



# Elites and health infrastructure improvements in industrializing regimes

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## Abstract

We collect information about more than 5000 Prussian politicians, digitize administrative data on the provision of health-promoting public goods, and gather local-level information on workers' movements to study why elites in industrializing countries implement policies that improve the health of the poor. Using county-level variation in elite structure, we present OLS and IV estimates, suggesting that elites improve access to health services due to pressure exerted by workers' movements. By contrast, policies that prevent disease outbreaks are implemented without such pressure. Analyses of roll- call votes substantiate the findings of the county-level analysis.

**Keywords** Distribution of power · Elite structure · Industrializing countries · Political economy of health-promoting policies · Prussian history · Redistribution · Workers' movements

**JEL Classification** H11 · H42 · H75 · I15 · N33 · O43 · P16

## 1 Introduction

The role of elites in the process of economic development has received significant attention in the disciplines of economics, history, and political science (Amsden et al., 2012). In the current debate, a key question is why elites implement reforms from which less wealthy segments of the society greatly benefit.<sup>1</sup> Broadly speaking, the literature presents two basic theories regarding this question. The first theory predicts that these policies were implemented in order to mitigate the likelihood of social or political turmoil [see e.g. Acemoglu and Robinson (2000, 2001)]. The alternative theory suggests that elites implement such

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<sup>1</sup> Examples in this regard are reforms that increase the number of people that enjoy political participation rights and measures that improve people's human capital.

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reforms even without such pressure, for instance due to their beneficial effects on the return to their assets [see e.g. Galor and Moav (2006), Galor et al. (2009), Lizzeri and Persico (2004)].

Recently, the proponents of either of these two popular theories provided rich qualitative and quantitative evidence that substantiates their preferred theory or invalidate the other.<sup>2</sup> In this project, we take a different approach. Rather than testing each theory in isolation, we consider them jointly to reach a comprehensive understanding of the triggers of reform processes in industrializing countries. To support our view, we consider policies that promote public health. More specifically, we distinguish policies preventing the outbreak and spread of infectious diseases (e.g. the construction of sewage systems) from measures that facilitate access to health care services (e.g. the opening of hospitals). We argue that elites improve people's access to health services due to pressure exerted by workers' movements, whereas preventive measures are implemented without this pressure.

In our empirical analysis, we focus on late-19th/early-20th century Prussia and exploit variation in elite structure to investigate why public health expenditures increase in industrializing regimes. The basis of our empirical strategy are models suggesting that the upper class of industrializing regimes can be split in a land-owning and a landless elite and that these groups of people may differ in their policy preferences [see e.g. Galor et al. (2009)]. To build a (county-level) measure that reflects how the political power was distributed among the landowning and landless elite, we compile biographical information on more than 5000 Prussian politicians. We also digitize local-level infrastructure data published by the Royal Prussian Statistical Office. Remarkable features of this data are that it provides information on eight health-promoting public goods and that these public goods affect public health in different ways. While three of them improve the access to medical care, the others prevent the outbreak of infectious diseases. Finally, we combine information on the voting results of the Social Democratic Party with data on strikes and trade-union membership to produce indicators, reflecting the strength of workers' movements.

We present results from cross-sectional OLS and 2SLS analyses, suggesting a strong relationship between elite structure and the provision of health-promoting public goods. More specifically, we find that the provision of such public goods increased in the political power of the landless elites. Various robustness checks confirm this result and rule out (among others) that our estimates simply reflect differences in industry structure, urbanization, fiscal capacity, or land inequality. When distinguishing between preventive measures and policies that improve the access to health care services, we detect that both of them were more frequently implemented in those counties where the landless elites enjoyed great influence. Finally, our mechanism analysis reveals that the landless elite implemented more preventive policies than the landowning elite, regardless of whether the workers' movements were strong or weak. This finding confirms political economy models predicting that elites implement reforms that are beneficial for the people even if they are not threatened. By contrast, regarding measures that facilitate access to health care services, we find that landless elites differed in their behavior from landowning elites only if workers' movement were well organized in their county. We interpret this finding as evidence

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<sup>2</sup> See e.g. Aidt and Jensen (2014), Aidt and Franck (2015, 2019), Andersson and Berger (2019), Baten and Hippe (2018), Boberg-Fazlic et al. (2023), Cvrcek and Zajicek (2019), Goñi (2023), Hollenbach (2021), Mares and Queralt (2015, 2020), Nafziger (2011), Ramcharan (2010), Vollrath (2013), and Ziblatt (2008b, 2008a).

for theories, implying that elites redistribute (for instance via public good provision) to avoid instabilities.

To further support the view that landowning and landless elites differ in their willingness to implement health-promoting policies, we pay attention to two roll-call votes in the German parliament. The first vote took place in May 1883 and concerned the eligibility criteria for the compulsory health insurance, while the second vote took place 17 years later and was on a bill that aims to implement mandatory trichinella inspection.<sup>3</sup> Consistent with the results of our county-level analysis, we observe in both votes that landowning politicians were less likely to approve the health-promoting reform than landless politicians. We also find that the voting behavior of the parliamentarians correlates with the vote share of the Social Democratic Party in the 1883 vote but not in the 1900 vote. This result is in line with our hypothesis that the pressure exerted by the workers' movements only plays a role for policies that improve access to health services.

Our paper contributes to the literature that studies the role of elites and elite structure in the process of development. In contrast to most other papers in this field, we do not focus on education policies [see e.g. Andersson and Berger (2019); Baten and Hippe (2018); Cinnirella and Hornung (2016); Galor et al. (2009); Goñi (2023); Ramcharan (2010)] but on policies that improve health.<sup>4</sup> The key insight of our paper is that elites often implement health-promoting policies without being threatened by the poor and that the pressure exerted by the workers' movements only plays a role in some cases. To our knowledge, our paper is the first empirical analysis showing that the two major theories on the motives of elites jointly explain why health expenditures considerably increase in industrializing regimes. Methodologically, we differ from earlier studies in two ways. First, rather than using land inequality to proxy how politically powerful the landowning elites are in a region, we exploit biographical information on locally elected politicians. Consequently, we take into account the concern by Acemoglu et al. (2008) who find that high land inequality does not necessarily imply that the landowning elite has great political impact.<sup>5</sup> Second, our paper uses both aggregated data and roll-call votes, whereas earlier studies run only one type of analysis. Since these approaches have different pros and cons, we are convinced that combining them is the optimal way for achieving credible results.<sup>6</sup> Finally, since using county-level data from late-19th and early-20th century is common in economic history research, we think that our measure on the distribution of political power between landowning and landless elites itself is a contribution to the literature.

<sup>3</sup> Trichinella (also known as trichina worms) are parasitic roundworms that cause an infectious disease, called trichinosis. Pigs are the main carrier. Humans get infected, for instance if they eat raw meat of contaminated animals. Compulsory trichinella inspection means that animals have to be tested before slaughter.

<sup>4</sup> Le Fur (2023) presents a theoretical model in which investments in sanitary infrastructure in industrializing regimes are the result of profit-maximization by capitalist elites. In his model, capitalist elites support such investments even when they are not threatened by the poor. Our results are consistent with this assumption.

<sup>5</sup> In the Prussian context, using data on land inequality as proxy for the distribution of political power is also problematic because Cinnirella and Hornung (2016) establish land inequality as a measure for the extent of serfdom.

<sup>6</sup> With our paper, we also contribute to the political economy literature that studies why public health provision differs within and across countries. Existing studies in this field focus on the effects of franchise extensions [see e.g. Aidt et al. (2010) Fujiwara (2015)], democratization [see e.g. Besley and Kudamatsu (2006); Kudamatsu (2012)], political selection [see e.g. Bhalotra and Clots-Figueras (2014); Franck and Rainer (2012)], and government ideologies [see e.g. Potrafke (2010)].

Our paper is structured as follows. Section 2 provides background information, develops our hypotheses, and presents anecdotal evidence. Section 3 includes our county-level analysis, while Sect. 4 shows the roll-call vote analysis. Section 5 concludes.

## 2 Background

### 2.1 Historical background

As in many other industrializing regimes, the public authorities in late-19th and early-20th century Prussia devoted huge effort to improve the health system. For instance, the total number of beds in hospitals increased from 76,310 in 1876 to 214,320 in 1900 (Guttstadt, 1900). At the same time, the number of physicians doubled (Spree, 1999). The total number of people working in the health sector even more than tripled between 1867 and 1907, according to the Prussian census data (Galloway, 2007). Furthermore, for workers, a compulsory health insurance system was introduced in 1884 (Scheubel, 2013). Last but not least, many health infrastructure projects were realized, including the construction of sewerage and water supply systems or the opening of slaughter houses, among others (Krabbe, 1985; Vögele, 2001),<sup>7</sup>

In Prussia, the political decisions behind the massive expansion of the public health system were almost exclusively made by the wealthy people. The primary reason for the enormous political power of the elite was the electoral rules that existed at that time [see Dawson (2019); Grzywatz (2003); Hofmann (2007), among others].<sup>8</sup> For instance, citizens who received any kind of pauper relief could not participate in elections. In addition, at the local level, suffrage was usually only granted to men who owned a dwelling house, paid a sufficiently high amount of taxes, or carried out a business. Finally, voting power was unequally distributed among eligible voters whereby the most wealthy voters typically had the largest impact on the election results (for further details regarding the electoral rules in Prussia and why they advantage wealthy people, see online Appendix A.2).

Why did wealthy people in late-19th/early-20th century Prussia support policy measures that improve public health? A potential answer to this question is that Prussian elites were concerned about the growing popularity of social democratic ideas and movements (for further details on workers' movements in Prussia, see online Appendix A.3). To slow down this development, they might have accepted policy reforms that promote the health of the poor people. Consistent with this view is Bismarck's 'carrots and sticks' approach. More specifically, on the one hand, the government implemented different laws (known as *Socialist Laws*) that punished social democratic activities (for details, see online Appendix A.3). On the other hand, however, key demands of the workers' movement were (at least partly) satisfied, including the introduction of a compulsory health insurance for workers in 1884 (for details, see online Appendix A.4 and Sect. 4). With the latter behavior, Bismarck

<sup>7</sup> Ample research exists regarding the question of how such public measures reduce mortality and morbidity [see Alsan and Goldin (2019) Bauernschuster et al. (2020), Chapman (2019), Gallardo-Albarrán (2020), among others].

<sup>8</sup> In Prussia, public elections took place for local councils, the lower chamber of the Prussian parliament (*Abgeordnetenhaus*), and the lower chamber of the German parliament (*Reichstag*). Detailed information regarding these elections and the administrative structure of the Prussian Kingdom can be found in online Appendices A.1 and A.2.

aimed to lower the support for democratic reforms [see Leichter (1979); Rosenberg (1967), Schmidt (2005), Tennstedt (2017)].<sup>9</sup>

While concerns regarding the rise of the workers' movements is undoubtedly a very popular explanation for why the Prussian elites agreed to health-promoting measures in the late-19th/early 20th century, it is not the only reason that can be found in the related literature. For instance, since upper class and working-class people did not live in fully separated areas, diseases spread from the poor to the rich. To reduce the risk of becoming sick, elites therefore supported reforms that prevent the outbreak of diseases among the poor [see e.g. Leichter (1979); Krabbe (1985)].<sup>10</sup> Furthermore, Brown (1989) argues that elites supported the provision of health-promoting public goods for commercial reasons. In particular, he suggests that the Prussian elites were concerned that diseases spread among their workers and thereby cause costly production stoppages or delivery delays. Vögele (2001) points out that house owners had a great interest in improving the public health infrastructure as the connection to a water-pipe or sewer system allowed them to increase rents. He also suggests that elites considered some health infrastructure investments (e.g. the construction of waterworks) as a lucrative source of future municipal revenues [see also Krabbe (1985)].

## 2.2 Conceptual considerations

### 2.2.1 Elite's motives for implementing health-promoting measures

Our first conceptual step is to categorize the potential motives of elite people. We think that the reasons suggested in qualitative studies can be differentiated into three broad categories. First, elites may aim at improving their own health, for instance by easing their access to health care services or by lowering their risk of becoming infected with a disease. Second, elites may want to achieve a financial profit, for example by reducing the likelihood that an infectious disease spreads among their workers and thus causes production delays. Third, elites may try to please working-class people, for instance to decrease the risk of strikes and turmoil or to obtain their support in elections. Below, we refer to the last motive when stating that elites implement measures due to pressure exerted by workers' movements, whereas we refer to the first two motives if we write that the elite implements a policy without being threatened.

Our next conceptual step is to distinguish different types of health-promoting public measures, depending on how they affect health. Below, we distinguish two main types. The first type are measures that ease people's access to health care services. Examples include openings of public hospitals or nursing facilities, the introduction of a compulsory health insurance system, and the establishment of municipal provident funds. For several reasons, such policies hardly affected the extent to which elite people had access to health care services in industrializing places such as late-19th/early-20th century Prussia. For instance, due to the low quality of state hospitals and an increased risk of becoming infected by diseases that predominantly spread among lower class people, elites usually received their treatments at home or in a non-public hospital (Labisch & Spree, 2001; Vögele, 2001). Elites also did not require public aid to cover the costs for their medical treatments and had

<sup>9</sup> According to an empirical analysis by Kersting (2022), Bismarck's approach was not successful at all.

<sup>10</sup> Examples for places where an epidemic cause local elites to invest in health-promoting public goods are the cities of Düsseldorf and Halle/Saale (Fuchs, 1910; Most, 1909).

the financial capabilities to insure themselves privately. Most workers, by contrast, could not pay such costs. A primary policy objective of the workers' movements was thus to ease the access to health care services for poor people. For instance, in its party program from 1891 (*Erfurt Program*), the Social Democratic Party (SPD) demanded free health care and that agricultural workers should not longer be excluded from the compulsory health insurance [see Specht (1898)].

The second type of public measures that improve peoples' health are measures that prevent the outbreak and spread of infectious diseases, including (e.g.) the construction of sewer or water-pipe systems, the opening of slaughterhouses, and the establishment of waste collections. Apart from the way of how such measures affect mortality and morbidity, three remarkable differences exist compared to the measures that ease people's access to health care services. First of all, as briefly sketched at the end of Sect. 2.1 and described in detail by Brown (1989) and Vögele (2001), elites had significant financial gains from implementing preventive measures. Second, while elites could access health services even if no government actions took place, this was not possible for most of the preventive measures. For instance, building a sewage or water-pipe system was a large-scale infrastructure project whose costs widely exceeded the financial capacities of most people in the elite. Consequently, collective action was necessary. Furthermore, restricting the access to such systems to a small group of wealthy people was not economically attractive, for instance due to high fixed costs and increasing economies of scale. Third, while improving access to health care services for the poor people was a key demand of the workers' movements, demands for measures that prevent the outbreak and spread of infectious diseases only played a subordinate role in their programs. In a few instances, they even opposed preventive measures. A popular example in this regard is the rejective stance of various social democrats towards vaccination campaigns [see Thießen (2017)].

From the above considerations, we derive the hypothesis that there is no unique reason for why elites in Prussia (and other industrializing regimes) implemented health-promoting measures. In addition, we hypothesize that their motives vary, depending on the type of measure. More specifically, on the one hand, we suggest that elites established measures that facilitate access to health services to please working-class people.<sup>11</sup> This hypothesis is in line with various political economy models predicting that elites accept redistribution policies to reduce the risk of turmoil [see Acemoglu and Robinson (2000, 2001, 2005), Boix (2003), Conley and Temimi (2001), Dorsch and Maarek (2015), Gilli and Li (2015), among other].<sup>12</sup> On the other hand, we argue that elites in industrializing regimes do not need to face pressure by workers' movements to support policies that prevent the spread and outbreak of infectious diseases. In this regard, we support theories implying that elites implement measures that are beneficial for the poor, even if no threat of revolution exists [see e.g. Ashraf et al. (2020), Galor and Moav (2006), Galor et al. (2009), Le Fur (2023), Lizzeri and Persico (2004), Llavador and Oxoby (2005), Doepke and Zilibotti (2005)].

<sup>11</sup> Importantly, we do not claim that this is the only reason for why the elites of industrializing regimes implement such policies (for details, see Sect. 2.2.2).

<sup>12</sup> An important prerequisite for this mechanism is that the tax system is redistributive. Spoerer (2004) who provides an detailed overview about the development of the Prussian tax system suggests that Prussia meets condition in our period of investigation.

**Table 1** Summary of conceptual considerations regarding landowning and landless elites and their support for health-promoting public goods

	Access to health services	Preventive measures
Motive I (own health status)	Landless ~ landowning	Landless > landowning
Motive II (financial benefits)	Landless > landowning	Landless > landowning
Motive III (pressure from workers' movements)	Landless > landowning	Landless ~ landowning
Total	Landless > landowning	Landless > landowning

This tables summarizes our conceptual considerations with regard to how landowning and landless elites differ in their willingness to support the provision of health-promoting public goods. We use > to illustrate that one group of the elite is expected to be more supportive than the other and ~ to show where we do not expect differences between the two types of elite

### 2.2.2 Elite structure

While the elite is often considered as a homogeneous group of people in political economy models, only a few of them distinguish between (two) different types of wealthy people. Examples are Akerman et al. (2016), Galiani and Torrens (2014), Galor et al. (2009), Ghosal and Proto (2009), and Llavador and Oxoby (2005). A common feature of these theoretical studies is that they refer to industrializing regimes as a prime example for a case in which the group of wealthy people can be divided into two subgroups. Typically, these two subgroups are referred to as *landowning* and *landless (capitalist)* elites. We aim to use this characteristic of industrializing regimes to provide empirical support for our hypotheses regarding elite's motives for supporting health-promoting policies. Galor and Moav (2006) use the same approach when shedding light on the reasons for why elites promote education measures in later stages of an industrial revolution. Below, we explain why landowning elites may differ from landless elites in their support for health-promoting policies. Based on the conceptual considerations in Sect. 2.2.1, we thereby differentiate three motives and two types of public goods. In Table 1, we present a summary of our hypotheses.

As outlined in the last section, one potential motive for why elites implement health-promoting measures is to improve their own health. However, since both landowning and landless elites were sufficiently wealthy to cover the expenses for (qualitatively much better) private health services, we think that neither of them supported measures that facilitate access to public health care services to improve their own health status. By contrast, with regard to preventive policies, we argue that landowning and landless elites differ due to this motive in their willingness to support the implementation of such measures. The key reason is that the landless elites usually lived less separated from the poor and thus faced a greater risk of getting infected by a disease that broke out among the lower class people.<sup>13</sup>

<sup>13</sup> An objection against this argument may be that some landowning elites had a residence in an urban place and therefore also faced the risk that they got infected by the diseases that spread among the poor. For two reasons, we are nevertheless convinced that our argument holds on average: first, we think it is plausible to assume that landless elites are more likely to have a residence in an urban place than landowning elites, and second, if a pandemic breaks out, landowning elites can easily reduce their infection risk by moving (at least temporarily) to their estate.

A second potential motive for why elites may support the provision of health-promoting public goods is, as already stated in the previous section, that they financially benefit from such measures. With regard to policies that prevent the outbreak and spread of infectious diseases, we argue for three major reasons that such gains were larger for landless elites. First, the share of workers that became (simultaneously) infected, if a disease broke out, was likely to be higher in non-agricultural sectors than in the agricultural sector since work spaces were more densely populated and propagation speeds thus higher. Second, the importance of high-skilled workers was larger in non-agricultural sectors [see Galor et al. (2009)] and replacing them, when they get sick, was much more difficult than replacing low-skilled workers [see Brown (1989)]. As the high- and low-skilled workers had to interact with each other, implementing measures that prevent the outbreak of infectious diseases among the poor help to protect the high-skill workers. Third, through the Ben-Porath mechanism, health-promoting public goods raise private investments in education, which is more beneficial for the landless elites because human capital enhances productivity in the non-agricultural sectors more than in the agricultural sectors (Galor et al., 2009). Especially the last point can also be used to explain why landless elites have more financial benefits from public goods that facilitate peoples' access to health care services,<sup>14</sup>

As sketched in Sect. 2.2.1, the third motive for why elites implement health-promoting policies is that they feel under pressure from workers' movements. We are convinced that this motive plays a greater role for landless elites because the workers' movements in the non-agricultural sectors were much better organized, probably due to lower coordination costs. However, as measures that prevent the outbreak of infectious diseases only played a minor role in the programs of the German workers' movements, we argue that the differences in the extent to which landowning and landless elites were threatened by the workers only influenced the provision of public goods that improve access to health care services.<sup>15</sup>

### 2.3 Anecdotal evidence

During our background research, we have found some anecdotal evidence for the hypotheses developed in the last section regarding the willingness of landowning and landless elites to implement health-promoting policies. This section shows a selection of examples. Our first example are the parliamentary debates about the introduction of the compulsory health insurance for workers in 1883. As already mentioned in Sect. 2.1, Bismarck's motive for implementing this policy was to reduce the support for democratic reforms among working-class people. A notable aspect about Bismarck's health insurance is that it included almost all types of industrial workers, but excluded agricultural workers. For our

<sup>14</sup> A couple of empirical studies confirms that health improvements promote education [see e.g. Baird et al. (2016) Bleakley (2007), Bütikofer and Salvanes (2020)].

<sup>15</sup> A legitimate concern with regard to our conceptual considerations is that we do not discuss whether landowning and landless elites were taxed differently. We neglect this aspect because the answer crucially depends on the institutional context. For late-19th and early-20th century Prussia, it seems that the landowning elites paid fewer taxes than the landless elites [see e.g. Buggeln (2022); Hallerberg (1996, 2002); Mares and Queralt (2015, 2020)]. Consequently, if tax considerations played a major role, we should find in our empirical analysis that landowning elites are more willing to support the provision of health-promoting public goods. Since we observe the opposite, we consider it as unlikely that differences in taxation are of relevance in our institutional setting. A related concern may be that different types of health infrastructure projects were financed through different types of taxes. At least for Prussia, this seems to be unlikely because tax revenues were not earmarked.

purpose, even more remarkable is the fact that the compulsory health insurance would have included many agricultural workers if the final draft of the bill had been accepted by the parliamentarians. However, prior to the vote on the respective paragraph, three landowners filed a motion for dropping the subparagraph related to agricultural workers. This motion was accepted by 136 to 134 votes [see Reichstagsprotokolle (1883)].<sup>16</sup>

Bismarck's approach of using social policy measures to reduce the support for democratic reforms was initially proposed by (liberal) academics and intellectuals in the 1860 s and early 1870 s. Many of them were economists, including Adolph Wagner (known for *Wagner's law*), Lujo Brentano, Adolf Held, and Gustav von Schmoller. In later years, scholars like Max Weber, Walter Sombart, and Joseph Schumpeter belonged to the proponents of this school of thought. The common starting points of people like Wagner and Schmoller were concerns regarding the social problems that arose in Germany during the industrialization and the view that neither a socialist approach (as e.g. proposed by Karl Marx and Ferdinand Lassalle) nor a laissez-faire approach (as e.g. proposed by Ludwig Bamberger or Hermann Schulze-Delitzsch) can address these problems. To develop and discuss appropriate social policy measures, annual meetings took place. The first was in Eisenach in 1872. Among the 158 participants were not only academics, but also bureaucrats, parliamentarians, lawyers, and factory owners. Only a few of them were landowners. An immediate result of the 1872 meeting in Eisenach was the establishment of the *Verein für Socialpolitik* (VfS).<sup>17</sup> Over the next decades, the publications and suggestions of the VfS and its members significantly influenced public debates and policy making (*Verein für Socialpolitik*, 1873; Boese, 1939; Stremmel et al., 2006).

The VfS was by far not the only association that aimed at improving people's health. Another prominent example is the *Niederrheinische Verein für öffentliche Gesundheitspflege* (NrVföGp) which was founded by the physicians Eduard Lent, Eduard Graf, and Friedrich Emil Sander in Düsseldorf in 1869.<sup>18</sup> As the VfS, the NrVföGp held annual meetings and drew upon scientific evidence. In case of the NrVföGp, however, this evidence came from medical sciences rather than social sciences. More specifically, the activities and goals of the NrVföGp were largely influenced by the work of Max von Pettenkofer, a German pioneer in the field of hygiene. Based on his research, he concluded that environmental factors play an important role for the spread of infectious diseases. The NrVföGp thus promoted sanitary reforms, including (e.g.) the construction of sewer systems (Lent, 2014; Limper, 1940). According to Vögele (2001), most members of the NrVföGp were bureaucrats and entrepreneurs. Vögele (2001) also suggests that this membership structure was a reason for why the NrVföGp became quite influential at the local level. Lent (2014) points out that the NrVföGp served as a role model for various local associations all over German Empire. In 1873, an umbrella association was established.

Landless elites were not only involved in associations such as the VfS or the NrVföGp but also took other actions that improve the health of the poor. For instance, as the city council of Essen hesitated to agree to the construction of a water supply plant due to the high costs, the steel manufacturer Krupp and other businessmen awarded an interest-free

<sup>16</sup> In Sect. 4, we study this vote and another vote in the Reichstag in greater detail.

<sup>17</sup> The VfS is still existing. Internationally, it is nowadays referred to as the German Economic Association (for details, see <https://www.socialpolitik.de/en>).

<sup>18</sup> All of them were politically engaged. Lent was a city councilor in Cologne, whereas Graf and Sander were members of the city councils in Elberfeld and Barmen. Furthermore, Graf held a seat in the lower chamber of the Prussian parliament between 1883 and 1895 (Hainbuch & Tennstedt, 2010)

loan (Krabbe, 1985).<sup>19</sup> Furthermore, various industrialists implemented measures that improved workers' access to health care services, for example by establishing company health insurance funds. Among the most popular examples are Alfred Krupp, Werner Siemens, and Karl Ferdinand Stumm. For these three entrepreneurs, it is also well documented that they used social policies to prevent the spread of social democratic ideas among their labor forces [see Dülmen and Jacob (1993); Epkenhans and Stremmel (2010); Kastl and Moore (2010), among others].<sup>20</sup>

### 3 County-level analysis

#### 3.1 Data

##### 3.1.1 Distribution of political power

We perform two types of regression analyses to test the hypotheses developed in Sect. 2.2.2. The first analysis exploits data aggregated at the county level (for details on the second analysis, see Sect. 4). A necessary element for such an investigation is a measure that varies at this level and reflects how the political power was distributed between the landowning and the landless elites. For this purpose, we apply an approach that exploits biographical information of locally elected politicians.

Our starting point is the increasing number of political economy studies that measure the political influence of a social group with the share of political posts being occupied by the members of this group [see e.g. Clots-Figueras (2011, 2012), Hyytinen et al. (2018)].<sup>21</sup> A natural measure for the local political power of the landless (landowning) elite in an electoral oligarchy is thus the share of elected politicians that belong to this group of upper class people. However, in practice, computing such a measure is challenging for a couple of reasons. A major issue is that producing a list of all elected politicians is impossible due to limited data availability. Extensive searches in dictionaries yield that a full list of incumbents can be compiled for three types of elected politicians: (i) county directors,<sup>22</sup> (ii) members of the Prussian House of Representatives (*Abgeordnetenhaus*), and (iii) members

<sup>19</sup> Similarly, to accelerate the building process of a water supply plant, the industrialist Bethel Henry Strousberg offered a loan to the city of Dortmund. However, in contrast to Essen, this offer was not accepted by Dortmund's city councilors (Krabbe, 1985)

<sup>20</sup> For instance, in a letter from December 1872, Werner Siemens stated that a key purpose for implementing such measures was to "discipline" the workers [see Tennstedt et al. (2002)].

<sup>21</sup> While Clots-Figueras (2011, 2012) uses the share of female parliamentarians to measure the political power of women, Hyytinen et al. (2018) measure the local political power of public employees with the share of local councilors that work in a public sector job. Implicitly, the assumption that the political power of a social group varies with the number of parliamentary seats is also made by studies that apply a Regression Discontinuity Design to check whether political selection affects policy outcomes (Pettersson-Lidbom, 2008)

<sup>22</sup> The Prussian authorities distinguished between counties (*Landkreise*) and county boroughs (*Stadtkreise*). The former were governed by a county administrator (*Landrat*), while the Lord Mayors of the eponymous towns served as the head of the county boroughs. We use the term "county director" to simultaneously refer to both of these posts.

of the German Parliament (*Reichstag*). In total, our three lists include 5144 politicians (for details, see Table B.2). All of them were male and served between 1867 and 1914.<sup>23</sup>

We define a politician as a member of the landowning elite if he owned arable land or had a landowning relatives (for a detailed description of our coding rules, see online Appendix B.1). Determining whether an individual belongs to this group is cumbersome since no centralized source of information exists. Put differently, we have to run a separate information search for each of our 5,144 politicians. More specifically, we first check whether a politician has an entry in (i) Wikipedia, (ii) the online databases on important persons published by the states of Rhineland-Palatinate, Saarland, Hesse, North Rhine-Westphalia and Saxony, or (iii) the bio-graphical handbooks published by Angerbauer (1996), Best and Schröder (1992), Dvorak (1996, 1999a, 1999b, 2000, 2002, 2005, 2013, 2014), Gey (1976), Hansen and Tennstedt (2010), Hauf (1980), Haunfelder (1994), Herlemann and Schatz (1996), Klein (1988), Kühne (1994b), Mann (1988), Romeyk (1994), Wagner (1982), and Wegmann (1969). For the members of a noble family, we also browsed through various volumes of the *Gothaisches Genealogisches Taschenbuch*.<sup>24</sup> If no primary source provided helpful information, we carried out an online search. After our search, we use the available information to classify each politician (for example cases, see online Appendix B.2). To be transparent in our coding, we create a separate document that lists our references and includes a short explanation for all 5144 decisions. Table B.1 presents an excerpt of this document.<sup>25</sup>

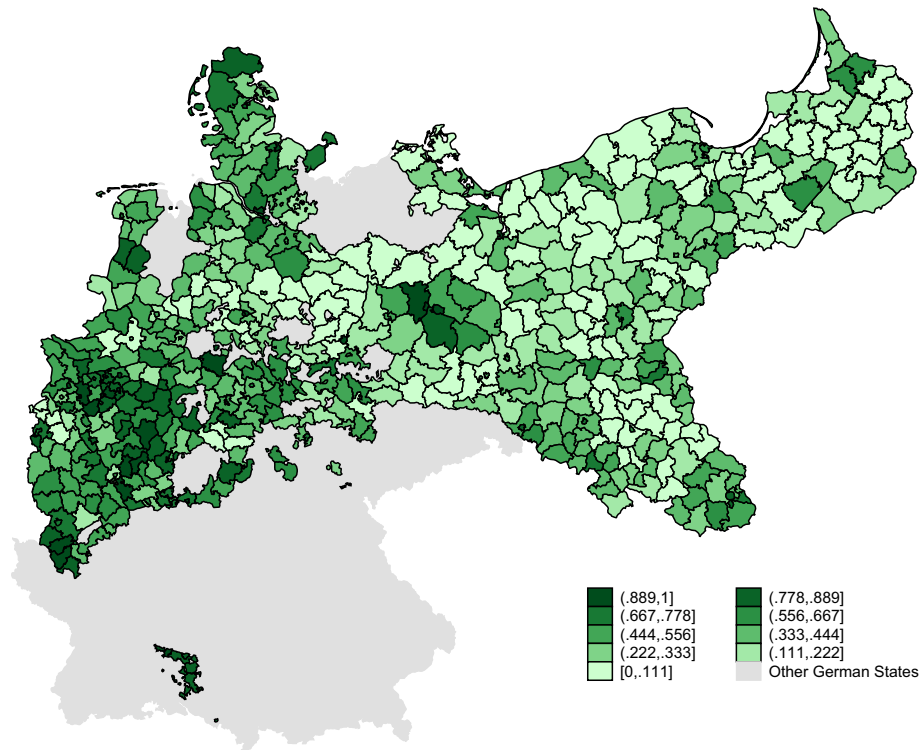
Finally, to obtain county-level measures that reflect the distribution of power between the landowning and the landless elites, we aggregate our individual-level data, using a four-stage aggregation procedure (for further details, see online Appendix B.3). An important note in this regard is that we only take into account county directors and members of the Prussian parliament when producing our baseline indicators. Put differently, our basic indicator of the distribution of political power is the mean of the share of time when the county director was a member of the landless elite and the share of time when the county representatives in the Prussian Parliament were members of the landless elite. Members of the German parliament are only considered in measures that we apply in robustness checks because the electoral rules for the Reichstag elections differed considerably from the electoral rules used in local elections (for more details, see online Appendices A.2 and B.3).

Figure 1 illustrates for each Prussian county how influential the landless elite was at turn of the 19th century, according to our measure. We observe notable heterogeneity, both across and within the Prussian Provinces. In particular, our measure suggests that the landless elite was least influential in the provinces of *Pomerania* and *East Prussia* and most powerful in the provinces of *Westphalia*, *Rhineland*, and *Hesse*. This pattern concatenates well with the assessments of a large number of historians [see e.g. Gerschenkron (1943),

<sup>23</sup> For comparison, Goñi (2023) and Bellani et al. (2022) compiled similarly detailed biographical information on roughly 500 and 1,200 elite people, respectively.

<sup>24</sup> The *Gothaisches Genealogisches Taschenbuch* is a regularly updated encyclopedia, including detailed information about German noble families.

<sup>25</sup> For 4 out of 2657 members of the Prussian House of Representatives ( $\approx 0.1\%$ ) and 144 out of 2031 county directors ( $\approx 7.1\%$ ), we find no adequate biographical information. 67 of these 144 county directors are from the provinces *Hanover* and *Schleswig-Holstein*, which are not part of the sample that we use in our empirical analyses. We label all persons for whom we have no information as representatives of the landowning elite. We proceed in this way as the resulting bias makes it most challenging to support the hypotheses developed in Sect. 2.2.2. We also conduct robustness checks in which we exploit measures that do not take into account these politicians (see Sect. 3.3).



**Fig. 1** Political power of the landless elite in Prussian counties (1890–1910). *Notes* This figure presents a map of the German Empire in the borders of 1890. The shade of green indicates how powerful the landless elite was between 1890 and 1910. A dark (light) shed of green suggests that the landless (landowning) elite enjoyed great political influence (Color figure online)

Kühne (1994a), Wagner (2005), Wehler (1987)]. In Fig. E.1, we show how the power of the landless elite developed over time. Three facts are worth mentioning. The first fact is that the landowning elite was always the more powerful part of the Prussian elite. Second, during the “liberal” era of Bismarck’s chancellorship (1871–1878), the landless elites were more influential than afterwards (1879–1890). Third, at the beginning of the 19th century, the political impact of the landless elite started to increase gradually. Figure E.2 suggests that this development is caused by power shifts in Prussia’s eastern provinces. In general, Fig. E.2 confirms the great East–West differences. While the landowning elite clearly dominated in the eastern parts of Prussia, the distribution of power was balanced in the western parts.

A concern about our measurement approach may be whether politicians that represent a county in the Prussian parliament or the Reichstag provide adequate information for producing a measure that allows us to investigate whether elite structure affects policy making at the local level. For three main reasons, we are convinced that this is indeed the case. First, as mentioned above, there existed substantial similarities between the voting systems used at the local level and in elections for the Prussian parliament (for further details, see online Appendix A.2). We thus think that it is plausible to assume that similar people were elected in these elections. Second, for a large number of parliamentarians, we have evidence that

they were active in local politics. A popular example for such a politician is the physician and professor Rudolf Virchow since he was not only a member of the Reichstag and Prussian House of Representatives but also served as councilor in Berlin for more than 40 years. In all parliaments, he advocated for policies that promote health. For instance, in the Prussian parliament, Virchow was a driving force behind the introduction of compulsory *Trichinella* examinations. In Berlin, Virchow pushed different sanitary reforms, including the construction of a sewer system Ackerknecht (1953); Goschler (2021). Other examples of people who were engaged at different levels are the founding chairmen of the VfS, Rudolf Gneist, and the NrVföGp, Eduard Graf Hansen and Tennstedt (2010); Mann (1988). To validate our measurement approach in a more systematic manner, we randomly choose 50 Reichstag parliamentarians and check for whom information exist that indicate local political engagement. For 38 of these 50 politicians, we find such information (see Table B.3). We repeat this test for the members of the Prussian parliament. Although biographical information on these politicians is scarcer, we can confirm engagement in local politics for 28 out of the 50 politicians in our sample (see Table B.4).<sup>26</sup> To support our view that differences in data availability constitute a plausible explanation for why we observe (much) more local political engagement for the members of the Reichstag, we consider those individuals that represented the city of Berlin in the German and Prussian parliament. We study Berlin, as data availability is relatively good for this place. As expected, we find that the differences disappear. We even observe that the share of locally engaged politicians is slightly higher for the members of the Prussian parliament than for the members of the Reichstag (63.04% vs. 58.97%; for details, see Tables B.5 and B.6).<sup>27</sup>

The third main reason for why we think that our approach is appropriate for measuring how the local political power was distributed among the landless and landowning elites is that our indicators strongly correlate with the allocation of seats in the county parliaments. To make this point, we digitize data by Meitzen (1869) who provides information on the composition of county parliaments in the 1860 s. More specifically, Meitzen (1869) reports how many seats are occupied by estate owners, the representatives of the urban places, and the representatives of the rural municipalities. Figure B.5 highlights that share of seats held by estate owners is closely correlated with our main measure for the political power of the landless elite. The correlation coefficient is  $-0.658$ .<sup>28</sup>

Although our binary classification of politicians is grounded in theory [see e.g. Galor et al. (2009)], we think that it is quite legitimate to wonder whether a clear assignment to either the landowning or the landless elite is always possible. For instance, the literature presents numerous examples of successful capitalists who bought agricultural estates at some point in their life and of big landowners who were heavily engaged in industrial activities [see e.g. Ashraf et al. (2020); Eddie (2008)]. We admit that classifying such

<sup>26</sup> The Prussian laws prohibited that judges, clergymen, and government officials entered local parliaments. This rule explain why we find evidence no for local political engagement for six (five) members of the German (Prussian) parliament.

<sup>27</sup> 7 (4) out of 17 (16) members of the Prussian (German) parliament from Berlin were judges, government officials, and clergymen and thus not allowed to enter a local parliament. 3 (8) of these 17 (16) people were members of the SPD. Hugo Hermes could not become a member of Berlin's city parliament since his brother (Otto) held a seat in this council. Franz Duncker was the chairmen of the craftsmen association in Berlin. His brother, Hermann Duncker, served a mayor of Berlin.

<sup>28</sup> The share of seats occupied by estate owners is not necessarily the same as the share of land-owning elites in the county parliament since the representatives of the towns and (even more likely) those of the rural municipalities could have also been owners of arable land.

individuals is a non-trivial task. For three major reasons, we label all persons who owned arable land as a member of the landowning elite, regardless of whether we find evidence for other entrepreneurial activities. First, data on whether landowner use their land (at least partly) for industrial activities is extremely scarce. Producing a reliable indicator that allows us to differentiate landowners that were only engaged in the agricultural sector from landowners that were also active in other sectors is not possible from our perspective. Second, when deciding about every uncertain case separately rather than applying a clear coding procedure, concerns that our coding is arbitrary or even strategically designed to get a particular empirical result may arise. Third, finding evidence for our hypothesis that public health spending increases in the political power of the landless elites is most challenging if we label persons for whom we face uncertainty as member of the landowning elite.

In sum, by using hand-collected biographical information on more than 5000 Prussian politicians, we build measures that reflect how the political power was distributed between the landowning and landless elite in late-19th and early-20th Prussia. Due to our validity checks, we are convinced that our new measure is of high quality and outperforms alternative approaches. As using county-level data from late-19th and early-20th Prussia is common in economic history research [see e.g. Bartels et al. (2023); Becker and Woessmann (2009); Kersting et al. (2020)], we also believe that our measure itself constitutes a nice contribution to the related literature.

### 3.1.2 Provision of health-promoting public goods

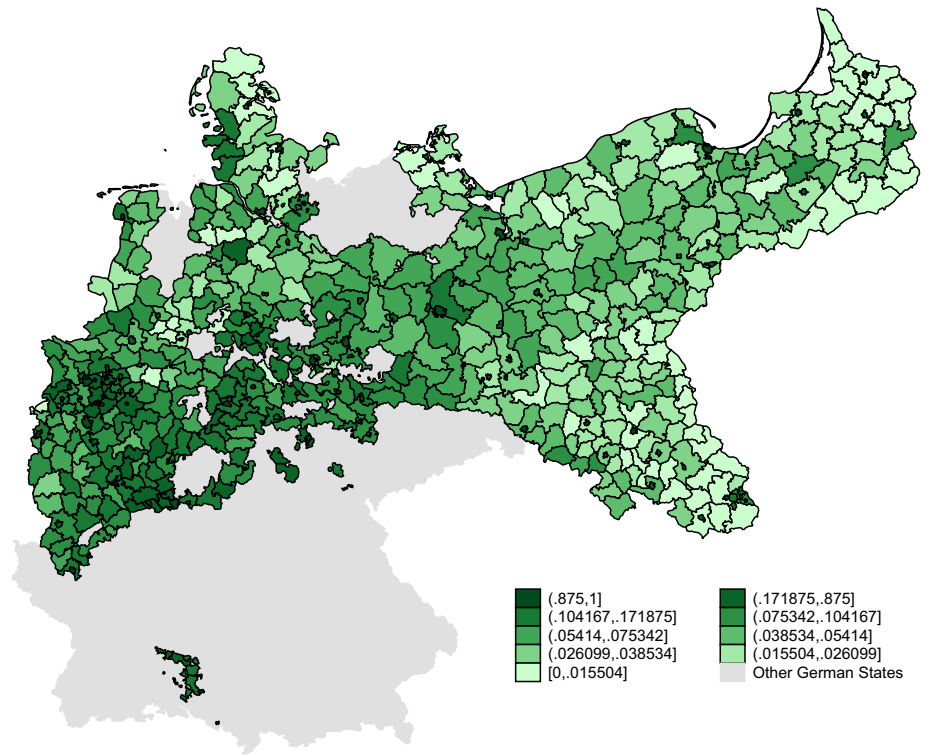
As outlined in Sect. 2.2, public measures differ in the way by how they affect people's health. More specifically, while some policies prevent the outbreak and spread of infectious diseases, others ease the access to medical services. For the purpose of this paper, this distinction is of importance because we expect some differences in the reasons for why elites in industrializing states implement such measures. To obtain data that allows us to differentiate between different types of measures, we digitize publications of the Royal Prussian Statistical Office [see Tetzlaff (1911, 1914)], including local-level data on the provision of eight health-related public goods. Three of them improve the access to health services for the poor, while the other five public goods have preventive purposes (for details, see Table 2). To the best of our knowledge, we are the first who make use of these historical statistics.<sup>29</sup>

Table F.4 exemplifies how we aggregate our raw data to compute county-level indices, reflecting the provision of health-promoting public goods. For each county, we first extract the total number of municipalities from Galloway (2007). We then exploit our data to count how many municipalities provided a particular health-promoting public good in 1911. Afterwards, we compute a coverage rate for each public good. Our final measure is the average over the eight individual coverage rates.

<sup>29</sup> Our eight health-promoting public goods were financed at the local level. The main source of income for local governments in Prussia were revenues from direct taxes. The most important taxes were the taxes on incomes, properties, businesses, and buildings. For each of them, the Prussian government defined a basic level and local governments could levy surtaxes (Spoerer, 2004). This is an important point because it implies that local elites had the possibility to generate sufficient tax revenues to finance health infrastructure projects. Since these projects were usually financed by long-term loans (Vögele, 2001), it was usually not necessarily to raise the surtaxes by a substantial amount to have enough funding.

**Table 2** List of health-related public amenities in our data set

Public good	Type
Hospital	Access
Nursing home	Access
Public health fund	Access
Sewer system	Prevention
Water supply system	Prevention
Waste collection	Prevention
Public bath	Prevention
Slaughterhouse	Prevention



**Fig. 2** Provision of health-promoting public goods in Prussian counties in 1911. *Notes* This figure presents a map of the German Empire in the borders of 1911. The shade of green reflects the extent of public good provision. The darker the shade of green, the more health-promoting public goods were provided (Color figure online)

In Fig. 2, we illustrate to which extent health-promoting public goods were provided in 1911, according to our measure. We observe remarkable differences, especially between eastern and western Prussia and between the counties and the county boroughs. Our data also suggests that heterogeneity existed between the health-promoting public goods. More specifically, nursing homes were (by far) the most frequently provided ones. We observe them in more than 21 percent of the municipalities. Among the preventive measures, water

supply systems were most widespread, followed by sewer systems. Waste collections and public health funds were rare in 1911. These two public goods existed in less than 1 percent of the municipalities.

### 3.1.3 Strength of the working class

The third key ingredient that we require for testing the hypotheses developed in Sect. 2.2.2 is a measure, reflecting whether elites were threatened by workers' movements. To produce such a measure, we combine different information. The first information is the average vote share of the SPD in the Reichstag elections between 1871 and 1911.<sup>30</sup> Our data source is Galloway (2007). Second, we apply municipal-level data on trade union membership. More specifically, we digitize a report published by the General Commission of German Trade Unions, including membership figures for each union cartel in 1911.<sup>31</sup> We aggregate the data to the county level and divide the aggregated figures by population size to increase the comparability. Third, we collect strike data for the period from 1899 to 1905 by digitizing 7 reports of the Royal German Statistical Office.<sup>32</sup> As for the second measure, we aggregate the data to the county level and express the number of strikes in per capita terms. Figures E.3–E.5 show that the vote shares of the SPD ( $W^1$ ), the number of trade union members ( $W^2$ ), and the number of strikes ( $W^3$ ) are strongly and positively correlated.

We proceed in two steps to aggregate  $W^1$ ,  $W^2$ , and  $W^3$ . In the first step, we dichotomize each of our three measures. In particular, we set  $W^{1,b}$  ( $W^{2,b}$ ,  $W^{3,b}$ ) equal to one if  $W^1$  ( $W^2$ ,  $W^3$ ) is above the 80 percentile. The second step aggregates our three binary measures. We apply two different methods. The first procedure sums up our three binary measures, whereas the second is to take the maximum value:

$$W_i^g = W_i^{1,b} + W_i^{2,b} + W_i^{3,b} \quad \text{and} \quad W_i^b = \max(W_i^{1,b}, W_i^{2,b}, W_i^{3,b}). \quad (1)$$

## 3.2 Empirical methods

### 3.2.1 Basic model

We begin our empirical analysis on the impact of elite structure on public health investments with the regression model:

<sup>30</sup> The elections took place in 1871, 1874, 1877, 1878, 1881, 1884, 1887, 1890, 1893, 1898, 1903, 1907, and 1912. We exclude the 1912 election from our calculation because we have data on public good provision from 1911. We consider the elections for the Reichstag rather than the elections for the Prussian parliament because the latter were often boycotted by the SPD. A concern may be that the SPD could not participate in the elections from 1878, 1881, 1884, and 1887 because of the Socialist Laws. However, since SPD members circumvented this ban by running as independent candidates, vote shares of the SPD are also available for the period in which the Socialist Laws were in place. To study whether including these elections affects our measure in a notable manner, we compute the average vote share of the SPD in the elections from 1890 onwards. The correlation between the two version of our measure is 0.979. We thus consider it as unlikely that our empirical result are biased due to our choice.

<sup>31</sup> The figures were published in the trade union magazine "Correspondenzblatt der Generalkommission der Gewerkschaften Deutschland" on 8 June 1912. A digital version of this issue is available here: <http://library.fes.de/gewerksz/correspondenzblatt/1912/pdf/1912-Statistische%20Beilage-005.pdf>

<sup>32</sup> In its series "Statistik des Deutschen Reiches", the Royal German Statistical Office provided information on strikes between 1899 and 1914. However, only until 1905, the data is published at the local level.

$$H_{i,1911} = \zeta + \beta \cdot U_{i,1871-1911} + \gamma \cdot \mathbf{X}_{i,1871} + \varepsilon_i, \quad (2)$$

where  $i$  denotes a county,  $H$  the level of public good provision (for details, see Sect. 3.1.2), and  $U$  the political influence of the landless elite (for details, see Sect. 3.1.1). When creating our basic measure for the distribution of political power, we take into account all county directors and all members of the Prussian parliament that were in office between 1871 and 1911. The parameter of interest is  $\beta$ , indicating whether the provision of health-promoting public goods increases ( $\beta > 0$ ) or decreases ( $\beta < 0$ ) in the political say of landless elites. As outlined in Sect. 2.2, we expect the parameter  $\beta$  to be positive, regardless of whether we jointly consider all health-promoting measures or whether we distinguish between preventive policies and policies that improve the access to health services.

As shown in Table F.1, the way of how the local political power was shared between landowning and landless elites in late-19th/early-20th century Prussia is not random. For instance, we observe that the political influence of the landless elite was greater in places with a high population density or higher income tax revenues. A bivariate regression may therefore produce biased estimates of  $\beta$ . To reduce the risk that our results are indeed biased, we add a comprehensive set of control variables ( $\mathbf{X}$ ) to our regression model.<sup>33</sup> We compile them from multiple sources (for a list and summary statistics, see online Appendix C). First, we exploit the Galloway database to get data on population and industry structure, fertility and mortality, urbanization, and income tax payments. We also use the Ifo Prussian Economic History Database (Becker et al., 2014), for instance to obtain data on education and land concentration. Furthermore, as qualitative studies argue that public saving banks often granted credits to local governments to finance public health infrastructure investments, we digitize a publication of the Royal Prussian Statistical Office, including local-level information on the amount of deposits and number of saving accounts. We also compute the distance to the capital city of Prussia (Berlin) and the nearest coal fields. For calculating the latter, we follow Fernihough and O'Rourke (2021). From Meitzen (1869), we extract data on road and train networks and soil texture. Finally, we control for the differences in the extent to which people had access to health services in the 1870 s. To this end, we digitize lists published by Engel (1877), including county-level information on the number of beds in general and maternity hospitals, and use data on the share of people working in the health sector, published by Galloway (2007).<sup>34</sup>

### 3.2.2 Instrumental variable approach

Despite the large set of controls in our basic regression models (see Eq. 2), we cannot fully rule out that our measure for the distribution of political power does not correlated with the error term. A key reason is that limited data availability prevents us from controlling for all

<sup>33</sup> A pitfall in this regard is that these control variables may be “bad controls”, i.e. variables that are part of the channel through which elite structure shapes the implementation of public health measures. As suggested by Angrist and Pischke (2009), we thus only use variables that were determined prior to our key explanatory variable. More specifically, as  $U$  reflects how political power was distributed among landowning and landless elites in the period from 1871 to 1911, we include county characteristics from the 1860 s and early 1870 s as control variables into our regression model.

<sup>34</sup> Unfortunately, no variables are available that allow to control for potential differences in the implementation of preventive policies in the 1870 s. However, we expect these differences to be small since the expansion of preventive measures had just started at this time.

potential confounders. Another reason is that our measure suffers from measurement error. To mitigate these issues, we apply a two-stage least squares (2SLS) approach,<sup>35</sup>

At the lowest administrative level, the Prussian laws distinguish three types of municipalities: towns, rural communities, and estates (for further details on the administrative structure of Prussia, see online Appendix A.1). In the towns and rural communities, policy decisions were made by a local council, whereas every estate owner had the right to decide alone about municipal matters (for institutional details, see online Appendix A.2). For our purpose it is of importance that the Prussian estate owners differed by law in their political rights, despite their common right to manage their territory according to their own will. The basic idea of our 2SLS approach is to exploit such differences. More specifically, our first-stage regression model is:

$$U_{i,1871-1911} = \zeta + \alpha \cdot K_i + \gamma \cdot \mathbf{X}_{i,1871} + \varepsilon_i \quad (3)$$

where  $K$  is the share of knight estates (*Rittergüter*) among all rural places. To compute our instrument, we use two data sources. The first is Rauer (1857) who lists all knight estates in 1856. The other is a census report, including the total number of rural places in 1849 Statistisches Bureau zu Berlin (1851). The ratio between the two figures is our instrumental variable.

For several reasons, we consider the share of knight estates as an appropriate instrumental variable for our county-level measure of the distribution of political power between the landowning and landless elites in late-19th/early-20th century Prussia. First of all, compared to virtually all other landowners, owners of knight estates had more political rights. For instance, until the 1870 s, all knight estate owners automatically occupied a seat in a county parliament. By contrast, other landowners were (if at all) represented by some deputies in these parliaments. In addition, these deputies were not only selected by landowners but also by other people that lived in the rural areas of a county. We can therefore expect that a higher share of knight estates leads to more political influence for the landowning elite. Consistent with this expectation, we find a strong correlation between our instrument and our main explanatory variable (see Fig. E.6).

Another main reason for why we are convinced by our instrument is that the number of knight estates is rather stable during the 19th century. In particular, Rauer (1857) suggests that only a bit more than 300 of the nearly 12,000 knight estates lost their status between 1834 and 1856. We also check on a random basis whether the knight estates indicated by Rauer (1857) are still described as such landholdings in the census documents from 1871. For the vast majority of knight estates, this is the case. Thus, which landholdings were knight estates and how many landowners thus had special political rights was already determined in the 1820 s as the respective registers of knight estates were first created. At that time, the industrial revolution in Prussia was (if at all) at a very early stage, workers' movements hardly existed, and the general opinion was that sanitation does not affect health.<sup>36</sup>

<sup>35</sup> In economic history studies on Prussia, the 2SLS approach is the most common strategy to address endogeneity issues [see e.g. Ashraf et al. (2020) Becker et al. (2010, 2011, 2012); Becker and Woessmann (2009), Cinnirella and Hornung (2016), Hornung (2014)].

<sup>36</sup> Many historians place the start of the industrial revolution in Prussia in the mid-1830 s [see Hoffmann (1963); Tilly (1996)]. The first workers' movements in Prussia emerged in 1848 [see Balsler (1962)]. The first scientific proof that sanitation has an impact on health was made by Ignaz Semmelweis in the 1840 s. Until the 1860 s, even most scientists did not believe in a relationship between sanitation and health [see Best and Neuhauser (2004)].

A third aspect that speaks in favor of our 2SLS approach is that the decision of which landholding is a knight estate was not made by the local authorities but rather by the Prussian government. Similarly, the institutional rules that created political privileges for the owners of knight estates were designed at the national level. Aidt et al. (2010) argue that such a setting can be used for developing an instrumental variable strategy because national laws and rules are unlikely to be determined by the political or economic situation of a particular municipality or county. To substantiate this point, we use county-level data from the early-1820 s reported by Mützell (1825). This data allows to test whether the distribution of knight estates correlated with other county characteristics at the time when the Prussian government decided which landholdings belong to the group of knight estates. Among others, Mützell (1825) indicates the number of mills and looms, mortality figures, and the number of farm animals (for a list of all variables, see online Appendix D).<sup>37</sup> As shown in Table F.3, our instrumental variable correlates with only two of the 28 available county characteristics in a significant manner. These two characteristics are the number of inns for cargo carriages and rural people as well as the number of servants for farming and other businesses.<sup>38</sup>

A concern regarding our procedure may be whether our instrument meets the exclusion restriction. We aim to alleviate this legitimate concern by showing that our second-stage estimates hardly change when we add control variables to our regression model. Such a robustness is reassuring since our controls block other channels through which the share of knight estates might affect the provision of public goods that improve the health of non-elite individuals. Another but related concern might be that the share of knight estates is used as an indicator for the extent of serfdom by Cinnirella and Hornung (2016), whereas Ashraf et al. (2020) consider it as a proxy measure of land concentration among the Prussian elites. Therefore, it might be that the share of knight estates affects the distribution of power not only through institutional rules but also via other channels. For our IV approach, such alternative channels are problematic if they shape the provision of health-promoting public goods not only via the distribution of power among the landowning and landless elites. We cannot fully rule out the existence of such an alternative channel. For instance, some studies suggest that both the extent of serfdom and land concentration have an effect on education [see e.g. Baten and Hippe (2018); Cinnirella and Hornung (2016); Goñi (2023)], which, in turn, might influence the provision of health-promoting public goods. We block this specific channel by controlling for differences in the level of education. Section 3.3 also presents results from regression models that explicitly control for land inequality. Neither our first- nor our second-stage results change in a notable way in these robustness checks.

<sup>37</sup> A few of these variables are included in the ifo Prussian Economic History Database (Becker et al., 2014) The other variables are digitized by ourselves.

<sup>38</sup> We also run a balance test where we study the relationship between our instrument and the control variables that we use in our main analysis. Table F.2 presents the results. We observe that the share of knight estates is significantly correlated with some of our controls. However, when comparing Tables F.1 and F.2, we find that our instrument is more balanced than our measure for the distribution of political power. For instance, while the latter is significantly correlated with population size and density, tax revenues, and the share of industrial workers (among other), such a relationship does not exist for the share of knight estates.

### 3.2.3 Augmented model

In Sect. 2.2.2, we do not only argue that landless elites provide more health-promoting public goods than landowning elites, but also establish the hypothesis that the reasons for why landless elites are more active in this regard are not the same for preventive measures and measures that ease the access to health care services. More specifically, we think that the differences in the latter type can be explained with differences in the extent to which the landless and the landowning elites are threatened by workers' movements. For preventive measures, we do not expect that this difference plays a role. To empirically test our hypotheses, we use two different strategies. The first is to estimate the regression model:

$$H_{i,1911} = \zeta + \beta_1 \cdot U_{i,1871-1911} + \beta_2 \cdot W_{i,1871-1911} + \beta_3 \cdot (U_{i,1871-1911} \times W_{i,1871-1911}) + \gamma \cdot \mathbf{X}_{i,1871} + \varepsilon_i \quad (4)$$

where  $W$  is one of our measures for the strength of the workers' movements (for details, see Sect. 3.1.3). The parameters of interest are  $\beta_1$  and  $\beta_3$ . The former indicates whether landless elites implement more health-promoting policies than landowning elites if workers are not well organized and elites thus not concerned about strikes or political turmoil. By contrast, the parameter  $\beta_3$  reflects how the behavior of the landless elite changes if the workers are better organized. If our theoretical considerations are valid, we find  $\beta_1 > 0$  and  $\beta_3 = 0$  for preventive measures and  $\beta_1 > 0$  and  $\beta_3 > 0$  for measures that facilitate people's access to medical services (for details, see Sect. 2.2.2).

The second procedure that we use in our mechanism analysis is to divide our sample, according to whether workers' movements are weak ( $W^b = 0$ ) or strong ( $W^b = 1$ ). In each of the sub-samples, we then apply our 2SLS approach. If our expectation about the mechanisms at work are correct, we observe in both sub-samples that the implementation of preventive policies increases in the political power of the landless elite. By contrast, for measures that improve the access to health care services, we only find evidence for an effect of elite structure on the provision of health-promoting public goods in the sub-sample that consists of the counties in which the workers are well organized.

## 3.3 Results

### 3.3.1 Main finding

In Table 3, we present results of eight regressions. These regressions share three features. First, they all exploit a sample including 15 county boroughs and 320 counties. Second, all non-binary variables are standardized such that they have a mean of zero and a standard deviation of one (for summary statistics, see Table C.1). Third, the outcome variable takes into account all of our health-promoting measures, regardless of whether they are preventive or ease the access to health care services (for the full list of measures, see Table 2).

In Column 1, we show OLS results from a regression model that includes two explanatory variables: a dummy that is equal to one for the 15 county boroughs, and our indicator of how politically powerful the landless elite was in the period from 1871 to 1911 (for details, see Sect. 3.1.1). Our first estimate indicates a positive and statistically significant relationship between the political influence of the landless elite and the implementation of health-promoting public policies. In particular, we observe that a one standard deviation

**Table 3** Baseline analysis (OLS and 2SLS estimates)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Landless elite	0.157*** (0.0222)	0.221*** (0.0356)	0.109*** (0.0284)	0.197*** (0.0651)	0.099*** (0.0285)	0.312*** (0.0760)	0.083*** (0.0258)	0.292*** (0.0743)
Approach	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
SW F-Stat	–	66.40	–	19.40	–	17.10	–	21.30
Observations	335	335	335	335	335	335	335	335
Borough FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province FE	No	No	Yes	Yes	No	No	No	No
District FE	No	No	No	No	Yes	Yes	Yes	Yes
Health	No	No	No	No	Yes	Yes	Yes	Yes

This table shows OLS and 2SLS estimates. The dependent variable is a coverage rate that takes into account eight health-promoting public goods (for details, see Sect. 3.1.2). All variables are standardized to have a mean of 0 and a standard deviation of 1. For summary statistics and a list of controls, see Table C.1. We report robust standard errors in parentheses and apply the following notation to highlight point estimates that are significantly different from zero: \* $p < 0.10$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$

increase in the power of the landless elite is associated with a 0.157 standard deviation increase in our main outcome variable.<sup>39</sup>

The OLS estimate reported in Column 1 might be biased, for instance due to measurement error in our measure for the political power of the landless elite or unobserved confounders. To alleviate this concern, we show results from our 2SLS approach in Column 2. Reassuringly, our parameter estimate of interest remains positive and statistically significant at the one percent level. The 2SLS estimate ( $\hat{\beta}_{IV} = 0.22$ ) even slightly exceeds the OLS estimate ( $\hat{\beta}_{OLS} = 0.16$ ). Our first-stage diagnostics indicate that our second-stage estimate does not suffer from a weak-instrument bias (for first-stage and reduced-form estimates, see Table F.6). For instance, the first-stage F-statistic is 66.40 and thus considerably above the commonly used threshold of 10.

In Columns 3 and 4, we augment our initial regression models by nine province fixed effects and thereby control for all institutional, economical, demographical, historical, cultural, and geographical factors that vary between provinces. Given that regional differences were substantial in late-19th/early-20th century Prussia (especially between Eastern and Western provinces), we believe that this model extension constitutes an important and demanding check. We find that our OLS estimate decreases from 0.16 to 0.11, but also that it continues to be statistically significant at the one percent level. For our 2SLS estimate, we observe a similar pattern. Consequently, we interpret the results presented in Columns 3 and 4 as evidence for our hypothesis that landless elites implement more health-promoting measures than landowning elites.

In Columns 5 and 6, we replace our province fixed effects by 25 district (*Regierungsbezirk*) fixed effects to control in a more detailed way for regional differences. Our OLS estimate hardly changes due to this model adjustment, while our 2SLS estimate increases from 0.20 to 0.31. We also observe that both estimates remain statistically significant

<sup>39</sup> As evident from Table C.1, the standard deviation in our outcome variable is nearly twice as large as the mean. Thus, 0.157 standard deviations are roughly the same as one third of the sample mean. A transition from an environment where the landless elite has no power to an environment where the landless elite possess all power is equivalent to a 4 standard deviation increase in our main explanatory variable.

at conventional levels. Table F.6 shows that the rise in the 2SLS estimate is caused by a stronger reduced-form relationship.

Ideally, we would like to extend our regression models with a measure that is produced in the same way as our dependent variable and reflects the provision of health-promoting public goods in 1871. With such a variable, we could further address the concern that our previous results might be driven by an unobserved cultural or historical factor. Unfortunately, creating such a measure is impossible because of limited data availability. As an alternative, we expand our regression model by variables that characterize the level of health and public health care in the early 1870 s. These variables are (i) the crude death rate, (ii) the death rate of newborns, (iii) the per-capita number of people working in the health sector, (iv) the per-capita number of public hospital beds, and (v) the per-capita number of beds in public maternity hospitals. Columns 7 and 8 imply that adding these five variables to our regression model only has little impact on our estimates.

In our conceptual considerations (see Sect. 2.2), we argue that landless and landowning elites differ in their policy preferences and thus do not put the same emphasis on the implementation of measures that improve the health of working-class people. While the results shown in Table 3 are consistent with this line of argument, other potential explanations exist for them. For instance, it might be that places that are governed by landless elites have a higher fiscal capacity and thus more health-promoting public goods than places in which landowning elites dominate. To verify whether this alternative mechanism is likely to explain our baseline estimates, we expand the regression models applied in Columns 7 and 8 of Table 3 by three variables. The first reflects income tax revenues (per capita) in 1876. The other variables are the total number of accounts (per capita) and the total amount of deposits (per capita) in public saving banks in 1875. While the former variable is a common proxy for fiscal capacity [see Karaman and Pamuk (2013)], we think that information on local public saving banks are an important complement in our case since these banks often provided loans for public health infrastructure projects in Prussia [see e.g. Krabbe (1985); Vögele (2001)]. The OLS and 2SLS estimate reported in the first column of Table 4 (see Panels A and B) illustrate that our results do not depend on whether we control for fiscal capacity. Consequently, we consider it as unlikely that differences in fiscal capacity explain why the provision of health-promoting public goods increases in the power of the landless elite.

In Column 2 of Table 4, we aim at alleviating the concern that our previous regression models do not adequately control for urbanization. This concern may exist since health conditions were much worse in urban areas in late-19th/early-20th century Prussia. Thus, the need for health-promoting reforms was higher in urban places than in rural places. At the same time, we can expect that landless elites were more powerful in urban environments. We capture local differences in urbanization by controlling for the share of people that lived in a town and the population density. Furthermore, we control for the total number of towns and rural communities, respectively. Compared with Columns 7 and 8 of our baseline Table 3, we find slightly smaller estimates when controlling for these four variables. However, we also observe that our estimates continue to be statistically significant at conventional levels. Therefore, we doubt that our baseline estimates simply reflect differences in urbanization.

Columns 3–8 of Table 4 show the results of further model extensions. In neither of these robustness checks, we find strong changes in our estimates. More specifically, in Column 3, we control for industry structure. To this end, we use census data on the share of workers in the industrial, transport, service, mining, education, and agricultural sector. In Column 4, we show how our results change when adding the share of literate males and females as

**Table 4** Baseline analysis (additional control variables)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
<i>Panel A: OLS estimates</i>											
Landless elite	0.075*** (0.0245)	0.056*** (0.0217)	0.050** (0.0227)	0.084*** (0.0254)	0.080*** (0.0266)	0.072*** (0.0238)	0.069*** (0.0251)	0.084*** (0.0280)	0.079*** (0.0264)	0.052** (0.0208)	0.056*** (0.0202)
<i>Panel B: 2SLS estimates</i>											
Landless elite	0.301*** (0.0826)	0.284*** (0.0738)	0.297*** (0.0836)	0.285*** (0.0731)	0.278*** (0.0721)	0.289*** (0.0703)	0.312*** (0.0880)	0.308*** (0.0757)	0.316*** (0.0886)	0.365*** (0.1105)	0.284*** (0.0785)
SW F-Stat	18.31	19.42	16.96	21.19	19.00	22.64	17.11	23.03	16.63	11.06	15.92
<i>Panel C: Reduced-form estimates</i>											
Knight estates	-0.07*** (0.0156)	-0.07*** (0.0144)	-0.06*** (0.0159)	-0.07*** (0.0163)	-0.06*** (0.0157)	-0.07*** (0.0162)	-0.07*** (0.0195)	-0.08*** (0.0175)	-0.07*** (0.0167)	-0.07*** (0.0162)	-0.07*** (0.0167)
<i>Panel D: First-stage estimates</i>											
Knight estates	-0.22*** (0.0524)	-0.23*** (0.0520)	-0.21*** (0.0520)	-0.25*** (0.0534)	-0.23*** (0.0531)	-0.25*** (0.0528)	-0.24*** (0.0574)	-0.26*** (0.0536)	-0.21*** (0.0522)	-0.20*** (0.0597)	-0.23*** (0.0587)
Observations	335	335	335	335	335	335	335	335	335	335	335
Borough FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Province FE	No	No	No	No	No	No	No	No	No	No	Yes
Health	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fiscal Cap	Yes	No	No	No	No	No	No	No	No	Yes	Yes
Urbanization	No	Yes	No	No	No	No	No	No	No	Yes	Yes
Industry struct	No	No	Yes	No	No	No	No	No	No	Yes	Yes
Education	No	No	No	Yes	No	No	No	No	No	Yes	Yes
Private prov	No	No	No	No	Yes	No	No	No	No	Yes	Yes
Infrastructure	No	No	No	No	No	Yes	No	No	No	Yes	Yes
Demographics	No	No	No	No	No	No	Yes	No	No	Yes	Yes
Geography	No	No	No	No	No	No	No	Yes	No	Yes	Yes
Land inequality	No	No	No	No	No	No	No	No	Yes	Yes	Yes

This table shows OLS and 2SLS estimates. In Panel A–C, the dependent variable is a coverage rate that takes into account eight health-promoting public goods (for details, see Sect. 3.1.2). In Panel D, the dependent variable is a measure reflecting the political power of the landless elite (for details, see Sect. 3.1.1). All variables are standardized to have a mean of 0 and a standard deviation of 1. For summary statistics and a list of controls, see Table C.1. We show robust standard errors in parentheses and use the following notation to highlight point estimates that are significantly different from zero: \* $p < 0.10$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$

proxies for the level of education to our model. We consider this robustness check as crucial due to the positive effects of education on health (Cervellati & Sunde, 2005; Hansen & Strulik, 2017) and since economic theory implies that landless elites have greater benefits from educating their workers than landowning elites (Galor et al., 2009). Column 5 addresses the concern that landowning elites might be more willing to privately provide services that are beneficial for workers and thus do not need to implement public measures. Because we lack data on private health services, we exploit education data to rule out this alternative explanation. In particular, in Column 5, we are controlling for the share of private schools, the share of pupils enrolled in private schools, and the share of teachers working in private schools. Column 6 examines whether our estimates may reflect that places dominated by landless elites are better connected with other places and thus have more/better information about health-promoting technologies and measures. To this end, we expand our models by variables indicating the total length of all country roads, navigable rivers, and railway tracks. In Columns 7 and 8, we control for standard demographic characteristics (e.g. share of females, Catholics, young people, and migrants) and geographic characteristics (e.g. soil texture, distance to Berlin and the nearest coal field, longitude, latitude).

Column 9 of Table 4 adds a measure of land inequality to our models. As outlined in Sect. 3.2, we think for several reasons that this robustness test is essential. For instance, land inequality correlates with the distribution of power between the landowning and landless elites and the share of knight estates (our instrumental variable). A reasonable concern is thus whether land concentration constitutes an alternative mechanism through which the share of knight estates influences the implementation of health-promoting policies. However, the results from our model extension suggest that this is unlikely since our estimates only change marginally when controlling for differences in land inequality. Especially notable in this regard are the results of our first-stage regression since we find a strong relationship between land inequality and the distribution of the political power (not reported), but also that the estimate showing the relationship of our instrumental variable and the distribution of power is nearly the same as in the baseline model (see Column 4 of Table F.6) and the other model extensions (see Columns 1–8 of Table 4).

In Column 10 of Table 4, we estimate a model that includes all 49 control variables and the 25 district fixed effects. We consider this robustness check as a very demanding test, especially because our sample only consists of 335 counties. Compared to Columns 7 and 8 of Table 3 and the other Columns in Table 4, we only observe small changes. The most notable change concerns the strength of the first-stage relationship. As a consequence, we find considerably larger second-stage estimates. To allay potential concerns regarding the strength of our instrumental variable, we replace the district fixed effects with province fixed effects. The first-stage relationship is stronger in this slightly less demanding robustness check and the second-stage estimate a bit smaller (see Column 11 of Table 4).

In addition to our model extensions, we perform some subsample analyses to check the robustness of our baseline estimates. Table F.7 presents the results of these analyses. More specifically, we first exclude all 15 county boroughs from our sample. Column 1 indicates that this restriction only has minor consequences. In Column 2, we study the Eastern parts of Prussia. Then, our estimates are smaller than in the baseline models (see Columns 7 and 8 of Table 3), but continue to be positive. Our IV estimate also remains statistically significant at the one percent level. The p-value of the OLS estimate is 0.109 and thus close to be statistically significant at conventional levels. If we exclude the county boroughs, the level of statistical significance improves slightly (see Column 3). Columns 4 and 5 replicate the previous analyses for the two Western provinces and suggest that our results also hold for this part of Prussia. Notably, we find only minor differences in our 2SLS estimates when

comparing the results for the Eastern and Western regions. Column 6 illustrates that our estimates hold when we drop all counties without a town. In Column 7, we exclude all counties that experienced a territorial change between 1871 and 1911, either due to a district reform or because a town became independent. This sample restriction does not affect our findings in a significant manner. Furthermore, Fig. E.7–E.12 present the results of various jackknife analyses and indicate that our estimates are not driven by a particular district, province or health-promoting public good. Lastly, we show in Table F.8 that our results are robust to methodological changes in our key explanatory variable. In particular, Columns 1 and 2 illustrate that our results remain virtually unchanged when applying a multiplicative rather than an additive aggregation procedure. In Columns 3 and 4, we additionally take into account the members of the Reichstag when producing our measure for the distribution of power. Our estimates hardly change when using this broader approach. Columns 5 and 6 show that our results hold if we only consider politicians that were active between 1900 and 1911. In Columns 7 and 8, we highlight that dropping politicians for which we do not find biographical information has no notable effects on our estimates.<sup>40</sup>

In sum, the results shown in this section suggest that the provision of health-promoting public goods in late-19th/early-20th century Prussia increased in the political power of the landless elite. This finding is consistent with the theoretical considerations presented in Sect. 2.2.2. Sect. 4 provides further support for our basic hypothesis by exploiting two roll-call votes in the Reichstag. However, before turning to this analysis, we differentiate between preventive measures and measures that improve the access to health services (see Sect. 3.3.2) and shed some light on the mechanisms at work (see Sect. 3.3.3).

### 3.3.2 Different types of health-promoting measures

In Table 5, we apply the same regression models as in Columns 7 and 8 of our baseline Table 3 but distinguish between measures that ease people's access to health services and measures that prevent the outbreak and spread of infectious diseases. If the line of argument developed in Sect. 2.2.2 is solid, we should observe that both types of measures were more frequently implemented in those Prussian counties where the landless elite is powerful. Our estimates are in line with this prediction. More specifically, our regression results imply a positive relationship between our measure reflecting the political influence of the landless elite and our type-specific measures for the provision of health-promoting public goods. Our 2SLS estimates and the OLS estimate that we obtain if we consider preventive policies are even statistically significant at the one percent level. The other OLS estimate is statistically significant at the ten percent level.

To assess the robustness of the estimates shown in Table 5, we made the same model extensions as in Sect. 3.3.1. Table F.10 reports the estimates. The basic structure of this table is the same as the structure of Table 4. We observe that our 2SLS estimates continue

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<sup>40</sup> We also test whether the relationship between the distribution of power and the provision of health-promoting public goods might be non-linear. To this end, we assign each county to one out of four groups (1:  $U \in [0, 0.25]$ ; 2:  $U \in [0.25, 0.5]$ ; 3:  $U \in [0.5, 0.75]$ ; 4:  $U \in [0.75, 1]$ ). Our OLS estimates suggest that virtually no difference exist between the first and the second group (see Fig. E.13). Put differently, whether a county is completely or largely dominated by the landowning elite does not play a big role for the provision of health-promoting public goods. In addition, the difference between the third and first group is much smaller than the difference between the fourth and third group. Overall, it thus seems that there is non-linearity. However, as only OLS estimates can be provided, this finding needs to be interpreted with caution. We leave it open for future research to dig deeper into this issue.

**Table 5** Different types of health-promoting public goods

	Access to health services		Preventive measures	
	(1)	(2)	(3)	(4)
Landless elite	0.064* (0.0357)	0.334*** (0.1124)	0.090*** (0.0240)	0.257*** (0.0643)
Approach	OLS	2SLS	OLS	2SLS
SW F-Stat	–	21.30	–	21.30
Observations	335	335	335	335
Borough FE	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes
Health	Yes	Yes	Yes	Yes

This table shows OLS and 2SLS estimates. In Columns 1 and 2, the dependent variable is a coverage rate that takes into account three health-promoting public goods that ease access to health services. In Columns 3 and 4, the dependent variable is a coverage rate that takes into account five preventive measures. All variables are standardized to have a mean of 0 and a standard deviation of 1. For summary statistics and a list of controls, see Table C.1. We report robust standard errors in parentheses and apply the following notation to highlight point estimates that are significantly different from zero: \* $p < 0.10$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$

to be positive and statistically significant at the one percent level in each extension. For the OLS estimates, this pattern holds when studying preventive measures. By contrast, for measures that facilitate the access to medical services, we have some specifications where the OLS estimate is not statistically significant at standard levels. We believe that the differences in the level of statistical significance are not fully implausible since we expect that the support of landless elites for measures that improve access to health care services depends on the strength of the workers' movements. In the following section, we provide more details on the mechanisms at work.<sup>41</sup>

### 3.3.3 Mechanism

As outlined in more detail in Sect. 3.2.3, we use two different approaches to shed light on the reasons for why landless elites in late-19th/early-20th century Prussia implemented more health-promoting policies than landowning elites. The first approach is to estimate an interaction model (see Eq. 4), using OLS. Our second approach is to split our sample into two parts based on how well workers were organized. For each subsample, we can then apply our instrumental variable strategy. In Table 6, we report the results of both approaches, but separately for measures that facilitate access to medical services and measures that prevent the outbreak and spread of infectious diseases.

In Columns 1 and 2 of Table 6, we use interaction models to highlight why the access to health care services increases in the political power of the landless elite. The difference between the two models concerns the way of how we measure the strength of the workers' movements: while we apply our graded measure ( $W^g$ ) in Column 1, the binary version

<sup>41</sup> In Table F.9, we study each of our health-promoting public goods separately. Only for one of them (waste collection), we do not find statistically significant 2SLS estimates. A potential explanation is the fairly low number of waste collections in 1911.

( $W^b$ ) is used in Column 2 (for details, see Sect. 3.1.3). The set of control variables is the same as in Column 7 of Table 3 and Columns 1 and 3 of Table 5. In line with our theoretical arguments, we find that landless elites improve access to health services if workers' movements are strong. Our second approach confirms this result (see Columns 3 and 4 of Table 6). Table F.11 illustrates that our findings hold if we add further control variables to our regression models.<sup>42</sup>

In Columns 5–8, we examine why landless elites implement more preventive measures. As outlined in Sect. 2.2.2, our basic hypothesis is that an increase in the political power of landless elites causes an increase in the implementation of preventive policies, regardless of how well the workers are organized. Our results indicate that this is indeed the case. More specifically, we observe positive and statistically significant estimates in both subsamples. When using the interaction model, we see that the main effects are statistically significant at common levels, while the interaction terms are (at best) weakly significant. Table F.12 shows that the interactions become statistically insignificant at conventional levels if we add additional controls to our regression model. The other estimates only change little in these robustness checks.

In sum, our results substantiate the hypotheses that the reasons for why the landless elite of an industrializing regime provides more health-promoting public goods than the landowning elite depends on the nature of the public good. More specifically, for measures that ease the access to health services for working-class people, we observe that the distribution of the political power plays a role only if workers' movements are strong. Since workers in late-19th/early-20th century Prussia were better organized in the non-agricultural sectors than workers in the agricultural sectors, we interpret our findings as evidence for theories suggesting that elites redistribute to reduce the risk of strikes and political turmoil [see e.g. Acemoglu and Robinson (2000, 2001)]. By contrast, for measures that prevent the outbreak and spread of infectious diseases, we find that landless elites implement them more frequently, irrespective of the strength of the workers' movement. We believe that this result is consistent with theories suggesting that elites conduct reforms that are beneficial for the poor without being threatened [see e.g. Galor and Moav (2006), Galor et al. (2009), Lizzeri and Persico (2004)].

## 4 Roll-call votes analysis

The results reported in the previous section strongly suggest that the landowning elite in late-19th/early-20th century Prussia were not as active in implementing health-promoting measures as the landless elite. We explain our key finding with differences in preferences and differences in the extent to which the two types of elites were threatened by workers' movements. To exclude other explanations for our results (e.g. differences in fiscal capacity), we add a large number of control variables to our regression models. However,

<sup>42</sup> In contrast to our expectation, we do not find that the estimates of  $\beta_1$  are positive. We think that this is not implausible as many of the facilities whose provision we study in this analysis are care facilities for terminally ill, disabled, elderly or invalid people. Although these facilities certainly helped these people to live longer, they hardly prolonged their working life. Thus, we believe that the Ben-Porath mechanism is only of minor relevance. Without this mechanism, there is little reason to expect that landless elites have more financial benefits from improving access to health services than landowning elites (for details, see Sect. 2.2.2). In Sect. 4, we consider a measure that improves access to health services and prolongs the working life. In line with the explanation provided for the non-positive estimates of  $\beta_1$ , we then obtain a different result.

**Table 6** Mechanism analysis

	Access to health services				Preventive measures			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Landless elite	− 0.008 (0.0340)	− 0.018 (0.0347)	− 0.142 (0.1108)	0.367** (0.1519)	0.059*** (0.0206)	0.047** (0.0209)	0.148** (0.0612)	0.305*** (0.1149)
Strength workers	0.007 (0.0394)	0.011 (0.0718)			− 0.009 (0.0206)	− 0.041 (0.0500)		
Landless elite × Strength workers	0.136* (0.0778)	0.144** (0.0641)			0.068 (0.0609)	0.087* (0.0451)		
Approach	OLS	OLS	2SLS	2SLS	OLS	OLS	2SLS	2SLS
Sample	Full	Full	$W = 0$	$W > 0$	Full	Full	$W = 0$	$W > 0$
SW F-Stat	–	–	9.23	10.23	–	–	9.23	10.23
Observations	335	335	223	112	335	335	223	112
Borough FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province FE	No	No	Yes	Yes	No	No	Yes	Yes
District FE	Yes	Yes	No	No	Yes	Yes	No	No
Health	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

This table shows OLS and 2SLS estimates. In Columns 1–4, the dependent variable is a coverage rate that takes into account three health-promoting public goods that ease access to health services. In Columns 5–8, the dependent variable is a coverage rate that takes into account five preventive measures. All variables are standardized to have a mean of 0 and a standard deviation of 1. For summary statistics and a list of controls, see Table C.1. We show robust standard errors in parentheses and apply the following notation to highlight point estimates that are significantly different from zero: \* $p < 0.10$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$

a concern regarding our county-level analysis might still be that aggregated data cannot be used to illustrate that the landowning (landless) elites actively oppose (support) health-promoting policies. The purpose of this section is to allay this legitimate concern by using roll-call votes. In the (historical) political economy literature, studying roll-call votes is a common method to reveal differences among landowning and landless elites. For instance, Galor and Moav (2006) use such an analysis to examine whether land-owning and landless elites differ in their attitudes towards education policies [see also Cvrcek and Zajicek (2019)]. For Prussia, roll-call votes were (e.g.) studied by Becker and Hornung (2020) and Ziblatt (2008a). To our best knowledge, no study exists that focuses on roll-call votes that are related to health policies.

## 4.1 Background information

### 4.1.1 Compulsory health insurance for workers

We consider the votes of two ballots in the German parliament (Reichstag). The first concerns the introduction of the compulsory health insurance for workers. As sketched in Sect. 2 and described in more detail in online Appendix A.4, this health-promoting policy was part of Bismarck's 'carrots and sticks' approach with which he aimed to reduce the support for social-democratic ideas and movements. The final votes on the respective bill took place in May 1883.

The minutes from the related parliamentary debates clearly indicate that the compulsory health insurance for workers was controversially discussed among the Reichstag parliamentarians. In particular, great disagreement existed with regard to the question of who should be eligible for this insurance. In the final bill, the eligibility criteria were specified in §1, §1a, §2, and §3. More specifically, §1 states that participation is compulsory for all industrial wage earners, while §1a defines that wage workers in the agricultural sectors also need to participate. §2 and §3 specify exemptions (e.g. civil servants and apprentices). In the second reading of the bill in April 1883, a majority of the parliamentarians approved that all four paragraphs should belong to the final bill.

Prior to the final vote on the bill in May 1883, three members of the German parliament (Georg von Hertling, Wilhelm von Minnigerode, Otto Uhden) filed a motion that aimed to restrict eligibility, especially for agricultural workers. Their motion was approved by 136 to 134 votes. Because of the request of the liberal politician Alexander Meyer, the vote on this motion was a roll-call vote. We can thus exploit this motion to study whether landowners differ from other elites in their willingness to support a policy that improves workers' access to health care services.

#### 4.1.2 Compulsory trichinella inspection

Contaminated meat was a frequent cause of illness and death in Germany in the second half of the 19th century. To address this health issue, some (but not all) German states passed laws that regulate the slaughter of animals. Most of these states also introduced compulsory trichinella inspections. For instance, in Prussia, trichinella inspections became mandatory in 1866. In 1899, the government of the German Empire presented a bill that aims to establish a uniform regulation. As mentioned by the Interior Minister Graf Arthur von Posadowsky-Wehner in the parliamentary debate on 17 April 1899, some interest groups opposed this bill for economic reasons. The minutes from this and other debates suggest that a main point of contention was §8 of the draft bill. The objective of this paragraph was to make trichinella inspections compulsory for virtually all slaughters. The only exception concerned slaughters for own use.

After intensive discussion, the final vote on the bill concerning the inspection of animals of slaughter and meat (*Gesetz betreffend die Schlachtvieh- und Fleisch-beschau*) took place in March 1900. Prior to the vote on §8 on March 10, the president of the German health department, Dr. Karl Köhler, clearly stated that establishing compulsory trichinella inspections is very important from a medical point of view and desired by the government. The parliamentarians nevertheless rejected this paragraph by 165 to 66 votes. Since the final vote on §8 was a roll-call vote, we can use it to examine whether landowning and landless elites voted differently on a policy that aims to prevent the outbreak of a disease.

## 4.2 Data

To identify how parliamentarians voted in the above-mentioned votes, we exploit the minutes of the parliamentary sessions on 25 May 1883 and 10 March 1900, respectively. We distinguish three types of voting behavior: voting in favor of a health-promoting policy ( $V = 2$ ), abstention from voting ( $V = 1$ ), and voting against a health-promoting policy ( $V = 0$ ). To decide whether a parliamentarian belongs to the landowning or the landless elite, we use the same procedure as in Sect. 3 (for details, see online Appendix B). Our key data source is the handbook by Best and Schröder (1992) which includes detailed

biographical information on all members of the Reichstag. From their handbook, we also extract other personal information such as date of birth, religion, party affiliation, electoral district, and whether a parliamentarian holds a PhD. Finally, we exploit Specht and Schwabe (1904) to obtain constituency-level data on the vote share of the SPD.

### 4.3 Results

Following Galor and Moav (2006), we perform ordered probit regressions to test whether landowning and landless elites voted differently in the votes on 25 May 1883 and 10 March 1900. Our regression results are reported in Table 7. In all regressions, we exclude the parliamentarians from the SPD since they reflect the interests of the workers.

Column 1 of Table 7 shows results from a parsimonious regression model. The only explanatory variable in this model is a dummy variable, reflecting whether a parliamentarian belongs to the landless or the landowning elite. Our estimates support our hypothesis that landless elites are more willing to implement health-promoting policies than landowning elites. More specifically, Panel A implies that the parliamentarians without land ownership were significantly more likely to vote against the motion that aims to tighten the eligibility criteria for the compulsory health insurance than parliamentarians that owned arable land. Panel B suggests that the landowning parliamentarians voted significantly more often against the compulsory trichinella inspection than the landless parliamentarians.

Columns 2–4 of Table 7 gradually expand the regression model estimated in Column 1. In particular, we add region fixed effects in Column 2 and personal characteristics (age,

**Table 7** Roll-call vote analysis

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Panel A: Compulsory health insurance</i>								
Landless elite	0.681*** (0.1183)	0.664*** (0.1345)	0.729*** (0.1451)	0.713*** (0.1454)	0.766*** (0.1735)	0.456*** (0.1535)	0.443*** (0.1543)	0.557*** (0.2110)
Vote share SPD				0.017* (0.0095)	0.035*** (0.0125)		0.014 (0.0096)	0.055*** (0.0150)
Observations	379	379	379	379	379	379	379	379
<i>Panel B: Compulsory trichinella inspection</i>								
Landless elite	0.743*** (0.1265)	0.802*** (0.1418)	0.882*** (0.1552)	0.862*** (0.1561)	0.770*** (0.1762)	0.612*** (0.1649)	0.606*** (0.1646)	0.582*** (0.1858)
Vote share SPD				0.008 (0.0061)	0.010 (0.0072)		0.004 (0.0063)	0.008 (0.0074)
Observations	335	335	335	335	335	335	335	335
Region FE	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Personal character	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Party affiliation	No	No	No	No	No	Yes	Yes	Yes
Levels (dep. var.)	3	3	3	3	2	3	3	2

This table shows results from ordered probit regressions. The dependent variable reflects the voting behavior of the parliamentarians. Robust standard errors are reported in parentheses. We use the following notation to highlight point estimates that are significantly different from zero: \* $p < 0.10$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$

religion, PhD) in Column 3.<sup>43</sup> Our estimates hardly change because of these model extensions. In Column 4, we show that our results hold when controlling for the vote share of the SPD. Interestingly, we only observe in Panel A that the vote share of the SPD is significantly correlated with the voting behavior of the parliamentarians. We consider this result as consistent with our hypothesis that the strength of the workers' movements plays a role when elites decide about policies that ease access to health care services, but does not shape their support for preventive measures. In addition, since landless elites were more likely to vote for the compulsory health insurance even if we control for the vote share of the SPD, we conclude that pressure from workers' movements cannot be the only reason for why landless elites are more willing to support measures that facilitate access to health services. This finding is also in line with the theoretical considerations presented in Sect. 2.2.2.<sup>44</sup>

Among studies that analyze roll-call votes, disagreement exists about how the politicians that abstain from voting should be taken into account. In our baseline model, we follow Galor and Moav (2006) and differentiate three different voting behaviors. In our robustness check, we distinguish parliamentarians that actively opposed the health-promoting policies from other parliamentarians [for a similar approach, see Cvrcsek and Zajicek (2019)]. Column 5 presents the results of this robustness check. The only notable change is that the estimate that reflects the relationship between the voting behavior of the parliamentarians and SPD's vote share is statistically stronger in Panel A.

Finally, we augment the models estimated in Columns 3–5 by dummies that indicate the political orientation of a politicians. We differentiate three types of political background: (i) member of a regional party, (ii) member of a right-wing party, and (iii) member of a center-left party. The effect of controlling for party affiliation is that our point estimates remain statistically significant but decrease slightly (see Column 6–8). From our perspective, the changes in the size of the estimates are not surprising since the share of landowners is much smaller in the center-left parties than in the other parties.

## 5 Conclusion

This paper uses newly digitized data from late-19th/early-20th century Prussia to examine why elite people in industrializing regimes increase public spending on health. Our findings suggest that their motives depend on the type of health-promoting policy. More specifically, we conclude that pressure exerted by workers' movement lead elites to improve access to health services since they feared social and political turmoil. However, we also observe that elite people implement policies that prevent the outbreak and spread of infectious diseases without such pressure. Our study therefore provides evidence for both major political economy theories concerning policy making in industrializing regimes. In addition, the data that we compiled for this project complements other data sets on Prussia [see especially Becker et al. (2014); Becker and Cinnirella (2020); Galloway (2007)]. We thus believe that it opens prospects for future research.

<sup>43</sup> We use five ten-year age cohort dummies to control for differences in the age of the parliamentarians. The region fixed effects divide the territory of the German Empire into eighteen regions.

<sup>44</sup> As shown by Bauernschuster et al. (2020), workers' mortality considerably declined due to the introduction of the compulsory health insurance. It is thus plausible to assume that the Ben-Porath mechanism set in.

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