, 2016, p.51). Related to earlier arguments by Rosa Luxemburg, Kautsky restated the Marxist concept of immiseration to mean not physical but social misery, that is "the discrepancy between cultural needs and the means of a wage worker to satisfy them."(Kautsky, 1899a, p.128). And while socialism would not be an automatic outcome of economic development, he pointed to the very remarkable political success of socialism over the last decades, in particular of the SPD in the last years (Kautsky, 1899a, pp.190f.). To summarize, while Kautsky (and the SPD establishment) interpreted any electoral success as a sign of growing inequality and class struggle, Bernstein argued that the party could only win votes by pragmatic work for better living conditions.

In the next section, we present our empirical strategy and findings to shed light on this debate. We are of course aware that these data do not cover all aspects of the debate, nor do they allow us to test "Marxism" in general. But our analysis certainly provides new evidence on core arguments of Orthodox Marxism that were discussed before 1914 and are still influential today.

4 Testing Marx

Our aim in this section is to provide systematic evidence in favour or against the three predictions. To this end, we interpret the predictions as empirically testable (and of

course refutable) hypotheses. We cannot say much about causality, but instead look for robust correlations exploiting the panel structure of our data with fixed effects. Together with several control variables and given the uniform institutional framework of Prussian regions, this limits issues of omitted variables. Moreover, all three Marxist predictions are formulated in terms of strong correlations, with a causal interpretation. Hence, the absence of a robust correlation would be sufficient to refute them. We estimate regressions of the following form:

$$y_{dt} = \beta \cdot x_{dt} + Z'_{dt}\gamma + \alpha_d + \tau_t + \varepsilon_{dt} \tag{4}$$

where the definitions of y_{dt} and x_{dt} depend on the tested hypothesis. Testing the first and the second hypothesis, we regress income inequality (y_{dt}) on capital share and capital concentration (x_{dt}). Testing the third hypothesis, we mainly regress vote shares for the socialist party (y_{dt}) on income inequality (x_{dt}).

Our panel data allow us to include district fixed effects, α_d, which capture time invariant local characteristics like coal reserves or pre-industrial capital. τ_t captures time fixed effects, allowing for common time trends and ε_{dt} represents the error term. Our standard control variables, Z_{dt}, include population density and income per capita. In our regression specification for voting outcomes, we also add turnout as a control variable. Moreover, we allow for more flexible region×year effects in some specifications distinguishing between four regions (North, West, Center, East (see Appendix C for the district classification).

Testing Hypothesis 1: A higher capital share increases income inequality

The results reported in Table 2 provide clear support for the first hypothesis that income inequality rises with the capital share. We find a strong and robust positive correlation between capital share and several measures of income inequality, namely, the top 1% share, the top 10% share and ratio 1/90. We account for unobserved time-invariant district characteristics as well as common shocks by including time and district fixed effects in all specifications.[22] The results remain qualitatively and quantitatively robust if we allow for more flexible region× year fixed effects (columns 2, 4 and 6). Further, the results are robust to using 3-year averages instead of annual values (see Appendix Table F.2). The composition of capital income varies across district types: in industrial districts, most of capital income stems from dividends and interest, while in rural districts, most of capital income stems from renting and leasing.

A 1%-point increase in the capital share is associated with a 0.4%-points higher top 1% share, a 0.6%-points higher top 10% share and a 0.9%-points higher ratio 1/90. This

[22]Visualizing this finding in Figure F.5, we find that the capital share and the top 1% income share increase simultaneously – with the sharpest increase in the more agricultural regions in the east of Prussia.

coefficient implies that a one standard deviation increase in the capital share can explain more than 80% of a standard deviation increase of the top 1% income share.[23] The size of the coefficient is in line with the coefficient found by Bengtsson and Waldenström (2018) in a cross-country panel analysis. In addition, the positive correlation between the capital share and the ratio between the top percentile's and the bottom 90% income share suggests that, indeed, the bottom 90% of the income distribution lose relatively to the top 1% (and that this finding is not about reshuffling within the top 10% of the income distribution).

Hence, the presented results provide evidence that income inequality did increase with the capital share. Note that this is based on strictly comparable data from regions within one country. This is clearly in line with the reasoning of Orthodox Marxism and against the claims made by Revisionists.

Table 2: Capital Share and Income Inequality, 1893-1913

	Top 1% Share		Top 10% Share		Top 1/ Bottom 90	
	(1)	(2)	(3)	(4)	(5)	(6)
Capital Share	0.433***	0.402***	0.681***	0.592***	0.949***	0.881***
	(0.036)	(0.047)	(0.065)	(0.072)	(0.056)	(0.070)
Year FE	✓		✓		✓	
District FE	✓	✓	✓	✓	✓	✓
Region × Year FE		✓		✓		✓
Further Controls	✓	✓	✓	✓	✓	✓
R-squared within	0.76	0.80	0.80	0.86	0.77	0.81
R-squared overall	0.88	0.88	0.95	0.90	0.92	0.89
Observations	588	588	588	588	588	588
Districts	28	28	28	28	28	28
Years	21	21	21	21	21	21
Mean Outcome	0.15	0.15	0.35	0.35	0.23	0.23
SD Outcome	0.04	0.04	0.05	0.05	0.09	0.09

Notes: The unit of observation is the district. Capital share data available from 1893 to 1913. Standard errors clustered on the district level. Further controls include population density and income per capita. * p<0.1, ** p<0.05, *** p<0.01.
Sources: See Appendix B.

Testing Hypothesis 2: Capital concentration increases income inequality

We now turn to the Marxist prediction that rising capital concentration will lead to increasing income inequality. We measure capital concentration by the number of employees per firm (= firm size). We already showed evidence that capital concentration if measured this way sharply increased in rural, mixed and industrial districts alike between 1875 and

[23]For this, we multiply the effect from column 2 with the within-district variation (1.51) and divide this by the within-district variation in the top 1% income share (0.68): $(0.4 \times 1.51)/0.68 = 0.88$

1907. We also noted that this measure is likely to be a lower bound. Overall, these trends support the Orthodox prediction of increasing capital concentration (hypothesis 2a).

When it comes to the relationship between rising concentration and income inequality (hypothesis 2b), the trends presented in Figure 1 suggest that capital concentration decoupled from income inequality since the late 1890s, particularly in industrial districts: While capital concentration continued to increase, inequality hovered around an elevated level in mixed and industrial districts. The results in Table F.3 confirm this observation. We see no significant relationship between firm size and the top 1% share. Interacting our market concentration measure with a post-1895 dummy in columns 3 and 4 (including region year fixed effects) of Table F.3 reveals a negative and significant coefficient after 1895. The baseline coefficient then becomes positive (but stays insignificant). This suggests that an initially weak positive correlation changed in the mid-1890s. This finding speaks against the Orthodox prediction of a strong association between concentration and inequality.

What explains this (maybe surprising) relationship? Historians of the German Empire have argued that the increasing role of trade unions and their strike activity contributed to wage growth and limited income inequality during this period (Kaelble and Volkmann, 1986). In the wake of new trade laws of 1869, a growing number of trade unions had been formed in Germany. They quickly improved their organization and managed to mobilize an increasing part of the industrial workforce, before the anti-socialist laws restricted them from 1878 onwards. After the end of the anti-socialist laws in 1890, unions were allowed to resume their activities.

To empirically test for this explanation, we newly digitized yearly data on strikes for the period 1899-1905 on a county×industry level.[24] We link these data to the newly digitized firm census for 1895, also available on the county×industry level. This approach allows us to employ county and industry fixed effects. We test whether capital concentration measured by firm size in 1895 is associated with more strikes during theses years. The results in Table 3 show throughout a strong positive correlation between capital concentration in 1895 and strike activity in the following decade. This result also holds once we include both, sector and county fixed effects.[25] Taken together, the results presented in Table 3 suggest that union activity in counties with high capital concentration might have kept inequality in check. Based on this evidence, let us test the connection between income inequality and union activities more directly.

To what extent did strikes contribute to a redistribution of income from the top (capitalists) to the bottom (workers) of the income distribution and, thereby, moderated

[24]The statistical office only collected data on this disaggregated level for these years.

[25]The results also hold if we only consider the extensive margin, i.e., construct a dummy variable for at least one strike or successful strike in Appendix Table F.4.

Table 3: Firm Size and Strikes, 1895/1899-1905

	Strikes		Successful Strikes	
	(1)	(2)	(3)	(4)
Firm Size	0.149***	0.068***	0.047***	0.018***
	(0.013)	(0.006)	(0.007)	(0.003)
Industry FE	✓	✓	✓	✓
County FE		✓		✓
R-squared	0.21	0.46	0.10	0.33
Observations	10930	10930	10930	10930
Mean Outcome	0.14	0.14	0.04	0.04

Notes: The unit of observation is county-industry. The accumulated number of successful strikes between 1899 and 1905 is in logs. The capital concentration as of 1895 is in logs. Standard errors are given in parentheses and are clustered on the county level. * p<0.1, ** p<0.05, *** p<0.01.
Sources: See Appendix B.

income inequality? To answer this, we can again use our county panel for the period 1899-1905, for which we have yearly strike data. But not all strikes should have mattered equally, only those that succeeded. Strikes were categorized as successful if employers met the strikers' demands, and higher wages represented the most common demand.[26] Table 4 shows results for three different income inequality measures: the top 1% income share, the bottom 95% income share, and the mean income of the top 1%. A 1% increase in the number of successful strikes reduces the top 1% income share by ca. 0.1 pp (column 1 and 2) and increases the bottom 95% income share by ca. 0.2 pp. These are sizable effects given that, on average, the top percentile received 12% of total income and the bottom 95% received 77%. Apparently, the greater the number of successful strikes, the more income was redistributed from top income earners to the middle and bottom of the distribution. What is more, the top 1% apparently even lost in absolute terms. A 1% increase in the number of successful strikes reduces (!) the top 1% mean income by 1.2-1.3%. In contrast to the relevance of successful strikes, the occurrence of a strike *per se* (successful or not) shows no significant association with income inequality (see Table F.7).[27]

However, this redistributive effect might have been rather temporary. Including time-lags shows that such an effect of strikes was present for one more year fading out thereafter (see Appendix Table F.6). Without an institutionalized wage setting between employers and employees yet (general wage negotiations were to come with the Stinnes-

[26]For example, in 1899, 40% of the strikes were directed towards higher wages, and 13% towards lower working hours (Kaiserliches Statistisches Amt, 1900, p.XV)

[27]We conduct one robustness check: Every fourth strike and almost one third of all successful strikes between 1899 and 1905 occurred on the city of Berlin. We might be concerned that the extensive strike activity in Berlin drives our results. As a robustness check, we exclude Berlin from the regression analysis. Our results remain qualitatively and quantitatively unchanged when excluding Berlin (see Appendix Table F.5).

Table 4: County-Year Income Inequality and Strikes, 1899-1905

	Top 1% Share		Bottom 95% Share		Top 1% Mean Income	
	(1)	(2)	(3)	(4)	(5)	(6)
Successful Strikes	-0.001***	-0.001***	0.002***	0.002***	-0.013***	-0.012***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.004)	(0.004)
Year FE	✓	✓	✓	✓	✓	✓
County FE	✓	✓	✓	✓	✓	✓
Controls		✓		✓		✓
R^2 within	0.29	0.32	0.17	0.23	0.40	0.42
R^2 overall	0.00	0.09	0.01	0.30	0.00	0.27
Observations	3045	3045	3045	3045	3045	3045
Counties	435	435	435	435	435	435
Years	7	7	7	7	7	7
Mean Outcome	0.12	0.12	0.77	0.77	9.42	9.42

Notes: The unit of observation is the county. Number of successful strikes and top 1% mean income are in logs. Further controls include urban population share, capital concentration, agricultural employment share. Standard errors clustered on the district level displayed in parentheses. * p<0.1, ** p<0.05, *** p<0.01.
Sources: See Appendix B.

Legien Agreement in November 1918), new strikes were needed to reduce top incomes and increase the relative income of the workers.

To summarize, we do observe an increase in capital concentration which is in line with the predictions of the Orthodox Marxists. But we do not observe a corresponding increase in income inequality. Instead, our results strongly suggest a role of strikes as counter-force, which speaks to the reasoning of the Revisionists. Apparently rising worker power helped to limit inequality before 1914.

Testing Hypothesis 3: Income inequality fosters support for socialism

In the last part of our empirical analysis, we examine the political consequences of income inequality. Orthodox Marxists predicted that rising inequality, notably the immiseration of workers, would strengthen political support for socialism.

Is there evidence for a growing immiseration of workers in late 19th century Germany? Wage data show the opposite (and we are not the first to point this out, see for example Allen (2009) on the UK). Detailed wage data for day laborers from Becker et al. (2014) show that wages increased even for these precariously employed workers. On average, wages for rural day laborers increased by 22% between 1892 and 1901, wages for urban day laborers by 16%. Different estimations for real wages in Germany over this period point into the same direction (Ritter and Tenfelde, 1992, p.491-496). Our average income measure based on income tax statistics also documents an upward trend (see Ap-

pendix Figure D.1). Given the increase in wages (across regions) and the simultaneous surge in votes for the SPD (see Figure 1d), we have to reject the first part of the political hypothesis put forward by the orthodox Marxists: There is no evidence for a growing immiseration of workers and, hence, no evidence for such a situation providing the ground for the political success of socialism.

Still, the rise of the socialist party might be related to increasing top income inequality, provided that the increase in wages was smaller than gains at the top. The SPD vote share increased from less than 10% in the 1870s to more than 30% in mixed and industrial districts in 1912 (see Figure 1d). As described in Section 3, the social democrats openly addressed the issue of inequality during this period. The SPD considered increasing capital concentration and unequal gains from industrialization as decisive economic problems. Therefore, in their famous revolutionary *Erfurter Program* from 1891, they called for, among other things, the abolition of private property, better protection for workers, and a more progressive tax system. Clearly, the vote share for the SPD was higher in districts with higher levels of income inequality (see Figure 1). But is this finding robust in a panel with fixed effects?

Table 5 displays our results for a panel with fixed effects. As already highlighted in Figure 1, the political support for the socialist party grows at a fast pace since the mid-1880s (only interrupted by the election in 1907, when the Socialists suffered a temporary backlash due to nationalist agitation in the context of Germany's colonial policy). In contrast, top 1% income shares fluctuated at an elevated level in industrial regions, where support for the socialist party was particularly pronounced. Columns 1 to 3 show results for 28 administrative districts and columns 4 and 5 show results for 224 constituencies. In column 1, we exploit the full length of our panel that offers inequality data on the district level from 1874 to 1912. In column 2, we restrict the district panel to the years, where we can estimate constituency-level inequality, which starts with the election of 1893. Columns 2 and 4 show results for districts and constituencies, respectively, including fixed effects and controls.

The results in table 5 suggest no relationship between income inequality and socialist votes bfeore 1914, neither at the level of districts (col. 1 and 2) nor at the level of constituencies (col. 4). Hence, instead of the Marxist prediction of growing class struggle, it might have been the successful activity of trade unions that mobilized workers to vote for the socialists as argued by the revisionists. The share of union members in the population increased rapidly from ca. 0.2-0.3% in the 1890s to more than 1% in 1907, reaching even 6-10% in Berlin, Bielefeld, parts of Brandenburg, Frankfurt a.M., Kassel, Kiel, and Magdeburg (see Appendix Figure F.7). With this, the influence of trade unions within the socialist movement grew.[28] Although the Orthodox Marxists still had their stronghold

[28]This is epitomized by the Mannheim agreement of 1906 between the SPD and trade unions that

Table 5: District- and Constituency-Year Inequality and SPD Votes, 1874-1912

	(1)	(2)	(3)	(4)	(5)
		District		Constituency	
Top 1% Share	-0.674	-0.492	-0.096	-0.339	-0.013
	(0.666)	(0.466)	(0.466)	(0.426)	(0.436)
Union Members			1.499***		0.911**
			(0.528)		(0.395)
Year FE	✓	✓	✓	✓	✓
District FE	✓	✓	✓		
Constituency FE				✓	✓
Further Controls	✓	✓	✓	✓	✓
R-squared within	0.78	0.65	0.67	0.43	0.36
R-squared overall	0.59	0.30	0.43	0.34	0.43
Observations	279	112	112	1120	896
Districts/Constituencies	28	28	28	224	224
Elections	10	4	4	5	4
Mean Outcome	0.14	0.20	0.20	0.19	0.18
SD Outcome	0.13	0.13	0.13	0.17	0.16

Notes: Unit of observation is the district in Column 1-3 and constituency in columns 4-5. Further controls include ln income per capita, share of urban population, capital concentration, share of industrial employment, turnout. We include the elections from 1874, 1881, 1884, 1887, 1890, 1893, 1898, 1903, 1907, and 1912 in Column 1 and 1893, 1898, 1903, and 1907 in Columns 2,3 and 5. Column 4 also includes 1912. Unions are measured by the share of union members in the district's population and data is not available for the election in 1912. Standard errors in parentheses. Standard errors are clustered on the district level. * p<0.1, ** p<0.05, *** p<0.01.
Sources: See Appendix B.

within the party, a more pragmatic, reform-oriented strategy slowly started to become the dominant position within the SPD. Did the reformist strategy of strengthening the position of workers through strikes and unionization actually work in favor of the SPD? In order to more closely investigate the role of trade unions, we add a control for union membership to our regression in columns 3 and 5 on the district- and constituency-level, respectively. Introducing union membership reveals a highly significant and positive coefficient. A 1 percentage point increase in union members is associated with a 0.9-1.4 pp increase in SPD votes. Clearly, this need not reflect any causality, but it lends support to the hypothesis that pragmatic policies and active voter mobilization through the unions may have attracted more votes than rising inequality per se. Regarding the third hypothesis, the Marxists were wrong.

established their strategic role for the years to come (Nipperdey, 2013, pp.568ff).

5 Conclusion

The German Empire in the late 19^{th} century provides us with a case study on the dynamics of income inequality, concentration and socialism. We compiled new panel data or Prussian districts 1871-1914 to look back at one of the most important debates on Marxism: the "Revisionism Debate" between Orthodox Marxists and their critics. Let us summarize our main results with an overall verdict. Who was right?

With regard to the first hypothesis on the relationship between inequality and the capital share, the Orthodox Marxists around Kautsky were clearly right. We find a strong and robust relationship between these two variables. For Imperial Germany before 1914, we have strong evidence that capital accumulation led to a growing share of capital in income and contributed to income inequality, as first predicted by Karl Marx and believed by his followers, but contested by their critics.

Next, both camps, the revisionists and the Orthodox, were half right and half wrong about the role of concentration within the process of capital accumulation. The Orthodox were right in their prediction that capital concentration was indeed strongly rising. However, they were wrong in their conviction that this would unambiguously be linked to rising income inequality. The revisionists around Bernstein, on the other hand, were wrong in their claim that concentration was stagnating. But they rightly pointed to limiting factors, and alternatives to ever-increasing inequality. Indeed, we could provide evidence that it was probably the revisionist strategy of strike activity, especially so in the more concentrated industry branches, that helped to limit a further increase in income inequality.

Regarding the third aspect of the debate, social democrats discussed the relationship between inequality and support for socialism. Here the evidence proved the Orthodox Marxists around Kautsky wrong, with their idea of continued immiseration leading to growing political support for the socialist movement and also with their more general prediction that rising income inequality would motivate workers to vote for socialism. Instead, we find that wage growth was (weakly) related to votes for the SPD. It was rather the activity of trade unions, which in turn contributed to wage growth, but also fought more broadly for better working conditions, that activated the electorate to vote for the SPD.

Overall, the debate ends with a draw. The Orthodox Marxists before 1914 had rightly predicted the tendencies towards rising inequality and concentration. However, they had underestimated the power of workers once they organized themselves in trade unions, which in turn was facilitated by the very process of concentration of capital reflected in growing average size of firms. The possibility of institutional change that could limit inequality and let worker benefit from industrial growth was not part of Marxist

predictions.

Finally, let us return to the present debate. First, the observed trends in income inequality, capital share and concentration are similar today and back then. This might surprise, given the fundamental changes in technology and society over the last 150 years. Second, the lack of a positive correlation between capital concentration and inequality already before 1914 highlights the importance of institutions such as trade unions and strikes, which acted as offsetting factors. However, these institutions were successful within a national framework, with growing political participation. Clearly, it has become more difficult to counter capital concentration and maintain the bargaining power of workers today. This is probably related to the global mobility of multinational firms and capital markets, compared to a still very limited mobility of people. Third, we only find a weakly positive relation between income inequality and votes for the socialists before 1914, frankly against our priors and against any simple neoclassical intuition, but in line with findings on the more recent decades. Apparently, what mattered more for election success of socialists was a pragmatic approach to the well-being of people, and its organizational backbone in form of trade unions. Marx is dead, but the debate about economic inequality, its drivers and political consequences is far from closed.

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Appendix

A Income tax regimes

In the following, the evolution of income tax regimes in Prussia is briefly presented. The Prussian income tax legislation can be divided into four phases: class taxation from 1821 to 1850 (1), class taxation and classified income taxation coexisting with a consumption tax (grind and butcher tax) in bigger cities from 1851 to 1873 (2), class tax and classified income tax from 1874 to 1890 (3), and modern income tax from 1891 to 1918 (4).

The class tax introduced in Prussia in 1820 is only of limited use for the estimation of income concentration because the assignment into a class hinges on the social class and not on income. Still, some contemporary authors argue that the class assignment was strongly related to the income position or earnings ability.[29] 12 subclasses were distinguished to which authorities of the municipality assigned all households[30] according to their social class. The second important drawback of the class tax is the fact that inhabitants of the biggest cities were not subject to the class tax, but instead had to pay grind and butcher tax (*Mahl- und Schlachtsteuer*) on flour and meat consumption.[31] We might thus worry to underestimate the concentration at the top (1) if the class membership does not perfectly reflect the position in the income distribution, (2) if more top income earners lived in the biggest cities than on the country side, and (3) if top income earners transferred their residence to a bigger city subject to grind and butcher tax in order to evade the class tax.

In 1851, a new classified income tax (*klassifizierte Einkommensteuer*) replaced both the class tax as well as the grind and butcher tax for all tax units with incomes above 3.000 Mark. The new classified income tax roughly applied to the top 2% of the tax units (or 1% of the population) and was levied on income from real estate, business, wages, interest rates and other capital income. However, incomes were estimated by a local committee such that top incomes are most likely to be systematically underestimated.[32] Since 1851, the class tax also incorporated explicit income bands, but the assignment to a class was under the responsibility of the Prussian administration and not revised annually, thereby potentially neglecting annual income fluctuations (Grant, 2002).

In tax year 1874, the grind and butcher tax was abolished and income taxation (classified and class tax) equally applied to cities and rural areas. Taxable income was defined as income from capital, renting and leasing, business, trade, and employment.

In 1891, a far-reaching income tax reform finally abolished the class tax. The definition of taxable income remained unchanged (§7 EStG). All households with incomes

[29] Engel (1868), director of the Prussian statistical office, states that the four classes of the class tax encompassed the very rich, the rich, less wealthy townsmen and peasants and the lowest class servants and day laborer. His predecessor Dieterici (1849) refers to the four classes as *patricians, bourgeoisie, petty bourgeoisie, secondary citizens* in the city and *landlords, landowners with allodial title, peasants* and *landless farm workers* on the country-side. The tax was judged to be regressive by contemporary authors: The tax of highest class paid 48 times the tax of lowest class, even though top class citizens probably earned more than 100 times more than the lowest class (Dieterici, 1849).

[30] Tax units were mostly close family members including other relatives in the household without own income. Tax units in the lowest class were individuals, but not more than two tax units per household (Geisenberger and Müller, 1972).

[31] In 1820, the grind and butcher tax applied in 132 bigger cities which was reduced to 83 cities in 1851 (Ketterle, 1994).

[32] Taxpayers brought before court in the Prussian city Bochum in 1891 admitted to have earned incomes more than twice as high than estimated by the local authorities for the tax collection (Wagner, 1891, p.587).

higher than 900 Mark were subject to a progressive income tax, which applied to 23% of the tax units or 31% of the population in Prussia. The share of the taxed population steadily increased and reached 50% in 1913. Most importantly, the obligation to file a tax return is introduced for incomes above 3,000 M (about 3% of tax units) which the authorities cross-checked with their own information (§24 EStG).

The obligation for top income earners to file a tax return induces an upward shift of top incomes in many districts, particularly in rich districts like Wiesbaden and Köln. This provides further evidence that the tax authorities underestimated top incomes before 1891. Therefore, we adjust our top income share series 1874-1890 upwards, proportionately to the shift we observe between 1890 and 1891.

B Data sources

Overview

Top 1% income share. For details see section 2. Available between 1874-1876 as well as 1880-1913. To calculate the top 1% income share, we digitize the sources listed in Appendix Table B.1.

Capital share. For details see section 2. Available between 1893-1913. To calculate the capital share, we digitize the income tax statistics listed in Appendix Table B.1.

Firm size. Average firm size. Constructed using district-level data reported by the Prussian statistical office for 1875 and 1882 and county-level data reported by the German statistical office for 1895 and 1907. The data allow also to calculate firm size by sector. We use volumes 40 and 83 of the *Preussische Statistik, Amtliches Quellenwerk* and volumes 116 and 218 of the *Statistik des Deutschen Reichs, Neue Folge.*

Votes for the SPD (share). We use election results provided by Caramani (2004). These data include the number of people allowed to vote, turnout and votes for all parties over multiple ballots for *Reichstag* elections. Available for elections in 1871, 1874, 1877, 1878, 1881, 1884, 1887, 1890, 1893, 1898, 1903, 1907, 1912.

Population density. Based on data provided by Galloway (2007), available for 1871, 1875, 1880, 1885, 1890, 1895, 1905, and 1910.

Employment (share). Occupation by sector on a county-level is reported in the German national statistics. We divide employment in industry or agriculture by total employment. This share is available for 1882, 1895, and 1907. We use volumes 2, 109, and 209 of the *Statistik des Deutschen Reichs, Neue Folge.*

Strike activity. The *Statistik des Deutschen Reichs, Neue Folge* lists all strikes for the years between 1899 and 1905 by sector and place. We aggregate these data to district-level. We use the following volumes of the *Statistik des Deutschen Reichs, Neue Folge*: 134, 141, 148, 157, 164, 171, and 178.

Sources of income tax statistics

The Prussian statistical office regularly published tabulations with the number of taxpayers per income bracket and the aggregated tax or aggregated taxable income per income bracket. These tables are the source of information for the distribution of top incomes. Sources for income tax tabulations by district used for the estimation of top income shares in Prussian administrative districts are given in Table B.1. Income is generated in the year preceding the tax year, e.g., incomes taxed in 1914 are generated in 1913. For the tax years 1874 to 1891, tabulations by district are published in volumes of *Anlagen zu den Stenographischen Berichten über die Verhandlungen des Hauses der Abgeordneten*; for the tax years 1892 to 1914, tabulations by district are published in in volumes of *Statistik der preußischen Einkommensteuer-Veranlagung.*

Table B.1: Sources of Income Tax Statistics for Prussia

Tax year	Source
1874	Stenogr. Berichte über die Verhandlungen des Hauses der Abgeordneten, 1875
1875	Stenogr. Berichte über die Verhandlungen des Hauses der Abgeordneten, 1876
1876	Stenogr. Berichte über die Verhandlungen des Hauses der Abgeordneten, 1877
1877	Stenogr. Berichte über die Verhandlungen des Hauses der Abgeordneten, 1877/78
1881	Stenogr. Berichte über die Verhandlungen des Hauses der Abgeordneten, 1882
1882	Stenogr. Berichte über die Verhandlungen des Hauses der Abgeordneten, 1882/83
1883	Stenogr. Berichte über die Verhandlungen des Hauses der Abgeordneten, 1883/84
1884	Stenogr. Berichte über die Verhandlungen des Hauses der Abgeordneten, 1885
1885	Stenogr. Berichte über die Verhandlungen des Hauses der Abgeordneten, 1886
1886	Stenogr. Berichte über die Verhandlungen des Hauses der Abgeordneten, 1887
1887	Stenogr. Berichte über die Verhandlungen des Hauses der Abgeordneten, 1888
1888	Stenogr. Berichte über die Verhandlungen des Hauses der Abgeordneten, 1889
1889	Stenogr. Berichte über die Verhandlungen des Hauses der Abgeordneten, 1890
1890	Stenogr. Berichte über die Verhandlungen des Hauses der Abgeordneten, 1890/91
1891	Stenogr. Berichte über die Verhandlungen des Hauses der Abgeordneten, 1892
1892/93	Statistik der preußischen Einkommensteuer-Veranlagung, 1892/93
1894/95	Statistik der preußischen Einkommensteuer-Veranlagung, 1895/96
1896	Statistik der preußischen Einkommensteuer-Veranlagung, 1896/97
1897/98	Statistik der preußischen Einkommensteuer-Veranlagung, 1898
1899	Statistik der preußischen Einkommensteuer-Veranlagung, 1899/1901
1900/01	Statistik der preußischen Einkommensteuer-Veranlagung, 1901
1902	Statistik der preußischen Einkommensteuer-Veranlagung, 1902/04
1903/04	Statistik der preußischen Einkommensteuer-Veranlagung, 1904
1905	Statistik der preußischen Einkommensteuer-Veranlagung, 1905/07
1906	Statistik der preußischen Einkommensteuer-Veranlagung, 1907
1907/08	Statistik der preußischen Einkommensteuer-Veranlagung, 1908/10
1910	Statistik der preußischen Einkommensteuer-Veranlagung, 1910
1911/12	Statistik der preußischen Einkommensteuer-Veranlagung, 1912
1913/14	Statistik der preußischen Einkommensteuer-Veranlagung, 1914

Note: Income is generated in the year preceding the tax year. For example, incomes taxed in 1914 are generated in 1913.

C Districts in Prussia

To harmonize the districts over time, we make the following four adjustments.

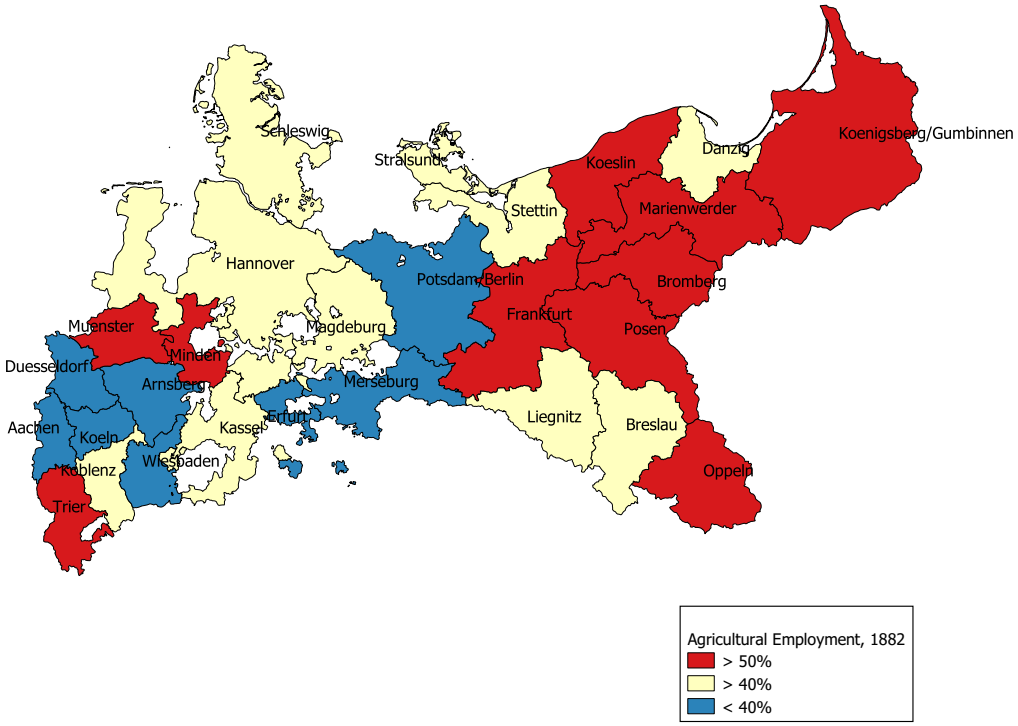
- We combine Aurich, Hildesheim, Stade, Lüneburg, Osnabrück to Hannover.
- We combine Gumbinnen, Königsberg, and Allenstein to Königsberg/Gumbinnen.
- We combine Berlin and Potsdam to Berlin/Potsdam.
- We drop Sigmaringen.

We classify the districts into four regions when we employ region×year effects.

- North: Schleswig; Hannover (consisting of six districts)
- West: Aachen, Arnsberg, Düsseldorf, Frankfurt, Kassel, Koblenz, Köln, Minden, Münster, Trier, Wiesbaden
- Center: Potsdam/Berlin, Erfurt, Breslau, Liegnitz, Magdeburg, Merseburg, Oppeln
- East: Bromberg, Danzig, Königsberg/Gumbinnen, Köslin, Marienwerder, Posen, Stettin, Stralsund

Figure C.1 provides the necessary geographic knowledge about Prussian districts. Moreover, we categorize the districts as in Figure 1.

Figure C.1: Districts by agricultural employment



Sources: See Appendix B.

D Reference total income

There are two approaches to derive the reference total income. The bottom-up approach adds the (estimated) income of tax exempt to the taxpayers' income documented in the income tax statistics. The top-down approach draws on national accounts and obtains reference total income as a fixed share of private household income documented in national accounts. National accounts provide a useful benchmark both regarding consistency over time and comparability across countries via the United Nations' System of National Accounts (SNA) first charted in 1947 and the European System of Accounts (ESA) which is a modification of SNA. We apply the bottom-up approach as national accounts were first produced in Germany in the interwar period.

During our period of observation, incomes recorded in income tax statistics represent the most reliable source for national income (Helfferich, 1917, p.91). The most consistent series of national income (*Volkseinkommen*) in Germany and German states is the series of Hoffmann and Müller (1959). Their numbers are based on tax incomes augmented by estimated non-filer income. Despite recurring criticism of this series, no attempt of replacing it has been undertaken.[33] In order to compute household income, Hoffmann and Müller (1959) estimate non-filers' income in German states. Applying the bottom-up approach, the reference total income 1874-1913 is obtained as

Tax income recorded in tax statistics (1)

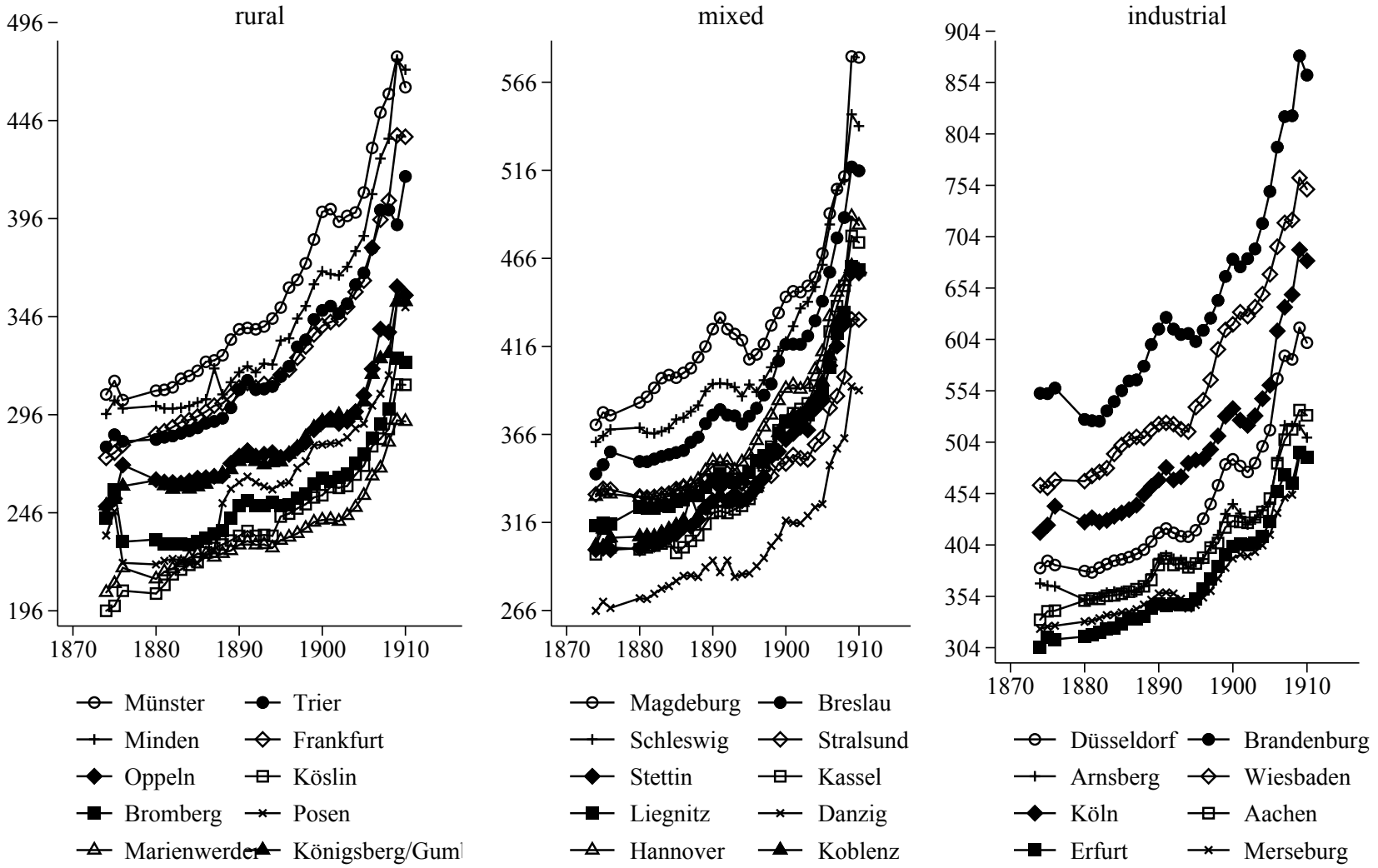
\+ Income of non-filers with income beneath the tax allowance (from Hoffmann and Müller 1959) (2)

= Reference total income

Tax income (1) per income bracket is imputed under the assumption that incomes are Pareto distributed following Piketty and Saez (2003). The group of non-filers (2) consists of two subgroups. The first group is exempted because their income is below the exemption limit of the income tax. The Statistical Office (Statistisches Reichsamt, 1932) published an estimate of the average income of tax-exempted non-filers for the year 1913. We follow Hoffmann and Müller (1959) and deflate the 1913 figures with the wage index for average gross wages in the industrial and agricultural sector from 1870 to 1914 from Kuczynski (1947). The second group is exonerated from tax statistics because of personal circumstance that reduce the capability to generate income such as the number of children, sickness, and indebtedness (§18 and §19 Prussian EStG 1891). This group exists since the tax reform in 1891. Average income of exonerated tax units in Prussia from 1891 to 1913 and in each province in 1907 is provided by the Statistical Office (Statistisches Reichsamt, 1932). As we do not have further information, we assume that average income of this group is equal across districts within a province. We deflate 1907 province average incomes using an index for Prussia 1891-1913. Figure D.1 displays the evolution of total reference income per capita in Prussian administrative districts.

[33] See, e.g., Fremdling (1988).

Figure D.1: Reference total income per capita in RM in Prussian districts, 1874-1913



Source: See Appendix B and Hoffmann and Müller (1959).

E Reference total population

The reference total population is needed to compute the number of tax units that represent a particular fractile of the population, such as the top percentile or the top decile. In general, there are two approaches to derive the reference total population. The bottom-up approach adds the (estimated) number of tax exempt to the number of taxpayers documented in the income tax statistics. The top-down approach draws on population statistics and obtains total tax units as the sum of married couples and bachelors reduced by the number of children. For the period 1874-1913, the number of tax exempt is documented in income tax statistics in Prussia. Hence, we can apply the bottom-up approach and obtain our reference total population as

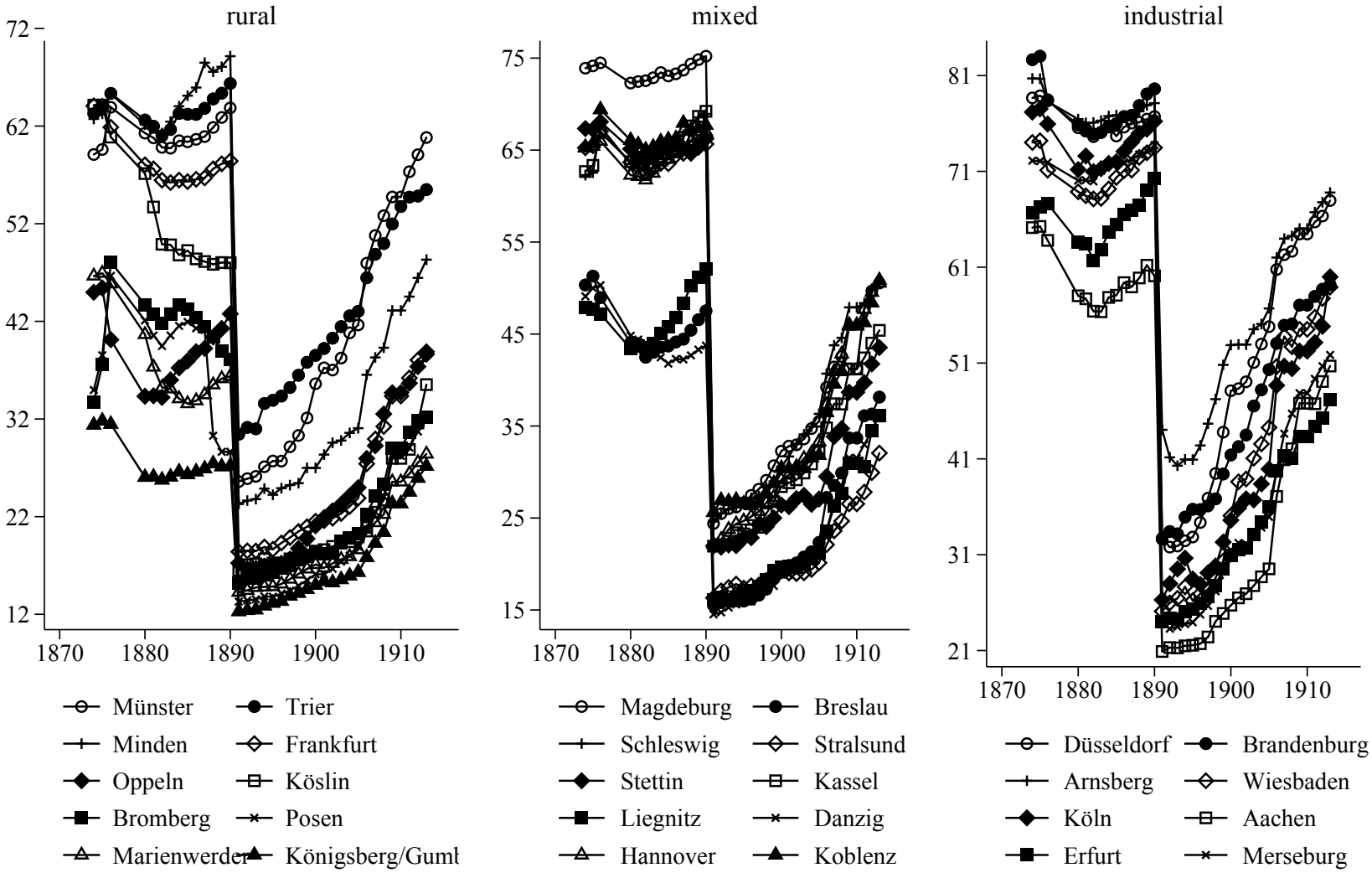
number of tax units recorded in tax statistics

+ tax exempt

= reference total population

Figure E.1 shows that more than half of the population were taxpayers across Prussian districts from 1874 to 1890. This share was reduced by the introduction of a tax allowance in 1891 and then steadily increased.

Figure E.1: Share of taxpayers in total population in Prussian districts (%), 1874-1913



Source: See Appendix B.

F Tables and Figures

Table F.1: Summary Statistics

Variable	Mean	SD
Measurement of Inequality		
Top 1% Share	14.24	3.99
Ratio 1 to 90	22.50	8.76
Capital Share	21.32	6.61
Average Firm Size	3.01	1.04
Political Polarization		
% Share Social Democrats	12.48	12.90
Further Controls		
Income p.c.	372.33	107.92
Population Density (in 1000)	112.18	81.21
% Turnout	69.66	11.70

Sources: See Appendix B.

Table F.2: Capital Share and Income Inequality, 1893-1912, 3-year averages

	Top 1% Share		Top 10% Share		Top 1/ Bottom 90	
	(1)	(2)	(3)	(4)	(5)	(6)
Capital Share	0.412***	0.372***	0.661***	0.559***	0.915***	0.825***
	(0.042)	(0.052)	(0.072)	(0.076)	(0.061)	(0.078)
Year FE	✓		✓		✓	
District FE	✓	✓	✓	✓	✓	✓
Region × Year FE		✓		✓		✓
Further Controls	✓	✓	✓	✓	✓	✓
R-squared within	0.74	0.79	0.78	0.85	0.76	0.79
R-squared overall	0.88	0.88	0.95	0.90	0.92	0.88
Observations	560	560	560	560	560	560
Districts	28	28	28	28	28	28
Years	20	20	20	20	20	20
Mean Outcome	0.15	0.15	0.35	0.35	0.23	0.23
SD Outcome	0.04	0.04	0.05	0.05	0.09	0.09

Notes: Unit of observation: district. Standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01. Standard errors are clustered on the district level. Further controls include population density and income per capita.
Sources: See Appendix B.

Table F.3: Firm Size and Income Inequality, 1875-1907

	Top 1% Income			
	(1)	(2)	(3)	(4)
Firm size	-0.414	-0.271	0.680	0.168
	(0.285)	(0.405)	(0.488)	(0.473)
Firm size × Post1895			-0.895***	-0.770**
			(0.259)	(0.304)
Year FE	✓	✓	✓	
District FE	✓	✓	✓	✓
Region × Year FE				✓
Further Controls		✓	✓	✓
R-squared within	0.67	0.67	0.72	0.77
R-squared overall	0.01	0.00	0.18	0.06
Observations	112	112	112	112
Districts	28	28	28	28
Years	4	4	4	4

Notes: Unit of observation: district. Standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01. Standard errors are clustered on the district level. Further controls include population density and income per capita.
Sources: See Appendix B.

Table F.4: Firm Size and Strikes, 1895-1907

	Dummy Strike		Dummy Success	
	(1)	(2)	(3)	(4)
Firm Size	0.110***	0.058***	0.042***	0.020***
	(0.007)	(0.005)	(0.004)	(0.003)
Industry FE	✓	✓	✓	✓
County FE		✓		✓
R-squared	0.21	0.37	0.11	0.25
Observations	10930	10930	10930	10930
Mean Outcome	0.12	0.12	0.04	0.04

Notes: The unit of observation is county-industry. The accumulated number of successful strikes between 1899 and 1907 is in logs. The capital concentration as of 1895 is in logs. Standard errors are given in parentheses and are clustered on the county level. * p<0.1, ** p<0.05, *** p<0.01.
Sources: See Appendix B.

Table F.5: County-Year Income Inequality and Successful Strikes excl. Berlin, 1900-1905

	Top 1% Share		Bottom 95% Share		Top 1% Mean Income	
	(1)	(2)	(3)	(4)	(5)	(6)
Successful Strikes	-0.001***	-0.003***	0.002***	0.004***	-0.013***	-0.027***
	(0.000)	(0.001)	(0.000)	(0.001)	(0.004)	(0.007)
Year FE	✓	✓	✓	✓	✓	✓
County FE	✓	✓	✓	✓	✓	✓
Further Controls		✓		✓		✓
R-squared within	0.29	0.33	0.17	0.24	0.40	0.43
R-squared overall	0.00	0.11	0.01	0.31	0.00	0.29
Observations	3038	3038	3038	3038	3038	3038
Counties	434	434	434	434	434	434
Years	7	7	7	7	7	7
Mean Outcome	0.12	0.12	0.77	0.77	9.42	9.42

Notes: The unit of observation is the county. Number of successful strikes and outcome variables are in logs. Further controls include urban population share, firm size, agricultural employment share. Standard errors clustered on the district level displayed in parentheses. * p<0.1, ** p<0.05, *** p<0.01.
Sources: See Appendix B.

Table F.6: County-Year Income Inequality and Successful Strikes including Lags, 1901-1905

	Top 1% Share		Bottom 95% Share		Top 1% Mean Income	
	(1)	(2)	(3)	(4)	(5)	(6)
Successful Strikes	-0.001***	-0.001***	0.001***	0.001***	-0.011***	-0.010***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.003)	(0.003)
L.Successful Strikes	-0.001**	-0.001**	0.001***	0.001**	-0.009**	-0.010**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.004)	(0.004)
L2.Successful Strikes	-0.000	-0.000	0.000	0.000	-0.003	-0.004
	(0.000)	(0.000)	(0.000)	(0.000)	(0.004)	(0.004)
Year FE	✓	✓	✓	✓	✓	✓
County FE	✓	✓	✓	✓	✓	✓
Further Controls		✓		✓		✓
R-squared within	0.37	0.38	0.23	0.27	0.55	0.56
R-squared overall	0.01	0.04	0.04	0.16	0.00	0.15
Observations	2175	2175	2175	2175	2175	2175
Counties	435	435	435	435	435	435
Years	5	5	5	5	5	5
Mean Outcome	0.12	0.12	0.77	0.77	9.42	9.42

Notes: The unit of observation is the county. Number of successful strikes and outcome variables are in logs. Further controls include urban population share, firm size, and agricultural employment share. Standard errors clustered on the district level displayed in parentheses. * p<0.1, ** p<0.05, *** p<0.01.
Sources: See Appendix B.

Table F.7: County-Year Income Inequality and Strikes, 1899-1905

	Top 1% Share		Bottom 95% Share		Top 1% Mean Income	
	(1)	(2)	(3)	(4)	(5)	(6)
Strikes	-0.000	-0.000	0.000	0.000	-0.003	-0.002
	(0.000)	(0.000)	(0.000)	(0.000)	(0.004)	(0.003)
Year FE	✓	✓	✓	✓	✓	✓
County FE	✓	✓	✓	✓	✓	✓
Further Controls		✓		✓		✓
R-squared within	0.28	0.32	0.17	0.22	0.40	0.42
R-squared overall	0.00	0.08	0.00	0.28	0.00	0.25
Observations	3045	3045	3045	3045	3045	3045
Counties	435	435	435	435	435	435
Years	7	7	7	7	7	7
Mean Outcome	0.12	0.12	0.77	0.77	9.42	9.42

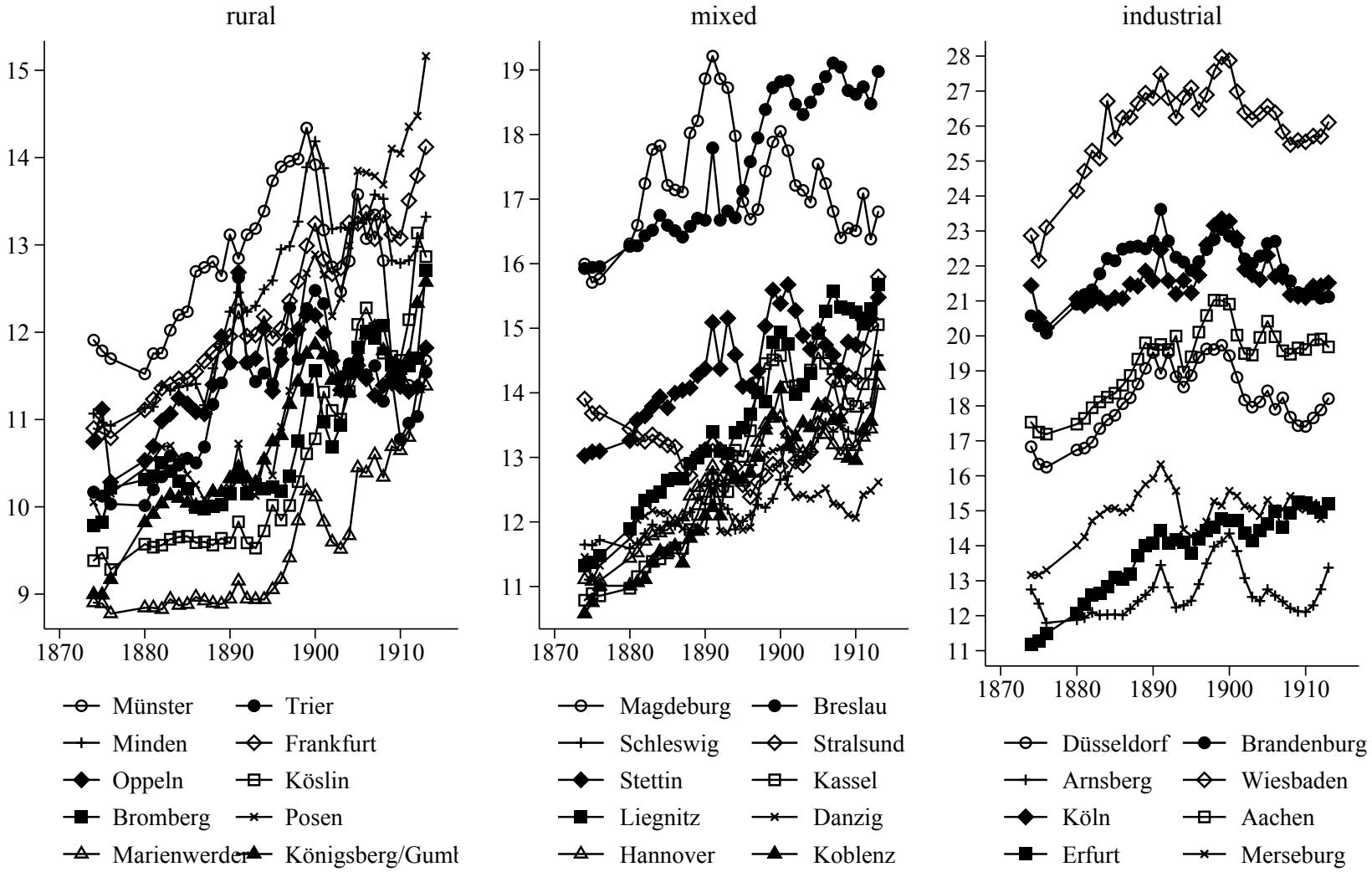
Notes: The unit of observation is the county. Number of successful strikes and outcome variables are in logs. Further controls include urban population share, firm size, and agricultural employment share. Standard errors clustered on the district level displayed in parentheses. * p<0.1, ** p<0.05, *** p<0.01.
Sources: See Appendix B.

Table F.8: Strikes and Firmsize by Sector

Sector	Firm Size		Dummy Strike	
	mean	sd	mean	sd
Construction	5.391	3.449	0.553	0.498
Accommodation	2.346	0.511	0.007	0.084
Clothing	1.509	0.256	0.150	0.357
Mining	119.872	247.605	0.151	0.358
Chemistry	9.539	2.565	0.027	0.162
Trade	1.898	0.375	0.068	0.253
Timber	2.604	1.154	0.284	0.451
Art	1.848	2.019	0.025	0.158
Nursery	2.562	1.643	0.014	0.120
Leather	2.781	2.621	0.089	0.285
Phosphor and Oils	8.745	11.737	0.025	0.157
Machinery	5.645	9.879	0.128	0.335
Metal	3.407	2.755	0.195	0.397
Food	3.548	1.692	0.163	0.369
Paper	7.061	1.286	0.049	0.217
Printing	5.756	3.816	0.057	0.232
Stones	1.347	1.109	0.186	0.389
Textiles	6.020	1.536	0.123	0.328
Animal Husbandry	2.376	1.540	0	0
Transport	2.033	1.148	0.074	0.262
Insurance	1.360	1.105	0	0
Total	8.254	4.946	0.115	0.319

Notes: Table reports mean and standard deviation over all counties by sector for two variables: average firm size and dummy strike.
Sources: See Appendix B.

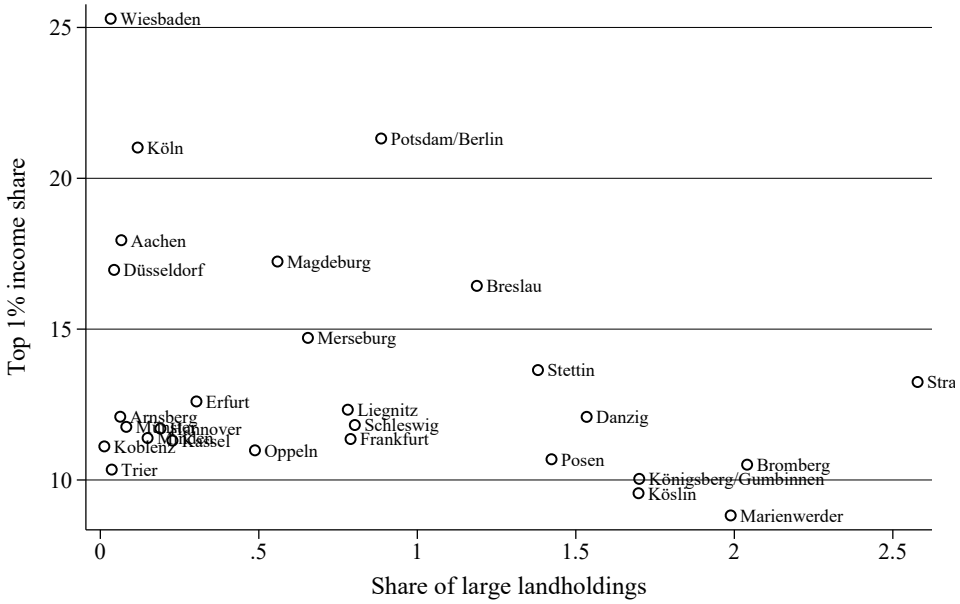
Figure F.1: Top 1% income share (%) in Prussian districts, 1874-1913



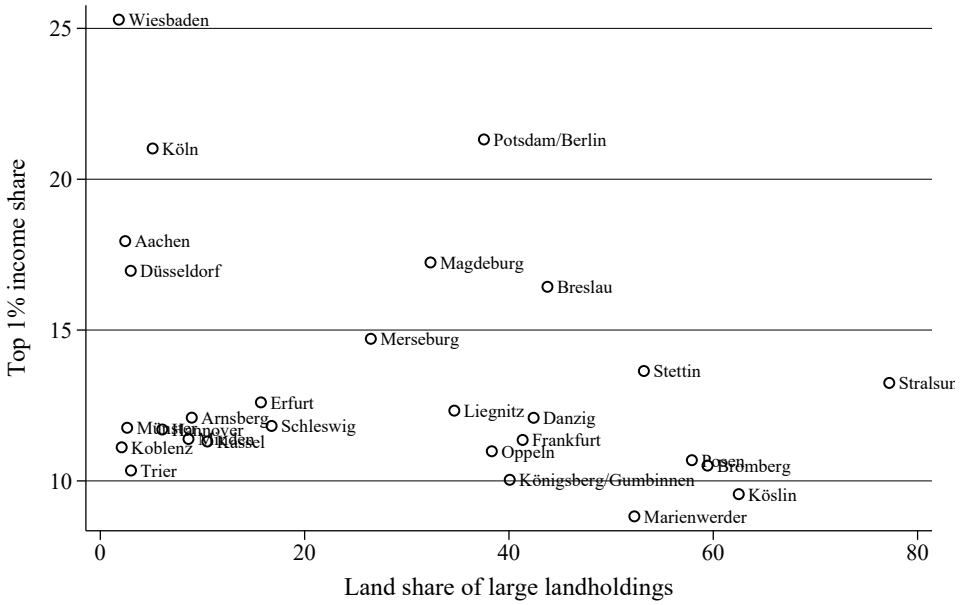
Sources: See Appendix B.

Figure F.2: Land inequality vs. income inequality, 1882

(a) Large landholdings and top 1%

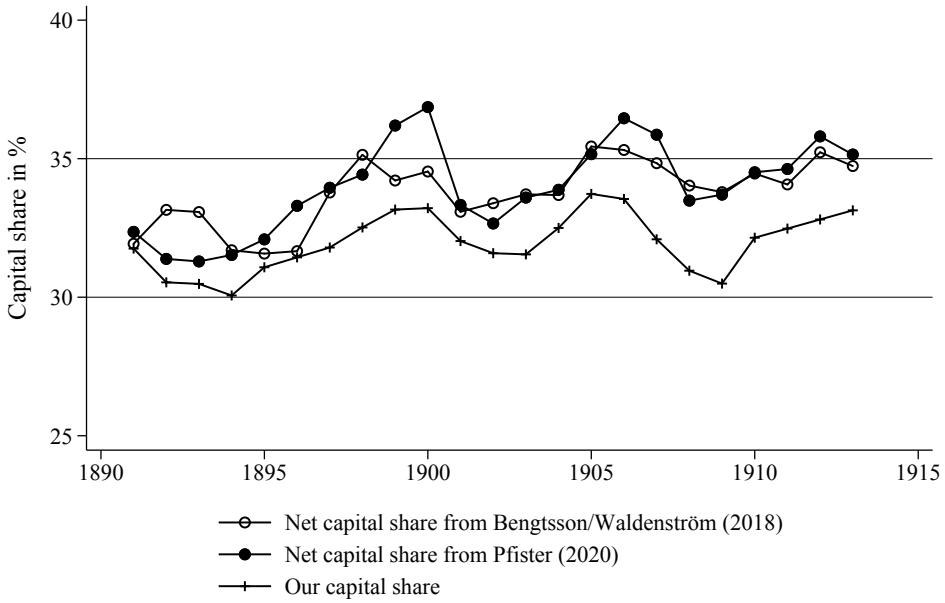


(b) Land owned by large landholdings and top 1%



Notes: Share of large landholdings as of 1882 is computed following Cinnirella and Hornung (2016) by dividing the number of landholdings with more than 75ha by the number of landholdings. Share of land owned by large landholdings is calculated by dividing the land owned by large landholdings by the agricultural area in one district.
Sources: See Appendix B and Cinnirella and Hornung (2016).

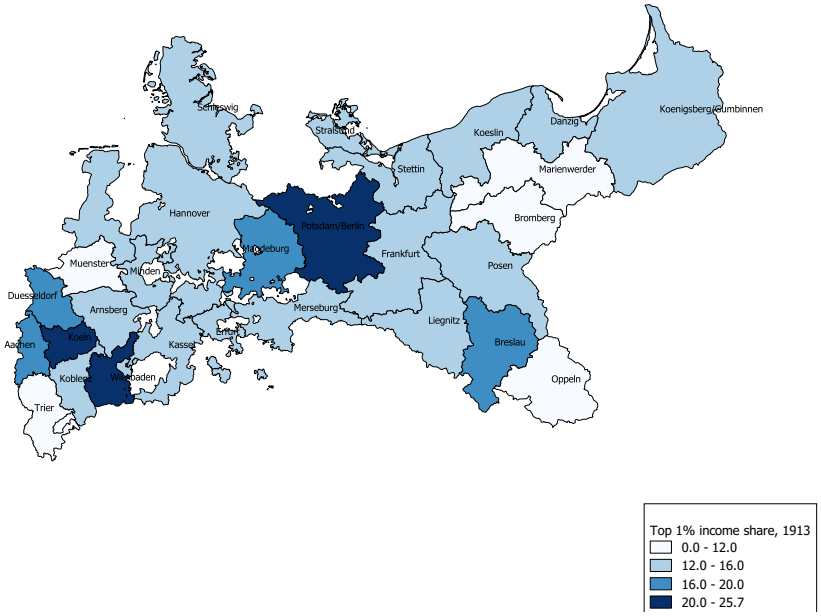
Figure F.3: Contrasting different capital share estimates, 1891-1913



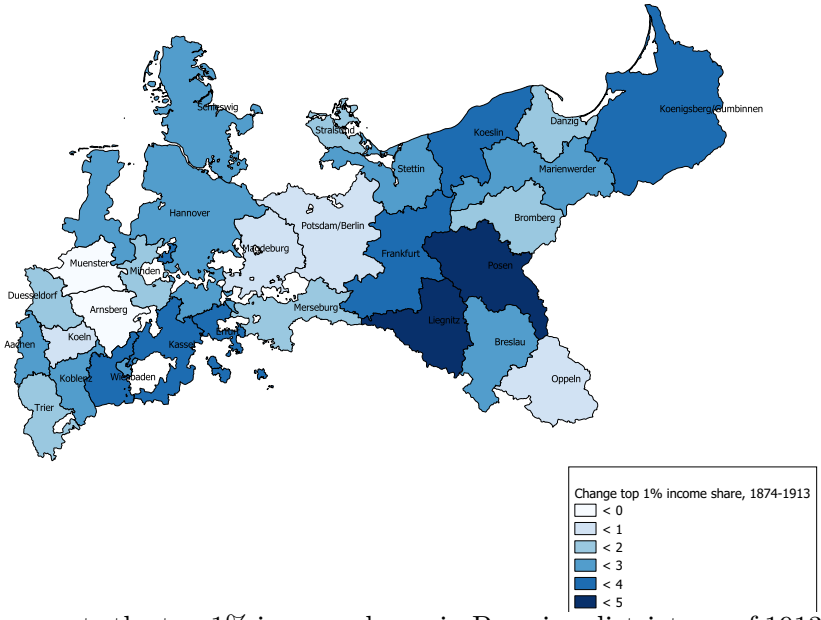
Notes: Our estimate for Prussia. Capital shares from Bengtsson and Waldenström (2018) and Pfister (2020) are computed for the German Empire.
Source: See Appendix B, Bengtsson and Waldenström (2018) and Pfister (2020).

Figure F.4: Top 1% income share in Prussian districts

(a) Top 1% income share, 1913

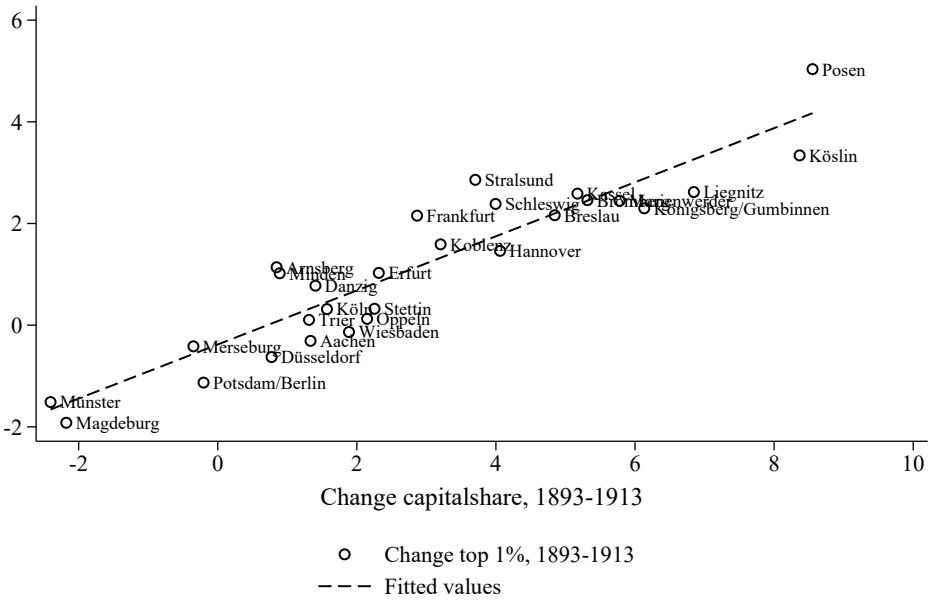


(b) Change in top 1% income share in Prussian districts, 1874-1913



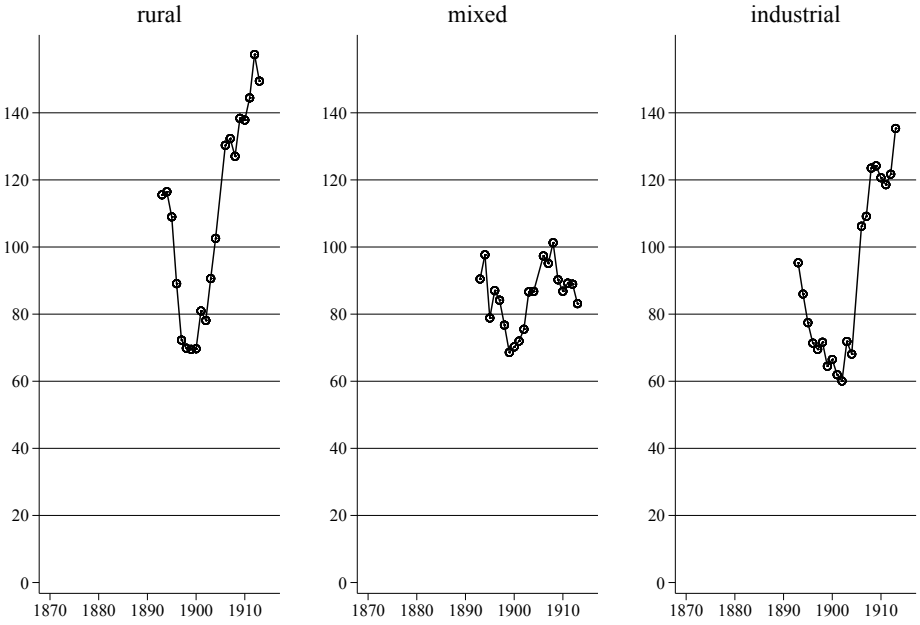
Notes: Map (a) presents the top 1% income shares in Prussian districts as of 1913. Darker blue districts show higher income inequality in 1913. Map (b) presents the change in top 1% income shares in Prussian districts between 1874 and 1913 (in pp). Darker blue districts experience higher increases in income inequality.
Sources: See Appendix B.

Figure F.5: Capital share and top 1%, 1893-1913



Notes: The graph plots the change of the capital share and the top 1% income share in percentage points within each district between 1893 and 1913.
Sources: See Appendix B.

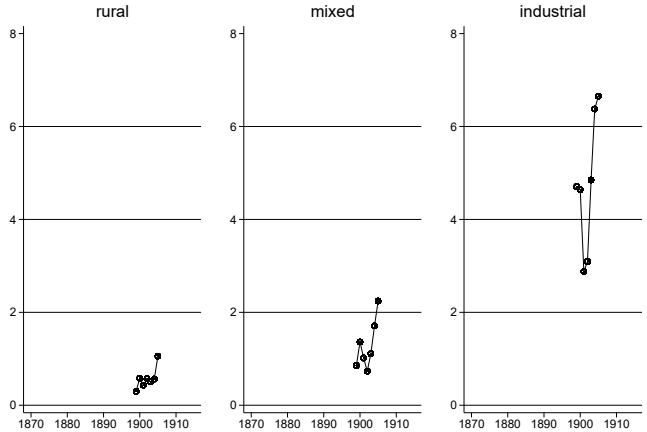
Figure F.6: Firm profit concentration, 1893-1913



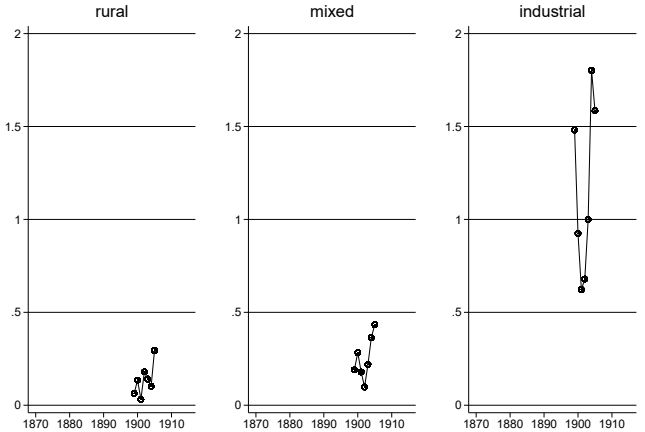
Notes: Half-squared coefficient of variation using grouped income taxes of corporations (*nicht-physische Personen*). Limited liability corporations (*GmbHs*) included since 1906.) *Source*: Income tax statistics.

Figure F.7: Socialist activity by county type

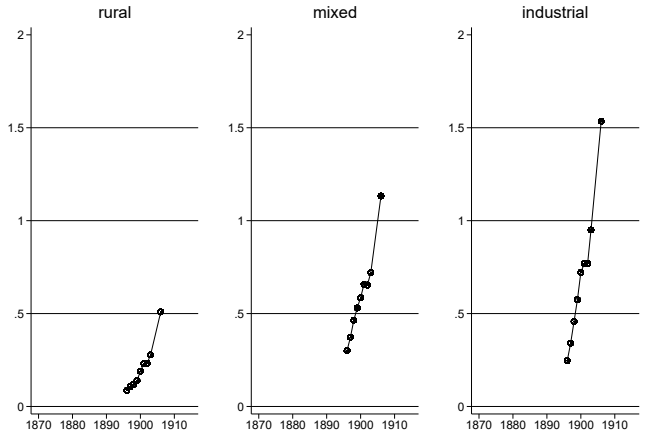
(a) Average number of strikes



(b) Average number of successful strikes



(c) Union membership (% of population)



Notes: The graphs shows the average number of strikes (a), successful strikes (b), union membership among employees (c) by county type. Counties with more than 50% employment in agriculture in 1882 are classified as rural (left panel), counties with between 40% and 50% employment in agriculture in 1882 are classified as mixed (middle panel), and counties with less than 40% employment in agriculture in 1882 are classified as industrial (right panel).
Sources: See Appendix B.

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