Extension of the franchise and government expenditure on public goods: evidence from nineteenth century England[*]

Jonathan Chapman[†]

September 20, 2016

Abstract

This paper develops a model predicting that the extent of the franchise has an inverted-U-relationship with government expenditure on public goods. Extending the right to vote from the rich to the middle class leads to increased spending, but further extensions lead to declines in expenditure. This prediction is tested by constructing a dataset of town council expenditure in Britain between 1867 and 1910. The effect of franchise extension is identified by exploiting regional and temporal variation in the right to vote. The results show strong support for the theoretical prediction, with government spending highest when around 50% of the adult male population was enfranchised. *JEL* Codes: P16, N43.

1 Introduction

There is significant evidence that government provision of sanitation infrastructure can reduce mortality rates (Zwane and Kremer, 2007). Yet investment in public goods such as clean water and sewage systems remains insufficient in many developing countries (Günther and Fink, 2011). It is often argued that democratization or increased political participation can help solve these issues, through increased support for redistribution or overcoming elite capture: most theories predict that extensions of the right to vote to the poor will be associated with increases in government expenditure (e.g., Meltzer and Richard, 1981; Lizzeri and Persico, 2004; Acemoglu and Robinson, 2000; Bonfiglioli, 2003). But severe public health challenges remain even in long established democracies, and it does not appear that democratization is associated with lower mortality rates once sample selection is accounted for (Ross, 2006).

I develop a new model of the extension of voting rights to argue that low investment in public goods can be explained by the opposition of the poor as well as the wealthy. In classic models of franchise extension, poorer citizens demand greater levels of redistribution, hence government spending increases once they are granted the right to vote. However, the same argument may not apply to government expenditure on public goods, since if public goods are normal goods then the poor may prefer lower taxes and *lower* government expenditure than the middle class (Epple and Romano, 1996a; Bursztyn, 2013). I show that in a framework where the poor pay taxes and governments can only spend on public goods—a constraint faced by many sub-national governments—both the rich and the poor desire lower government expenditure than the middle class. As a result, if the right to vote is extended in order of income (from the highest to the poorest) then the relationship between the franchise and government expenditure is inverted-U-shaped, with spending highest when the middle class control government. As a result, an extension of voting rights to the poor

2

may lead to a reduction in government expenditure on public goods.

To test this prediction I construct a new dataset of local government expenditure and the extent of the local franchise in England and Wales between 1867 and 1910. Britain at this time faced demands for new public goods—such as clean water and sewer systems—similar to those required in developing countries today, and so the political obstacles they encountered are of continuing relevance. Further, the institutional structure present in Britain at this time allows a clean test of the model predictions. Decisions over spending on important local public goods and services—including streets, sewer systems, water supply and refuse collection—were made by town councils, providing variation within a common cultural and institutional environment. However, town councils did not control spending on redistributive transfer expenditure and were also legally constrained in their ability to redistribute through taxation. These facts closely match the assumptions of the model, and allow me to isolate the effects of franchise extension where governments are constrained in their ability to redistribute.

To identify the effects of extending the franchise to the poor I exploit variation in the level of the local franchise across time and across towns. I argue that, conditional on observable town characteristics, this variation was plausibly exogenous since it was a result of externally imposed national reforms and decisions by other local authorities that were elected by a different electorate to the town councils. Consequently the variation was unrelated to councils' decisions over public goods expenditure—a claim supported when testing the relationship between the extent of the franchise and other town characteristics.

The results show strong support for the inverted-U-relationship between the extent of the franchise and two main dependent variables: tax receipts per capita and public goods expenditure per capita. I first estimate the relationship semi-parametrically using the procedure of Baltagi and Li (2002), finding evidence that tax receipts and government expenditure per capita were maximized when approximately 50% of the adult male population had the

right to vote. Further extensions, however, were associated with a decline in both taxation and spending. I then test the relationship further by estimating panel regressions with linear and quadratic terms in the franchise and including time and year fixed effects. The results are robust to the inclusion of time-varying demographic controls, including potential sources of spurious correlation such as population growth, urban crowding, and the tax base per capita.

I undertake a series of additional tests of the inverted-U-relationship predicted by the model. I first allow for the inclusion of lagged dependent variables and complex time trends to allow for further sources of spurious correlation not captured by towns' observable characteristics. Second, I show that, as expected, the inverted-U-relationship held only in towns where the poor did not have the right to vote at the beginning of the analysis. Third, I find that the relationship existed only in towns where the initial level of the franchise was below 50%. In contrast, in towns that started with a franchise above this point, further franchise extensions led to a monotonic decline in the level of government expenditure per capita. Fourth, I restrict the analysis period to focus on the exogenous variation resulting from national reforms to the franchise. Finally, I check that the results are also robust to variations in the definition of the franchise and in the groups of towns included in the regression.

The model predicts that the poor opposed government expenditure on public goods because of the tax burden they faced, and the fact they would rather spend their income on private consumption. However, an alternative explanation could be that the poorest citizens simply did not understand the benefits associated with spending on certain types of infrastructure—including, in particular, sanitation investment. To test the existence of such a "learning effect", I compare how the relationship between spending and the extent

of the franchise changed over time. I also compare sanitation public goods (streets, water supply, and sewage disposal) to other public goods where the benefits would be more immediate (trams and electricity supply). The results show no evidence that the effect of

4

the franchise on sanitary public goods diminished over time, indicating that opposition did not fall as a result of greater experience with these public goods. Further, the extent of the franchise continued to have the same effect on other public goods, such as tramways and electric lighting, that became widely available in the 1890s. This also supports the hypothesis that opposition to public goods was based on income, rather than specific features of sanitation infrastructure.

I conclude the paper with a discussion of how these results apply to developing countries today. In many countries, the poor continue to face fees or taxes to fund local investment in infrastructure, particularly through an emphasis on "cost recovery". At the same time, there is a common desire to decentralize decision-making over public goods expenditure and to ensure the participation of the poor in local governance. The findings of this paper indicate that these two trends may conflict with the goal of ensuring widespread access to sanitation and water supply.

2 Related literature

Most theories of franchise extension imply that extending the right to vote to the poor will be associated with an increase in the size of government (e.g., Meltzer and Richard, 1981; Lizzeri and Persico, 2004; Acemoglu and Robinson, 2000, 2001, 2006).[1] The theoretical work that has suggested otherwise has focused on differences in value (real or perceived) of public goods across income groups, due to differing effects on productivity across industrial sectors (Llavador and Oxoby, 2005) or by increasing the return to capital and hence wage income (Aidt et al., 2010). In this paper I emphasize a more general mechanism: opposition to government spending due to the concurrent tax burden.

The model in this paper first examines the relationship between individual income and

---

[1]See also Toscani (2012); Conley and Temimi (2001); Justman and Gradstein (1999); Jack and Lagunoff (2006); Bertocchi (2011); Borck (2007).

demand for government expenditure on public goods and then, given those demands, analyzes the effect of extending the right to vote on the implemented level of the government expenditure. The analysis of government public goods provision in this paper is closely related to previous work of Epple and Romano (1996a,b), who study the demand for public services in a setting where citizens can obtain the same services through private provision. This paper in contrast, shows an "ends against the middle" effect even where private provision is not possible. This latter case applies to spending on infrastructure (such as roads) or on public health and sanitation where much of the benefit results from others consuming the public good. As a result the wealthy oppose greater spending because of the size of their tax burden, rather than because it is cheaper to pay for private provision. In addition, the model in this paper provides different predictions as to the composition of the coalition demanding lower public goods expenditure. First, the wealthy always desire some expenditure on the public good. Second, the location of highest demand for the public good is not driven by the location of the mean and median income and as a result, the model shows that the support for spending may be driven foremost by an upper middle class.

Empirical studies of the effects of the extension of the franchise have focused on national- or state-level expenditures, and so overlook many of the key infrastructure investments undertaken at city- or town-level. This limitation has led to a focus on redistributive government expenditure (e.g., Husted and Kenny, 1997; Lott and Kenny, 1999; Aidt et al., 2006; Aidt and Dallal, 2008; Abrams and Settle, 1999; Lindert, 2004) or nationally-funded education services (e.g., Stasavage, 2005; Brown and Hunter, 2004; Baum and Lake, 2003). The evidence that is available does not identify a clear cut effect of franchise extension on the provision of public goods. Female enfranchisement had no effect on investment in sanitation infrastructure between 1905 and 1930, although this may reflect the fact that by this point large towns had already invested in these public goods (Miller, 2008). More generally, there is evidence that poorer citizens sometimes oppose government expenditure (Brown, 1988;

6

Harding and Stasavage, 2014; Bursztyn, 2013).

Using a dataset similar to the one underlying this paper, Aidt et al. (2010) find evidence of a "retrenchment" effect, whereby the middle class opposed expenditure on public goods. The results here differ as a result of utilizing a larger, more comprehensive dataset. In particular, by collecting data from a broader range of accounts I am able to more accurately measure town council spending. Specifically, I take account of additional expenditure before major extensions of the franchise in 1869 by including the spending by town councils as "Improvement Commissions". I also benefit from a much broader and longer panel dataset, as a result of collecting additional data relating to the municipal franchise.

The results of this paper have important implications for understanding of the relationship between decentralization and public spending. In recent years development agencies have had increasing interest in passing responsibility for key infrastructure projects—such as clean water supply—to local governments on the basis that encouraging local participation will encourage more efficient levels of investment (Bonfiglioli, 2003). Scholarly papers have investigated the role of increasing political participation and avoiding elite capture on improving both legitimacy and the representativeness of political decisions (Chattopadhyay and Duflo, 2004; Beath and Enikolopov, 2012; Olken, 2010). The findings here suggest that such policies may lead to reductions in spending on public goods that do not increase recipients' income.

3   Model

This section presents a simple model showing that, if local governments impose linear taxes and cannot utilize transfer payments, the poor and the rich will desire lower government expenditure on public goods than the middle class. In contrast to many previous models, I assume that towns controlled expenditure over public goods, but could not undertake

redistributive transfer payments.

The model predicts that, if the franchise is extended first to the rich, then to the middle class, and then to the poor, the relationship between municipal expenditure and the extent of the franchise will be inverted-U-shaped. This prediction results from assumptions relating to the shape of citizens' utility functions, particularly the fact that the poor have a relatively high marginal utility of consumption. Those assumptions are particularly plausible in a low income economy, where poorer citizens may struggle to pay for a sufficient food intake or be forced to live in extremely cramped living quarters. The rich, on the other hand, oppose higher tax rates because they face a relatively high tax burden.

3.1 Framework

Consider an individual i who receives utility from consumption c_i and from expenditure on a local public good G. Utility from the public good is dependent on the per capita level of expenditure $g = \frac{G}{N}$, where N is the town population.[2] As such, utility is given by:

$$U_i = u(c_i) + v(g)$$

Individuals receive an income y_i, with aggregate income denoted by Y. The public good is funded through a linear tax rate $\tau \in [0, 1]$, leading to a government budget constraint of $G = \tau Y$. Assume u and v are strictly concave, continuous, twice differentiable and $\lim_{x \to 0} u'(x) = \lim_{x \to 0} v'(x) = \infty$ and that the returns to the public good are exhausted at some point: that is, there is some $\hat{G} < Y$ such that $v'\left(\frac{\hat{G}}{N}\right) = 0$. In addition, assume the following conditions on the coefficient of relative risk aversion for $u(c)$, $r_R(c, u) = -c\frac{u''(c)}{u'(c)}$.

1. $\frac{\partial r_R(c,u)}{\partial c} < 0$.

---

[2] This assumption reflects the fact that, for instance, a fixed investment in clean water supply may only be able to serve a certain number of citizens.

2. $\lim_{c \to \underline{s}} r_R(c, u) > 1$ and $\lim_{c \to \infty} r_R(c, u) < 1$.

where $\underline{s} \geq 0$ can be interpreted as a subsistence level of consumption from which individuals receive no utility (that is below this level they are essentially unable to meet their basic needs). These assumptions state, essentially, that poor individuals are very sensitive to reductions in consumption, but that this is less true of the wealthy. Intuitively, poor households may be unwilling to gamble, since any loss means more to them. Ogaki and Zhang (2001) provide evidence that this form of utility is appropriate in modern-day developing societies with low income households.

One type of utility function that meets these conditions is a subset of Hyperbolic Absolute Risk Aversion (HARA) models (Merton, 1971). In particular, if:

$$u(c_i) = \frac{1 - \gamma}{\gamma} \left(\frac{\beta c_i}{(1 - \gamma)} - \underline{s} \right)^{\gamma}$$

then the conditions are satisfied for $\underline{s} > 0$ and $0 < \gamma < 1$.

3.2 Results

Individual's optimal government expenditure per capita

The assumptions over u and v, combined with assumptions 1 and 2 are sufficient to give the following proposition.[3]

Proposition 1. *Denote g_i^* as the optimal level of government public goods expenditure per capita for an individual with income y_i. Then there exists $\tilde{y}$ such that:*

1. *$\frac{\partial g_i^*}{dy_i} \geq 0$ for $y_i \leq \tilde{y}$*

2. *$\frac{\partial g_i^*}{dy_i} < 0$ for $y_i > \tilde{y}$*

---

[3]All proofs are contained in the Online Appendix.

This proposition states that the optimal tax rate is inverted-U-shaped in income: the rich and poor desire lower government spending per capita compared with those with medium levels of income. The preferred level of spending is increasing in income until a point, $\tilde{y}$, after which the preferred amount of spending decreases in income. Intuitively, this is because at low levels of income citizens cannot "afford" spending on the public good, since an increase in taxation moves them to very low levels of disposable income. As income rises, this cost is reduced, increasing the preferred tax rate. However, at the same time, the marginal cost of taxation increases since richer citizens have a greater income to be taxed. Thus eventually demand for per capita public expenditure declines.

The model uses a proportional tax rate which, as we will see below, closely matches the institutional framework of nineteenth century Britain. However the prediction of the inverted-U-shape relationship is not dependent on this simple assumption. The same proposition holds when extending the model to incorporate progressive taxation, as detailed in the Online Appendix. Rather, the important insight is that the poor face some of the cost of paying for public good provision.

Extension of the franchise and public goods expenditure

The discussion above has characterized how citizens' preferences over government spending change with income. I now identify the translation of these preferences into the implemented level of spending. In particular, assume that the tax rate and spending is set by a politician chosen through a standard two-candidate simple majority election, in which candidates' promises are binding.

Denote the most limited (that is the initial) electorate as E_0 and suppose the right to vote is extended sequentially in decreasing order of income, such that a citizen i is only enfranchised once all citizens with $y_j > y_i$ are already enfranchised. Let $\tilde{\tau}$ denote the median level of τ_i^* for all individuals for whom $y_i \geq \tilde{y}$. That is the median tax rate desired by individuals who are on the decreasing part of the optimal tax function.

I make the following assumptions on the distribution of income in the town:

3. $|\{i|y_i \geq \tilde{y}, \ i \notin E_0\}| \geq 2$; and

4. $|\{i|y_i < \tilde{y}, \ \tau_i < \tilde{\tau}\}| \geq 2$.

These conditions ensure the electorate will consist first of very rich citizens, then be extended to some middle income citizens, and finally to very poor citizens. The first condition states that there are some middle class individuals who are not initially enfranchised. The second states that there are some individuals sufficiently poor to want a lower tax rate than the rich.

Proposition 2. *Let N and E_0 be odd and assume $y_i \neq y_j$ for $i \neq j$. Then, given assumptions 3 and 4, the tax revenue and amount of government spending per capita will be inverted-U-shaped in the level of the franchise.*

This proposition states that extensions of the franchise will initially lead to higher public goods spending and taxation but then, eventually, lower levels of spending on the public good.

Growth in town wealth

The final proposition considers the effects of growing town wealth on public goods expenditure. This is likely an important factor in explaining the diffusion of public goods over time, regardless of the extent of the franchise. The effect of increases in average income can vary depending on how the additional income is distributed, since this will affect the identity of the median voter. As such, I consider increases in aggregate town income that are distributed equally across all citizens: i.e., the income of all individuals increases proportionally to average income. For instance, a 10% increase in average income would be associated with a 10% increase in every individual's income.

Proposition 3. *Increases in average municipal income are always associated with increases in government expenditure per capita.*

This proposition reflects the fact that an increase in average income leads to an increase in the tax revenue collected (i.e., the tax rate multiplied by aggregate income) at any given tax rate. As such expenditure in public goods may increase independently of the level of the franchise.

4 Historical background

Testing the model is difficult since most historical changes in the franchise have involved big jumps under which whole classes have been enfranchised simultaneously. In British history, for example, large extensions of the Parliamentary franchise occurred in 1832, 1867, 1884 and 1918. However, by looking at the municipal franchise in England we can overcome this difficulty. The councils of incorporated towns ("municipal boroughs") during the nineteenth century were all locally elected but, critically for our analysis, varied in the extent of the franchise.[4] A combination of local and national factors led to extensive variation in the proportion of the adult population holding the right to vote in different towns (see Figure I).[5]

The right to vote in municipal elections was determined under a separate set of regulations to those in Parliamentary elections. Notably, the municipal franchise was extended without restrictions on income or property value. Whereas in Parliamentary elections, prior to 1867, the right to vote was restricted to those occupying property worth more than £10 rental value per annum, the municipal franchise was extended to all heads of household.[6] However, the right to vote in municipal elections was, at the start of our period, subject to five major conditions. Individuals had be heads of household ("householders") and, until 1869, male. They also had to meet residence requirements, have paid taxes, and have not

---

[4]The councils were locally elected from the 1835 Municipal Corporations Act onward. Interested readers are referred to the Online Appendix for the discussion of other specific Acts that affected the municipal franchise: for the sake of brevity I refer to most legislative changes only by the dates when they occurred.

[5]The construction of the franchise measure is discussed in Section 5 and in detail in Online Appendix B.

[6]This restriction refers to the right to vote in borough constituencies.

received poor relief in the year prior to each election.

These conditions disenfranchised a large proportion of citizens, many of them poor. Despite the absence of any restriction on the value of property occupied, the Parliamentary franchise was often broader than the municipal franchise: in a sample of 39 towns the Parliamentary franchise exceeded the municipal by approximately 15% (Keith-Lucas, 1952, p.61). The reason for this was two-fold. First, residence and tax paying requirements were much severer in municipal elections: voters must have been resident for at least three years rather than one year, and had to have paid local taxes for at least two and a half years (rather than 6 months). Second, those citizens not qualifying for the Parliamentary franchise were poorer, and hence less likely to meet the tax paying requirements.

In fact, the requirement that the right to vote was determined by having paid taxes was a particular source of variation across towns, since it meant that local decisions over whom to tax determined the size of the electorate. In particular, towns varied in their approach to assessing occupiers of small dwellings. The low value of these houses often made it costly to tax them directly, and so in some areas tax collectors collected taxes from landlords, who paid on behalf of their tenants (in return for a discount of around 20–25%). Prior to 1869, however, the law did not clearly specify whether tenants who did not pay their taxes directly had the right to vote. Whether these tenants were actually enfranchised thus varied according to both how taxes were collected and how the law was interpreted by poor law authorities (not municipal councils) in different areas.[7]

Major reforms in 1869 lightened these restrictions, and led to significant expansions of the franchise—despite continued variation in the size of the electorate across towns. Two major changes to the male franchise led to growth in the median level of franchise of almost 20% of the adult male population between 1866 and 1885.[8] First the right of tenants to vote

---

[7]This may lead to some concerns regarding the endogoneity of the level of the franchise. This is discussed in Section 5.2.

[8]Since the right to vote was only given to heads of households—rather than to individuals—these figures

even when paying their taxes indirectly through their landlord was enshrined in law. Second, the reforms significantly reduced both the length of residence and tax-paying requirements by two years. These reforms were exogenous to each individual town and provide a major source of variation in the franchise variable. At the same time women also gained the right to vote, although the restriction to heads of household meant that they remained a small proportion of the electorate.

The restrictions on the franchise would be expected to focus on the poor since these citizens would likely move most frequently and either fail to pay taxes or pay them indirectly. This is important, since a key assumption in the model was that the franchise would be extended in descending order of income—that is, to the poorest citizens last. Analysis in Online Appendix C supports this assumption, with the franchise found to be higher where more citizens paid tax indirectly, and lower where those with the right to vote in Parliamentary elections (who were generally wealthier) were over-represented in the electorate. Further, regression analysis indicates shows that the 1869 reforms did, in practice, extend the franchise to these poor indirect tax payers that were previously disenfranchised. Specifically, before 1869 the franchise was higher in towns where more of the citizens paying their taxes indirectly had the right to vote. However, the *change* in the franchise following the 1869 reforms was lower in those towns, indicating that the reforms were successful in extending voting rights to these poor citizens.

A further important point is that these extensions did not involve adding new taxpayers to the voting register but, rather, involved making sure existing taxpayers had the right to vote. This is important as otherwise the reforms to the franchise would also have the effect of expanding the tax base that towns had available to spend on public goods, which could confound the analysis.

---

indicate that by the 1880s a very high proportion of households had the right to vote in these towns. This also explains the comparatively low level of the female franchise since few women were heads of household (fewer than 7% of adult women in the 1881 census).

Although the system of the franchise remained, essentially, the same after 1869, a series of smaller reforms—primarily aimed at clarifying and consolidating the 1869 changes—led to further variation in the franchise over time. The most notable of these changes occurred in 1878 and 1882, which addressed further legal challenges to the status of the poor indirect taxpayers enfranchised in 1869.

4.1   Local government taxation and spending powers

A further attraction of using the municipal boroughs as the focus of our analysis is that their councils faced tight legal constraints over the types of spending they could undertake, and the types of taxes they could levy. Their spending was largely limited to spending on infrastructure and other public goods. For most of the period of the empirical analysis, much of this spending was associated with sanitation—including water supply, sewer systems and paving or cleaning of streets. Later on, in the 1890s, this role expanded to include electricity supply and tram systems. Importantly, however, municipal councils did *not* have authority to undertake transfer payments and did not control spending on either welfare (that is poor relief) or on education.[9] This framework then closely matches the assumptions of the model.

Town councils also faced restrictions on the type of taxes they could impose, meaning that in practice they had to impose a tax burden that was approximately proportional to household income, as assumed in the model. Tax raising power was limited to taxes on property, and was restricted to a single proportional rate—there was no possibility of a progressive tax rate. Nor was it is possible to impose other taxes, such as business or income taxation that could have led to a more progressive schedule. Further, taxes fell on all property occupiers, rather than just owners, meaning that all households were charged tax and making tax extremely politically salient in local elections.

---

[9]Welfare expenditure was controlled by Boards of Poor Law Guardians, who were elected separately on a graduated franchise, with district boundaries which often differed substantially from those of the municipalities. Education spending was also determined separately by local School Boards.

The argument that property taxation implemented fell proportionally on all occupiers assumes, of course, that the full value of the tax was passed on tenants and not absorbed by landlords through lower rents. There was some debate at the time about where the incidence of taxes was likely to fall (for instance, see the discussion in *Hansard*, 20 February 1850 col 1118-27). However, for the purposes of the theoretical prediction, it is sufficient that a part of the cost passed on to tenants since the model extends to a situation of progressive taxation (see Online Appendix A for details).

Returning to the question about whether all property was rated for tax purposes or not, the assumption in the model is that all citizens whether they are voters or not pay the proportional tax. This would not be true in the data in towns with a limited number of voters because payment of the local property tax was a necessary condition for the right to vote. This, then, has the implication that an expansion of the number of voters, in particular starting from a very low base, is likely to have been associated with an increase in the tax base. This link between the franchise and the tax base is not taken into account in the theory.

4.2   The politics of taxation and government spending

The need to improve urban environments was a major source of political debate following the Industrial Revolution. From the 1840s onward, reacting to squalid urban environments—famous even now, due to the work of Dickens and Engels (amongst others)—sanitary reformers pressed for greater government intervention to improve public health. Yet despite the sanitary benefits of these investments, the reformers' progress was often stymied by taxpayer opposition to new expenditure that would dramatically increase their tax burden (Hennock, 1973, 1963; Wohl, 1983). It is telling that even in 1900 sanitary conditions remained extremely poor in many areas. As a useful comparison, in Manchester and Liverpool mortality in the decade 1895-1904 was 10% higher than that in New York (Lampard, 1973). The

following quote gives some sense of the conditions many had to endure:

> "In walking through a few of the many slum districts of Bradford during the week we spent there, I was at first disgusted to observe that children, even of respectable parents, were encouraged to make a convenience of the open street, if not of the kitchen floor. On closer observation of the sanitary environment, I felt there was much excuse...I have seen without enthusiasm, both earth closets and middens where pails were used but this was my first acquaintance with the truly primitive arrangement in vogue in Bradford, and the flies that bred in and swarmed around these filthy places also settled thickly about the eyes of the babies in the wretched little houses, whose front doors opened within a few feet of these insanitary conveniences." (Quoted in Thompson, 1984, p.141)

Not only were these conditions appalling, they were inescapable for even the richest citizens of a town. Although wealthy citizens could purchase certain goods privately even if they were not obtained publicly (e.g. private wells could be used for water supply), improvements in the sanitary condition of a town would improve the survival rate of all citizens in a town. Townspeople had to continually interact not only with each other, but also with the urban environment in a way that meant they were continually exposed to the less than savory conditions around them. In the words of one historian, "even with the growing separation of the classes, many elements of sanitary condition—water supply, drains, muck in the streets, odors, facilities for relieving oneself, complexion and stature of the people—were truly public" (Hamlin, 1998, p.281). As a result of the externalities within a town, health investments benefited all social classes within a town—Lizzeri and Persico (2004) present evidence that the life expectancy of different social classes moved closely together after 1870, indicating that certain groups were unable to isolate themselves from the problems of disease. Similarly, Szreter and Mooney (1998) (Table 2) present data

showing that differences in life expectancy at birth in inner and outer areas of six large cities remained relatively constant between 1851 and 1900, suggesting that the wealthy did not gain preferentially from the large scale investment in sanitation that occurred over this period.

How could there be continued opposition to increased government expenditure in the light of such conditions? Critically, town councils were expected to raise their own funds to pay for any new expenditure—there was no recourse to grants from central government. Since even the poorest citizens were expected to pay taxes, opposition was found even amongst the working classes. The opposition of a "shopocracy" of small property owners has been recognized in the historical literature (e.g., Yasumoto, 2011; Aidt et al., 2010), but working classes were also reluctant to endorse greater government expenditure. In one Welsh town "workers were willing enough to admit they were killing themselves, but they saw immediate income as more important than environmental quality" (Hamlin, 1998, p.298). Politicians stood— and won—elections on the basis of their refusal to resistance to spending, as illustrated by the following speech by a councilor newly elected by the poor:

> "I took considerable pains this morning to convince you that although poor, you were men of considerable influence and importance. I told you that the legislature had given you an extension of the franchise for the purpose of purifying the corporations of England. . . I promised that if sent to the council chamber I would fearlessly...set my face against all extravagant expenditure...I now repeat that promise." *Source: Preston Guardian, "Municipal Elections", November 5 1853.*

This appeal made to the poor reflects a broader interest in municipal politics across all classes of society—during this period "urban turnouts of 85% were routine—in by-elections as well as general ones" (Garrard, 2006, p.157). Evidence from Parliamentary elections indicates there was little difference in participation in elections across different classes of

voters. Berlinski et al. (2011) find only weak evidence that franchise extension led to reduced turnout between 1865 and 1868, and no evidence of any effect by 1874.

The opposition of the poor to higher taxes is not surprising if we consider the financial constraints that they faced. Rough estimates of the level of poverty in 1860, calculated through "back-casting" 1900 figures, indicate that in 1860 approximately 40% of urban households were living in "primary poverty"—indicating that individuals did not receive sufficient calories to achieve "minimum physical efficiency".[10] Up to three-quarters of households are estimated to have been living in poverty based on a qualitative measure. Further, estimates of income elasticities of the poor suggest that the additional income available through lower taxes would be used to increase their spending on rent and on higher quality foods such as meat, vegetables and fruit.[11]

5 Data and identification

5.1 Data

5.1.1 Sample

The group of incorporated towns in England included nearly all the largest towns in the country, with the major exception of London which was governed under its own set of councils. However, it also included a number of small market towns, due to historical charters obtained prior to the Industrial Revolution. The main specifications focus on a subset of these towns. In particular, the sample is limited to municipal boroughs that were both incorporated (i.e., had councils elected under the system described here) and had control of sanitary expenditure in 1867 (i.e., the start of the study period).

---

[10]I use Rowntree's well-known 1901 survey of York to identify the financial constraints in 1900. A detailed explanation of the methodology used to calculate estimates is provided in Online Appendix E.

[11]Income elasticities are estimated citizens using contemporary (1890) budget data for a sample of approximately 1,000 households collected by Haines (2006). See Online Appendix E for further details.

A total of 214 towns had been incorporated by 1867; however only 154 had control of sanitary expenditure prior to this date. A further four towns are excluded due to either franchise data that appeared implausibly high (above 90% in some cases) or (in one case) because of difficulties identifying boundary changes.[12] The remaining 150 towns include 92% of the 1881 population of the 214 municipal boroughs incorporated by 1867. Further, they include all towns with population above 100,000 in 1881, and 35 of 41 towns with population above 50,000 in 1881.[13] The findings are unchanged using a broader sample—see the discussion of robustness tests in Section 6.

5.1.2 Financial data

The analysis uses a new annual panel dataset for the years 1867 to 1910.[14] The dataset was constructed from the *Local Taxation Returns* contained in the Parliamentary Papers collection. These financial accounts detail the sources of revenue and types of expenditure in each town. Financial values are then translated into constant values using the Rousseaux Price Index (Mitchell, 1971, pp. 723-4) following Millward and Sheard (1995).

I use this dataset to construct three measures of government revenue and expenditure. The first is the level of tax revenue per capita. Second, I construct two measures of public goods expenditure. The first includes all public goods expenditure. This has the advantage of being available for the whole period from 1867 onwards—expenditure was not generally disaggregated before 1872. After 1890 some street expenditure was financed by transfers from the newly reformed County Councils and, as such, this is subtracted from overall street expenditure.[15]

---

[12]See Online Appendix B for further details of the excluded towns.

[13]These figures exclude London, which was governed under a separate West Ham and Croydon, which are suburbs of London and became London Boroughs at a later date.

[14]Summary statistics for the main variables used in the regressions are presented in Online Appendix B. Since data on the franchise is unavailable after 1900, financial data for the years 1901–1910 is used only to estimate the ongoing expenditure measure discussed below and is not used in the main regressions (the year 1901 is used when aggregating the data into five year periods in the analysis in Table V).

[15]The results are not dependent on subtracting this type of expenditure and, as discussed below, the

One concern is that the financial accounts do not differentiate between investment and ongoing (e.g., maintenance) expenditure on public goods. As a result, it is clear from inspection of the dataset that there are a large number of extremely high one time expenditures. To deal with this issue, I construct a measure of ongoing expenditure. To separate ongoing expenditure from investment expenditure, I first identify "investment periods" by analyzing deviations in trend expenditure for each type of expenditure. In non-investment periods, the level of ongoing expenditure is simply the per capita expenditure in that period. In investment periods, the level of ongoing expenditure is the level of expenditure in the next non-investment period. For instance, if 1873 and 1874 were investment periods, but 1875 was not, then the level of per capita expenditure in 1873 and 1874 is set equal to that in 1875.

Investment periods are identified using both the level and year-on-year increase in expenditure.[16] An investment period is identified as starting when either a town begins spending for the first time, when year-on-year expenditure increases by more than 100%, or if the town's per capita expenditure is higher than twice the median of per capita expenditure in the town in future years. An investment period is then identified as continuing until expenditure falls significantly again, relatively both to other towns and future expenditure in the same town. Prior to the existence of disaggregated data in 1872, investment periods are also identified if expenditure is more than twice the aggregated 1872 ongoing expenditure. The results are robust to alternative ways of identifying these periods.[17]

---

results also hold for the period prior to 1890.

[16]Online Appendix B contains full details of the methodology used to identify investment periods.

[17]An alternative approach is to simply remove the observations with very high values from the analysis as outliers. There is still strong support for the inverted-U-relationship, for instance, when excluding the highest 1% or 5% of observations of expenditure per capita on public goods in year. However this approach has the difficulty that it may be biased against towns with generally high expenditure, and may lead to bias by excluding periods when important expenditure occurred.

5.1.3 Measuring the franchise

My measure of the franchise is the *male* franchise, since the key prediction of the model relates to the extension of voting rights to poorer citizens. This is important since using the total franchise could conflate two (potentially very different) sources of changes in the franchise: the broadening of the male franchise, and the extension (for the first time) of the franchise to women. As discussed in detail in Section 4, it is reasonable to assume that growth in the male franchise involves extensions of the right to vote to poorer citizens. However, this is not necessarily the case for women, since their right to vote depended on being a head of household, and it is not clear how the preponderance of female household heads may have varied across income groups.

I measure the level of municipal franchise for each sex as follows:

$$\text{Male (female) franchise} = \frac{\text{Number of male (female) electors}}{\text{Male (female) population of voting age}}$$

The numerator of the measure is calculated using the number, and gender breakdown, of municipal electors reported in a number of parliamentary papers for ten cross sections between 1864 and 1897. The franchise in intervening years is interpolated using a compound average growth rate. The denominator is calculated using total male and female municipal population collected from decennial censuses, adjusted by the estimated proportion of male and female citizens of voting age, using information from the 1881 census.[18]

To account for potential delays between the date of registration and actual change in expenditure, I use the value of the franchise lagged by three years. This time lag reflects the fact that municipal councils were elected across a three year period; the results, however, are robust to different lag periods (including no lags). To ensure that the results are not driven exclusively by the tails of the franchise distribution, I also exclude the top and bottom 1%

---

[18]Online Appendix B includes figures displaying how the distribution of the both expenditure and the franchise changed over time.

of franchise values. The results are unchanged when including these observations.

5.2 Identification

The complexity of the regulations governing the right to vote mean that we must be careful in understanding the sources of the franchise variation. As explained in Section 4, there was considerable variation in the level of the franchise both cross-sectionally and over time. The changes over time provide a particularly strong source of exogenous variation, since they resulted from national reforms that were motivated not by concerns in any particular town, but were rather a follow-on to changes in the Parliamentary franchise in the 1867 Second Reform Act. Identifying the sources of cross-sectional variation is, on the other hand, more complex since it was a result of a series of interactions between both local characteristics and local decision-making.

The first complication is that the variation in the franchise may be merely capturing variation in other observable characteristics, due to either national regulations controlling the right to vote or merely as an artifact of the way in which the variables are constructed. Town population, for instance, is linked to our franchise variable by definition (since it forms the denominator of the measure), but might also be related to economies of scale in the provision of sanitation. Similarly both population growth and urban crowding (defined as population/number of houses) may be correlated with demand for public goods and also the extent of the franchise. This is because, first, population growth may be associated with more adults failing to meet the residence requirements for receiving the franchise. Second, more individuals per household would lead to individuals being disenfranchised since they were not heads of households. As such it is important to control for these characteristics in the main regressions.

A second major concern is potential reverse causality resulting from local authorities controlling who had the right to vote. Although this concern is mitigated by the 1869

reforms which took away much control over these decisions, it is possible that local authorities varied in how rapidly or effectively they implemented these changes. Further, if these factors determined the level of the franchise before 1869, they could also affect the change in the franchise caused by the reforms leading to a further form of endogoneity.

This issue is alleviated further, however, by the fact that the level of the franchise was not determined by municipal councils, but instead by the authorities responsible for poor relief. In particular, decisions over who to tax and how taxation was implemented were made by a combination of officials of Poor Law Union and local vestries.[19] Historical evidence shows that these bodies did have some control over who was allowed to vote (Fraser, 1976; Salmon, 2002). However, there is little reason to believe that these authorities were particularly concerned with municipal concerns when making these decisions. Not only were these authorities governed separately to town councils, they were elected separately and under a different franchise. Poor Law Guardians, for example, were elected under a graduated franchise whereby the wealthy could receive up to 12 votes each (Lizzeri and Persico, 2004).

Further, the poor law authorities governed jurisdictions with boundaries that were generally very different to the areas governed by town councils. Most towns formed only a small part of a much larger poor law union: in 1881 88% of municipal boroughs fell within a single Poor Law Union, with the median town comprising only approximately 36% of the population of that Poor Law Union.[20] The second set of relevant poor law authorities, local vestries, governed parishes which comprised only parts of municipal boroughs. Only 22% of towns were comprised of a single complete parish in 1871, with almost 50% containing more than 3 parishes. Several larger towns, including as Norwich and York, contained over twenty

---

[19]Essentially, the municipal councils would set a tax rate that sat on top of the poor law taxes that were set and collected by the poor law authorities. Once the Poor Law Guardians had set a tax rate, vestries were charged with assessing property and collecting the tax.

[20]Poor Law Union population is estimated using the average population of Registration Districts 1871-1880, which were almost always coextensive with the Poor Law Unions.

parishes.[21]

Vestries' general lack of concern for municipal affairs is illustrated by patterns of adoption of legislation that affected both their tax-collecting powers and the franchise. Discussing one such piece of legislation, the Small Tenements Rating Act (henceforth STRA), an 1859 Select Committee commented that "as it bestows no parochial votes on the tenement holders, it is not surprising that the vestries should look at the question of its adoption merely in a financial point of view."(House of Lords, 1859, p.vii). Further, different parishes *within* a town varied in their decisions over the STRA, indicating that municipal concerns were at most only one factor in the decision over adoption. Within a sample of 85 towns, only 33% had adopted the Act within all of their parishes, whereas 47% had adopted it within some parishes.[22] Finally, Parliament itself failed to anticipate the significant effect the STRA had on the franchise (Keith-Lucas, 1952)—providing further suggestive evidence that local elites (who often served in the House of Commons) did not control these decisions.

A final concern is that the decisions of poor law authorities may have indirectly been correlated with spending choices of municipal councils due to some common local characteristic. For example, poorer areas may have been more willing to extend the franchise (due to the financial concerns highlighted above) and also spent less on public goods. To address this issue I analyze whether and how the extent of the franchise was related to town characteristics in five cross sections (1866, 1873, 1879, 1885 and 1897).[23]

I first regress the level of the franchise on the control variables that we would expect to be correlated with the level of the franchise due to the franchise regulations. I then regress the residuals of that regression on six additional variables that we might expect to be correlated with expenditure on public goods: town population density (in 1871), the town tax base

---

[21]Calculations using House of Commons (1872a).

[22]Figures based on data from House of Commons (1866). The sample consists of towns consisting of multiple parishes with coterminous Parliamentary and municipal boundaries in 1866.

[23]These cross sections were chosen due to data availability.

per capita, and dummy variables indicating textiles or farming towns. I also include the number of parishes in the town since franchise decisions may have been more correlated with municipal concerns in towns with fewer parishes, and a dummy variable indicating whether the town was a Parliamentary constituency, to capture any effect of stronger presence of national political organizations.

The results of these regressions are displayed in Table I. The top panel shows that as expected, there is strong evidence that the franchise was higher when a higher proportion of men were heads of household. Further, the relationship with population growth is generally negative (albeit statistically insignificant), reflecting the effect of the residence requirements. As such it will be important to include these variables in our regressions (either directly or as fixed effects).

Once these variables are controlled for, however, the remaining variation in the franchise is not explained by any of our remaining control variables. All individual coefficients, as well as joint F-tests, are statistically insignificant in these residual regressions. This provides further reassurance that the observable characteristics used in the regressions are sufficient to account for any correlation between the franchise and other town characteristics affecting town expenditure.[24]

6   Empirical specification and results

In this section I test the key hypothesis of the model: that the relationship between the extent of the franchise and per capita expenditure on public goods is inverted-U-shaped. I first present simple semi-parametric plots of the data, followed by panel regressions that show the relationship is robust to the inclusion of time-varying town characteristics and town- and year-fixed effects. The subsequent subsection discusses the robustness of the results and

---

[24]Regressing the change (rather than the level) of the franchise after 1866 on these control variables shows similar results—see the additional results in Online Appendix C.

additional tests of the model. The final subsection shows that the magnitude of the reforms was large, but that the effect on sanitary expenditure weakened over time.

To test the existence of an inverted-U-shape I use both a parametric Ordinary Least Squares approach and a semiparametric partially linear model. In particular, the parametric approach uses the following quadratic specification:

$$g_{i,t} = \alpha + \beta_1 franchise_{i,t} + \beta_2 franchise_{i,t}^2 + \gamma X_{i,t} + \gamma_0 Z_i + \delta year + \epsilon_{i,t}$$

where i indexes towns, t indexes year and ϵ is an error term. The vector X includes town-specific time-varying controls. In particular I include measures that would be likely to reflect greater demand for public goods including urban crowding (measured as number of houses/population), population growth, the extent of the female franchise, and population. To allow for potential economies of scale in the provision of these public goods, population is binned into six categories. Importantly, the panel structure also allows us to control for characteristics of towns—e.g., location—that do not vary over time, as well as time trends. All our specifications include town level (Z) and year fixed effects ($year$) that account for any time-invariant aspects of towns that may affect the level of expenditure.

The panel structure of the dataset means that the data is likely to suffer from serial correlation. While this will not bias the estimated regression coefficients, it may bias the size of the standard errors downwards. To adjust for this I cluster standard errors at the town-level in all regressions, allowing for any form of error correlation structure within towns. As an additional test of robustness to serial correlation, I run an additional specification including one and two lags of the dependent variables. The results, which are presented in the Online Appendix, are consistent with the main findings.

The existence of an inverted-U-shape relationship implies $\beta_1 > 0$ and $\beta_2 < 0$. As well as the individual statistical significance of these coefficients, I also check that the estimated

turning point is within the interior of the franchise range, and that the two franchise terms are jointly significant with an F-test of joint significance. In addition, I use the test for U-shaped relationships developed in Lind and Mehlum (2010). This test accounts for the fact, if the relationship has at most one extreme point, then an inverted-U-shape implies that the slope is positive at the lower end of the interval and negative at the higher end (that is, in this case, for the highest values of franchise)—a joint restriction that may lead to particular problems when the estimated turning point is near the extremum of the dataset.

The parametric approach is useful since it allows for directing testing of the inverted-U-relationship predicted by the model. However, it imposes strong assumptions—particularly symmetry—on the shape of the relationship, beyond the predictions generated by the model. One way of addressing this concern is to test for the significance of higher level polynomial terms in the regression framework—I present the results of such an analysis in the Appendix. As an alternative I use a semiparametric specification that allows for a flexible relationship between the level of the franchise and the dependent variables, while also accounting for other control variables.

To estimate the parametric part of the linear regression with town fixed effects I use the procedure in Baltagi and Li (2002). The nonparametric relationship is then estimated by using a Nadaraya-Watson non-parametric regression of the residuals from this specification against the male franchise. A confidence band around the fitted value is then by implementing a wild cluster bootstrap using 999 replications.[25]

6.1   Semi-parametric regressions

I start by presenting the results of the semi-parametric estimation of the relationship between the extent of the franchise and the level of tax receipts and public goods expenditure per

---

[25]See Cameron et al. (2008) for details of the wild cluster bootstrap and Yatchew (2003) for application of the wild bootstrap to partially linear regression. Full details of the procedure implemented are presented in the Appendix F.

capita. In particular, I plot the relationship between the male franchise and each of the dependent variables "purged" of the linear part of the model—including the year and town fixed effects, and the controls for population (in six bins to allow for a flexible relationship), population growth and urban crowding.[26]

Figure II plots the relationship between these residuals and the male franchise (on the x-axis) and both tax revenue per capita (left hand panel) and public goods expenditure per capita (right hand panel). Both panels show clear evidence of the inverted-U-relationship. In both, there is evidence that the dependent variable increases until a franchise of approximately 50%, and then declines beyond this point. This represents around the median level of the franchise prior to the reforms of 1869, and around the 25th percentile of the franchise immediately following the reforms.

6.2   Parametric regressions

The figures above show clear evidence of the inverted-U-relationship. In this subsection I use panel regressions to test whether this relationship remains after controlling for potential confounding factors. I then present several additional tests of the model and robustness tests.

The results are presented in Table II. Specifications (1)–(3) use tax receipts per capita as the dependent variable, while specifications (4)–(6) use public goods expenditure per capita as the dependent variable. Specifications (1) and (3) include only the measure of the male franchise and franchise squared, while specifications (2) and (4) include the control variables discussed above. To aid interpretation, the franchise variable is measured in terms of a 10% increase, while the dependent variable is standardized. As such, the coefficient on the franchise variable represents the effect of a 10% change in the proportion of men enfranchised

---

[26]This specification relates directly to the parametric results presented in specification (2) and (4) in Table II below. Similar results are obtained when estimating specification (1) and (3).

as a proportion of a standard deviation of the dependent variable. I discuss the magnitudes of these effects further below.

The inverted-U-relationship is strongly supported in all specifications, with both the individual coefficients and joint tests strongly statistically significant. The addition of the control variables does, however, reduce the size of the franchise coefficients.

In specifications (3) and (6) I include as a control variable a measure of the size of the tax base per capita in each town. This measure represents the aggregate "rateable" value of property in the district—including both houses and other forms of property. Including this variable acts as a proxy for town wealth, and in particular checks that the inverted-U-relationship is not driven by a relationship between the size of the tax base and decisions over who to tax: for instance if wealthier towns were more able to avoiding taxing the poor in order to deny them the right to vote. Data regarding the level of the tax base per capita is available (almost) annually from 1872 onwards, and also for 1866 and 1870: values for missing years are interpolated linearly.[27]

6.3 Additional tests of the model and robustness tests

Including lagged dependent variables As a further test that the results are capturing a causal relationship, Table III presents the results of regressions including additional control variables to capture potential sources of spurious correlation. In specification (1) and (5) I include the first lag of the dependent variable in each case. This approach accounts for the dynamic nature of investment in the public goods and the dependence of expenditure on amount of investment that has occurred in the past. Unsurprisingly, the results are reduced in size by this approach (since some of the franchise effect may work through expenditure before the current period, since it is lagged three years), but they remain strongly statistically

---

[27]Further discussion of the construction of this variable are provided in the appendix.

significant.[28]

Allowing for different time paths according to town characteristics I include inter-actions between the 1871 levels of the major correlates with the franchise at the beginning of the period and a fourth-order polynomial in time. By doing so, I allow for differences in the time path of the dependent variables according to these observable characteristics and hence for factors that might affect public health expenditure and be correlated with the franchise indirectly through these characteristics. As an example of such a mechanism, it could be that public health movements began earlier in wealthier cities. (See Gentzkow (2006) for a previous application of this approach.) Specification (2) includes specifications correlated with the level of the tax base per capita in 1873, specification (3) includes interactions with 1871 town population, and specification (4) includes interactions with the percentage of men that were heads of household (in 1881).[29]

There is clear evidence of the inverted-U-relationship in all eight specifications, with both the linear and quadratic terms statistically significant in all cases. The joint tests of significance are also statistically significant in all cases. Further, the estimated turning points remain similar to those reported in the main regressions. As such these results provide further reassurance that we are capturing idiosyncratic variation in the franchise.

Focusing on the effects of national reforms To test more clearly that the relationship between government spending and the level of the franchise is causal, I estimate additional specifications in which I limit the analysis to shorter periods around the national reforms discussed in Section 4. By doing so I identify primarily on the changes in the franchise resulting from these reforms. Further, by using shorter periods there are also less likely to be major changes in other variables or in the availability of particular public goods technologies, providing further reassurance that the results are capturing the effects of changes in the

---

[28]The appendix also includes tests with two lags of the franchise, with similar results.

[29]The Online Appendix presents similar results including interactions with 1871 urban crowding and 1871-1881 population growth.

franchise.

To test the effects of the shocks to the franchise, I separate the data into six equally spaced time five-year periods (1867-1871, 1872-1876, etc.) around the reforms. By using 5-year periods I highlight the shifts that occurred between periods, and am also able to avoid the extensive interpolation needed to construct the annual franchise data used in the main specifications: on these specifications I use franchise data only from years the franchise data was reported to estimate the average level of the franchise in each 5 year period (see the footnote to Table V for details).[30]

Table V presents the results of these specifications. The dependent variable in each specification is then the *mean* spending or taxation per capita within the five year period. In columns (1) and (4) the specifications include only the two five year periods immediately before and after the 1869 reforms. Specifications (2) and (4) add the following two five year periods, covering the changes made by the 1878 and 1882 reforms. Specifications (3) and (6) then include the whole period from 1867–1901. As we can see, there is strong evidence of the inverted-U-shape relationship in each of the specifications.

Differences depending on whether the poor were enfranchised before the 1869 reforms The model predicts that extending the franchise should lead to an inverted-U-relationship only if the poor were *not* initially enfranchised. Thus, as a further test of the model, I distinguish between towns where the poor were enfranchised at the start of the analysis period, and those where the poor were not enfranchised.

To identify whether the poor were enfranchised, I use information relating to the percentage of households living in Parliamentary Boroughs in houses of various "rateable" values in 1866.[31] Specifically I estimate the percentage of "non-poor" households as those living in dwellings of over £6 rateable value, the threshold frequently used as potential "lower limit"

---

[30]Some towns had missing data for specific years: in this case I use the interpolated data.

[31]Since not all towns were Parliamentary Boroughs, the sample size is lower in these specifications.

for the Parliamentary franchise in the 1850s and seen as a bulwark against providing the working classes with democratic control (Seymour, 1915). I then consider a town as having enfranchised the poor if the 1866 franchise exceeded this proportion.

Table IV presents the results of the estimations splitting the towns into these two sub-samples. Specifications (1) and (6) show that there is strong evidence of the inverted-U-relationship where the poor were disenfranchised in 1866. However, there is no evidence of an inverted-U-relationship where the poor had the right to vote prior to franchise extension (specifications (2) and (7)).

Estimated relationship on different sides of the turning point The next set of tests checks whether the relationship is identified by towns moving "over" the turning point, or by the fact that towns with a low franchise (to the left of the turning point) may act differently to towns with a high franchise. To do this, I split the sample based on the turning points estimated in specifications (2) and (5) of Table II and estimate the inverted-U-relationship separately for the two sub-groups. I then also test whether for a linear relationship for towns with a high franchise initially since the model suggests once a certain proportion of the town have been enfranchised, further extensions should lead to lower levels of spending on public goods.

Specifications (3) and (8) of Table IV show that the inverted-U-relationship is maintained even when restricting to towns that began with a sufficiently low franchise. Specifications (4) and (9), on the other hand, show that, as predicted by the model, towns starting with a high franchise did not experience the inverted-U-shape effect as a result of these changes. However there was a negative relationship on spending and taxation of further increases in the franchise: specifications (5) and (10) show strongly statistically significant effects on a linear model for this subsample of towns.

Alternative polynomial specifications I have also tested alternative polynomial specifications, including a linear specification and polynomial specifications including franchise

terms up to order six, with the results presented in the Online Appendix. In no case are any of the higher-order terms statistically significant at the 10% level. There is narrow statistical significance in the linear specification for the tax regression, but this is much weaker than in the quadratic specification, and the quadratic specification is preferred under both the Akaike and Bayesian Information Criteria.

Analysis of sub-samples and alternative variable definitions The Online Appendix includes the results of a number of further robustness check. I have varied the groups of towns included in the specification, including i) focusing on a balanced panel of towns, ii) including towns that received sanitary authority after 1872 and iii) including towns excluded as outliers due to very high or very low values of the franchise. I have also varied the definition of the franchise variable—including using different lag lengths, and alternative measures of population. As an additional check that the results are not capturing other characteristics of towns, I have also tested the robustness of the results when removing observations with very high or low levels (top or bottom 10% of the sample) of population, urban crowding and population growth. In addition, I tested the robustness to limiting the sample to towns incorporated in 1835. The results are supported in all regressions, with strong statistical significance in the expenditure regressions in particular.

6.4   Magnitude of the effects

The previous results have shown consistent evidence of the inverted-U-relationship until 1900—both for public goods expenditure per capita and for tax receipts per capita. In this section I show that these effects were large.

Figure A.V plots the estimated effect of extending the franchise using the results from Table II. To provide a sense of scale, the effect is measured as a percentage of the median of the dependent variable across all towns between 1867 and 1900. An extension of the franchise from 30% to 40%, for example, is estimated to have led to an increase in taxation

34

per capita of around 5% of the median level of taxation across the period. The changes in the franchise had an even bigger impact on public goods expenditure. An increase of the franchise from the maximum (at 51%) to 75% led to an estimated decline of over 20% of the median expenditure per capita.

While these effects were sizable, they may have changed over time as new public goods became available. In particular, the model predicts that, as aggregate town income increases expenditure on public goods will increase. Over time therefore, we would expect the overall level of expenditure to increase and, possibly, that the relationship with the franchise will weaken. To explore this, I analyze the changing relationship between the franchise with both "all public goods" (our main dependent variable) and "sanitary public goods"—water supply, sewers, street cleaning and refuse collection.[32]

This also lets us assess the extent to which the inverted-U-relationship applies to public goods in general, or whether it was limited to specific public goods. This is particularly important, since it provides some indication of whether opposition to greater expenditure might have been driven by, for example, a lack of understanding of the health benefits associated with sanitary public goods.

Figure IV explores this possibility via a rolling regression in which I extend the sample by one year at a time. That is, the first regression covers the period 1872–1886, the second 1872–1887, etc. I then plot the estimated coefficient for the quadratic term on the franchise for "all public goods" and "sanitary public goods" separately over time (that is, the y-axis measures the β_2 term in main specification). This provides an indication of the changing size of the relationship between the franchise and expenditure across the period. For comparability, both dependent variables are standardized in terms of standard deviations of the *all public goods* variable.

---

[32]These categories are those identified as having a sanitary aspect in Millward and Sheard (1995). I combine the measures into a single variable, since some towns did not distinguish between them in the financial reports.

The figure shows that at the beginning of the period, the effect size is similar across the two categories: the effect of the franchise was focused on the important sanitary public goods. Over time, however, the size of the effect of the franchise on expenditure sanitary public goods remained fairly constant, providing no evidence that the opposition to expenditure declined as the benefits of spending on sanitation became clearer through experience. However, the relationship between the franchise and all public goods expenditure actually grew, reflecting the greater levels of expenditure that occurred towards the end of the period as new public goods, such as tramways and electric lighting, became available. Again, expenditure on these public goods was highest in towns with intermediate levels of the franchise.

7 Discussion: additional evidence and broader implications

I conclude with a brief summary of the main results of the paper, and then discuss first additional evidence in support of the theory and then the broader implications of the results

This paper has introduced a new model of the relationship between the extension of the right to vote and government expenditure on public goods. The model predicts an inverted-U-shape relationship: that the poor and the wealthy will desire lower government expenditure on public goods than the middle class. The poor's opposition to expenditure results from the high marginal value of consumption at low levels of income. The wealthy's opposition, on the other hand, results from the relatively high tax burden that they face.

I then test this prediction using data on town council expenditure in nineteenth century England, exploiting variation in the extent of the franchise across towns and over time. I argue that this variation in plausibly exogenous due, in particular, to a series of national reforms that imposed franchise increases upon towns. The results show clear evidence of the predicted relationship: the level of public goods expenditure per capita and tax revenue per

capita in towns was highest when approximately 50% of the adult male population had the right to vote. Additional tests of the model show that this relationship was limited to towns where, at the start of the data period, the extent of the franchise was below this point; in towns with an initial franchise of above 50%, further franchise extensions led to a monotonic decline in the level of spending. Supporting the model further, evidence of the inverted-U-shape relationship is found only in towns where the poor did not have voting rights at the beginning of the period.

7.1 Identification: Additional evidence from a national reform

The identification in this paper relies on two sources of exogenous variation in the extent of the franchise. First, variation between towns that was due to decisions made by a set of authorities elected separately to, and with different goals than, municipal councils. Second, variation over time due to the imposition of national reforms that extended the right to vote in towns. I have presented several tests supporting this argument, but ideally I would also be able to utilize discrete changes in the level of democratic governance that could serve as a "natural experiment".

Although this approach is not possible for the municipal boroughs studied in this paper, such a test is provided by an 1894 reform to the governance structure of a separate set of towns. Prior to the reform, those towns were governed by councils elected under a graduated franchise where the wealthy had up to twelve votes and no secret ballot was in place. After the reform, councils were elected under the same system as the towns studied in this paper—one-household-one-vote with a secret ballot. As a result, poorer citizens held a much greater degree of political influence.

Chapman (2016) uses this reform as the treatment event in a difference-in-difference analysis where the control group are a set of comparable municipal boroughs. The results show that the imposition of the democratic reform slowed growth of public goods expenditure

and, in particular, reduced the rate of investment in new infrastructure. Additional tests show that this effect was limited to towns where, prior to the reforms, town elites were predominantly middle class. In towns where elites were predominantly upper class there is no evidence of any effect. Both findings provide further support for the theoretical argument presented in this paper.

7.2   Broader implications

The evidence presented here suggests a return to Lizzeri and Persico's (2004) question of why the elites would extend the franchise. They argue that the middle class drove franchise extension to increase government expenditure on public goods. In contrast, my results suggest that the rich may have accepted franchise extension because they could rely on the support of the poor in opposing the middle class' desire to grow the size of the state. This is especially true since, by controlling the system of local taxation—particularly by limiting the possibility of progressive tax rates at a local level—the wealthy were protected against large scale expropriation.

Can we also draw lessons of contemporary relevance from the particular historical experience of nineteenth century England? When and where might we expect to see the wealthy gain support from the poor in campaigning against government expenditure? The key insight of the model is that the poor will oppose expenditure on public goods—not redistributive transfers—when they face some of the cost of providing those goods through taxation. The critical question then is how frequently this condition is met, outside of the specific tax system implemented in English towns.

In fact, it remains the case that the poorest citizens continue to pay tax at both a local and a national level in many countries. Most countries impose Value Added Tax (VAT) or other consumption taxes at a national level (Keen, 2009), leading to a high tax burden for the poorest citizens. A recent study of 20 OECD countries found that citizens in the bottom

income decile face a VAT tax burden of almost 14% and an excise tax burden of almost 5% of income (OECD/KIPF, 2014).[33] In the United States, state and local taxation is regressive in all 50 states, with poorer citizens facing particularly high tax burdens through sales, excise and property taxes (Davis et al., 2015). Governments also frequently rely on other revenue sources funded in part by the poorest citizens, including user fees and gambling revenues. The reasons for the imposition of such regressive taxes are far beyond the scope of this paper. But if, as is plausible, they reflect constraints on government's ability to raise revenue then we might expect a similar effect to those observed at a local level: the poor and the rich opposing expenditure. In particular, taxes to combat climate change are often criticized due to their impact on the poorest (Chiroleu-Assouline and Fodha, 2014; Mathur and Morris, 2014).

A particularly relevant modern parallel is the widespread emphasis on cost recovery in the provision of sanitation and water supply. It is often argued that charging users is necessary to ensure sustainability of sanitation investments, with even the poorest expected to pay tariffs (OECD, 2009; African Development Bank, 2010). But this often leads to pricing structures that are, in practice, regressive (Van Ginneken et al., 2011) and also political opposition to increased tariffs that precludes pricing that can sustain sufficient investment in water and sanitation (Boland and Whittington, 1998; Herrera and Post, 2014; Marson and Savin, 2015; Herrera, 2014). In 2007 only approximately one third of African utilities had tariff structures that met operating and maintenance recovery at an average level of water use while fewer than 10% met capital cost recovery thresholds (Banerjee et al., 2010).[34] If control of these expenditures is to be decentralized, as is often advocated, then such political constraints need to be accounted for.

How might one overcome this opposition? The clearest answer is to reduce the burden

---

[33]Author's calculations using simple cross-country averages based on data in Table 2.1 and 2.5.

[34]Figures taken from Figure 6. Since the paper does not account for collection or enforcement of tariffs, the actual level of cost recovery is likely lower than these figures.

of taxation that falls on the poor. The examination of the English case suggests that a major barrier was the restricted tax schedule that town councils were allowed to impose. If they had been able to implement a more progressive taxation schedule then the poor would not have faced the same incentives to oppose expenditure, and political outcomes may have been very different. Alternatively, grant funding from the central government could—at the very least—have relaxed the pressure on local finances. In the American South the enfranchisement of Blacks as following the 1965 Voting Rights Act led to greater transfers *across* a state (Cascio and Washington, 2014). Further research is required to address these issues in more detail.

References

Abrams, B. A. and R. F. Settle (1999). Women's suffrage and the growth of the welfare state. *Public Choice 100*(3-4), 289–300.

Acemoglu, D. and J. Robinson (2006). *Economic Origins of Dictatorship and Democracy.* Cambridge: Cambridge University Press.

Acemoglu, D. and J. A. Robinson (2000). Why did the West extend the franchise? Democracy, inequality, and growth in historical perspective. *Quarterly Journal of Economics 115*(4), 1167–1199.

Acemoglu, D. and J. A. Robinson (2001). A theory of political transitions. *American Economic Review 91*(4), 938–963.

African Development Bank (2010). Guidelines for user fees and cost recovery for urban, networked water and sanitation delivery. Retrieved July 27 2015.

Aidt, T., M. Daunton, and J. Dutta (2010). The retrenchment hypothesis and the extension of the Franchise in England and Wales. *The Economic Journal 120*(547), 990–1020.

Aidt, T. S. and B. Dallal (2008). Female voting power: the contribution of women's suffrage to the growth of social spending in Western Europe (1869–1960). *Public Choice 134*(3-4), 391–417.

Aidt, T. S., J. Dutta, and E. Loukoianova (2006). Democracy comes to Europe: franchise extension and fiscal outcomes 1830–1938. *European Economic Review 50*(2), 249–283.

Baltagi, B. H. and D. Li (2002). Series estimation of partially linear panel data models with fixed effects. *Annals of Economics and Finance 3*(1), 103–116.

Banerjee, A. V. and E. Duflo (2007). The economic lives of the poor. *Journal of Economic Perspectives 21*(1), 141.

Banerjee, S. G., V. Foster, Y. Ying, H. Skilling, and Q. T. Wodon (2010). Cost recovery, equity, and efficiency in water tariffs: evidence from African utilities. *World Bank Policy Research Working Paper 5384*.

Baum, M. A. and D. A. Lake (2003). The political economy of growth: democracy and human capital. *American Journal of Political Science 47*(2), 333–347.

Beath, Andrew, C. F. and R. Enikolopov (2012). Direct democracy and resource allocation: Experimental evidence from afghanistan. *World Bank Policy Research Working Paper Series 6133*.

Berlinski, S., T. Dewan, et al. (2011). The political consequences of franchise extension: Evidence from the second reform act. *Quarterly Journal of Political Science 6*(34), 329–376.

Bertocchi, G. (2011). The enfranchisement of women and the welfare state. *European Economic Review 55*(4), 535–553.

Boland, J. J. and D. Whittington (1998). The political economy of increasing block tariffs in developing countries. In *World Bank Sponsored Workshop on Political Economy of Water Pricing Implementation, Washington, DC*.

Bonfiglioli, A. M. (2003). *Empowering the poor: Local governance for poverty reduction.* United Nations Publications.

Borck, R. (2007). Voting, inequality and redistribution. *Journal of Economic Surveys 21*(1), 90–109.

Brown, D. S. and W. Hunter (2004). Democracy and human capital formation: Education spending in Latin America, 1980 to 1997. *Comparative Political Studies 37*(7), 842–864.

Brown, J. C. (1988). Coping with crisis? The diffusion of waterworks in late nineteenth-century German towns. *The Journal of Economic History 48*(2), 307–318.

Bursztyn, L. (2013). Poverty and the political economy of public education spending: Evidence from Brazil. *Unpublished Manuscript*.

Cameron, A. C., J. B. Gelbach, and D. L. Miller (2008). Bootstrap-based improvements for inference with clustered errors. *The Review of Economics and Statistics 90*(3), 414–427.

Cascio, E. U. and E. Washington (2014). Valuing the vote: The redistribution of voting rights and state funds following the voting rights act of 1965. *Quarterly Journal of Economics 129*(1).

Chapman, J. (2016). Democratic reform and the growth of government in nineteenth century Britain. *Working paper*.

Chattopadhyay, R. and E. Duflo (2004). Women as policy makers: Evidence from a randomized policy experiment in india. *Econometrica 72*(5), 1409–1443.

Chiroleu-Assouline, M. and M. Fodha (2014). From regressive pollution taxes to progressive environmental tax reforms. *European Economic Review 69*, 126–142.

Conley, J. P. and A. Temimi (2001). Endogenous enfranchisement when groups' preferences conflict. *Journal of Political Economy 109*(1), 79–102.

Crafts, N. F. and T. C. Mills (1994). Trends in real wages in Britain, 1750–1913. *Explorations in Economic History 31*(2), 176–194.

Davis, C., K. Davis, M. Gardner, H. Heimovitz, S. Johnson, R. S. McIntyre, R. Phillips, A. Sapozhnikova, and M. Wiehe (2015). *Who Pays?: A Distributional Analysis of the Tax Systems in All 50 States* (5th ed.). Institute on Taxation & Economic Policy.

Epple, D. and R. E. Romano (1996a). Ends against the middle: determining public service provision when there are private alternatives. *Journal of Public Economics 62*(3), 297 – 325.

Epple, D. and R. E. Romano (1996b). Public provision of private goods. *Journal of political Economy*, 57–84.

Fraser, D. (1976). *Urban politics in Victorian England: The structure of politics in Victorian cities*. Leicester University.

Garrard, J. (2006). The democratic experience. In S. Berger (Ed.), *A Companion to Nineteenth-century Europe*, pp. 149–163. Malden MA.

Gazeley, I. and A. Newell (2000). Rowntree revisited: poverty in Britain, 1900. *Explorations in Economic History 37*(2), 174–188.

Gazeley, I. and A. Newell (2007). Poverty in Britain in 1904: An early social survey rediscovered. Technical report, IZA Discussion Papers.

Gentzkow, M. (2006). Television and voter turnout. *Quarterly Journal of Economics*, 931–972.

Günther, I. and G. Fink (2011). Water and sanitation to reduce child mortality: the impact and cost of water and sanitation infrastructure. *World Bank Policy Research Working Paper Series 5618*.

Haines, M. R. (2006). Cost of living of industrial workers in the United states and Europe, 1888–1890 [computer file]. ICPSR07711-v4. Hamilton, NY: Michael R. Haines, Colgate

University [producer], 2006. Ann Arbor, MI: Inter-university Consortium for Political and Social Research [distributor].

Hamlin, C. (1998). *Public health and social justice in the age of Chadwick: Britain, 1800-1854.* Cambridge University Press.

Harding, R. and D. Stasavage (2014). What democracy does (and doesn't do) for basic services: School fees, school inputs, and African elections. *Journal of Politics 76*(01), 229–245.

Hennock, E. (1963). Finance and politics in urban local government in England, 1835-1901. *The Historical Journal 6*(02), 212–225.

Hennock, E. (1973). *Fit and proper persons: ideal and reality in nineteenth-century urban government.* Number 2. Edward Arnold (London).

Herrera, V. (2014). Does commercialization undermine the benefits of decentralization for local services provision? Evidence from Mexicos urban water and sanitation sector. *World Development 56*, 16–31.

Herrera, V. and A. E. Post (2014). Can developing countries both decentralize and de-politicize urban water services? Evaluating the legacy of the 1990s reform wave. *World Development 64*, 621–641.

Horrell, S. and D. Oxley (1999). Crust or crumb?: Intrahousehold resource allocation and male breadwinning in late Victorian Britain. *Economic History Review 52*(3), 494–522.

House of Commons (1866). *Electoral returns. Boroughs and counties, 1865-66,* Parliamentary Papers *1866 (3626).*

House of Commons (1867). *Small Tenements Rating Act Return* Parliamentary Papers *1867 (207).*

House of Commons (1872a). *Census of England and Wales, 1871. (33 & 34 Vict. c. 107.) Population tables. Area, houses, and inhabitants. Vol. I. Counties.* Parliamentary Papers *1872 [C.676].*

House of Commons (1872b). *Return showing with respect to the municipal boroughs in England and Wales, boroughs in which town councils have become the urban sanitary authorities under the Public Health Act, 1872, in place of boards under local acts* Parliamentary Papers *1874 (304).*

House of Lords (1859). Parliamentary Papers *Select Committee on the operation of the Small Tenements Rating Act.* 1859 Session 2 (56).

Husted, T. A. and L. W. Kenny (1997). The effect of the expansion of the voting franchise on the size of government. *Journal of Political Economy*, 54–82.

Jack, W. and R. Lagunoff (2006). Dynamic enfranchisement. *Journal of Public Economics 90*(4), 551–572.

Justman, M. and M. Gradstein (1999). The industrial revolution, political transition, and the subsequent decline in inequality in nineteenth-century Britain. *Explorations in Economic History 36*(2), 109–127.

Keen, M. (2009). What do (and don't) we know about the Value Added Tax? a review of Richard M. Bird and Pierre-Pascal Gendron's "the VAT in developing and transitional countries". *Journal of Economic Literature*, 159–170.

Keith-Lucas, B. (1952). *The English local government franchise: a short history.* Blackwell.

Lampard, E. E. (1973). The urbanizing world. In H. J. Dyos and M. Wolff (Eds.), *The Victorian City: images and realities*, pp. 3–58. Taylor & Francis.

Lind, J. T. and H. Mehlum (2010). With or without U? The appropriate test for a U-shaped relationship. *Oxford Bulletin of Economics and Statistics 72*(1), 109–118.

Lindert, P. H. (2004). *Growing Public: Social Spending and Economic Growth since the Eighteenth Century.* Cambridge University Press.

Lizzeri, A. and N. Persico (2004). Why did the elites extend the suffrage? Democracy and the scope of government, with an application to Britain's Age of Reform. *Quarterly Journal of Economics 119*(2), 707–765.

Llavador, H. and R. J. Oxoby (2005). Partisan competition, growth, and the franchise. *The Quarterly Journal of Economics 120*(3), 1155–1189.

Lott, J. R. and L. W. Kenny (1999). Did women's suffrage change the size and scope of government? *Journal of Political Economy 107*(6), pp. 1163–1198.

MacKenzie, W. (1921). Changes in the standard of living in the United Kingdom, 1860–1914. *Economica* (3), 211–230.

Marson, M. and I. Savin (2015). Ensuring sustainable access to drinking water in Sub-Saharan Africa: Conflict between financial and social objectives. *World Development 76*, 26–39.

Mathur, A. and A. C. Morris (2014). Distributional effects of a carbon tax in broader US fiscal reform. *Energy Policy 66*, 326–334.

Meltzer, A. and S. Richard (1981). A rational theory of the size of government. *Journal of Political Economy 89*(5), 914–927.

Merton, R. C. (1971). Optimum consumption and portfolio rules in a continuous-time model. *Journal of Economic Theory 3*(4), 373 – 413.

Miller, G. (2008). Women's suffrage, political responsiveness, and child survival in American history. *The Quarterly Journal of Economics 123*(3), 1287–1327.

Millward, R. and S. Sheard (1995). The urban fiscal problem, 1870-1914: government expenditure and finance in England and Wales. *The Economic History Review 48*(3), 501–535.

Minnesota Population Center (2008). *North Atlantic Population Project: Complete Count Microdata. Version 2.0 [Machine-readable database].* Minneapolis: Minnesota Population Center, www.nappdata.org.

Mitchell, B. R. (1971). *Abstract of British historical statistics.* CUP Archive.

OECD (2009). *Managing water for all: an OECD perspective on pricing and financing.* Organisation for Economic Co-operation and Development.

OECD/KIPF (2014). *The Distributional Effects of Consumption Taxes in OECD Countries.* OECD Tax Policy Studies, No. 22, OECD Publishing, Paris. DOI: http://dx.doi.org/10.1787/9789264224520-en.

Ogaki, M. and Q. Zhang (2001). Decreasing relative risk aversion and tests of risk sharing. *Econometrica 69*(2), pp. 515–526.

Olken, B. A. (2010). Direct democracy and local public goods: Evidence from a field experiment in Indonesia. *American Political Science Review 104*(2), 243–267.

Ross, M. (2006). Is democracy good for the poor? *American Journal of Political Science 50*(4), 860–874.

Rowntree, B. S. (1901). *Poverty: A study of town life.* Macmillan.

Salmon, P. (2002). *Electoral Reform at Work: Local Politics and National Parties, 1832-1841*, Volume 27. Boydell & Brewer.

Schürer, K. and M. Woollard (2003). *National Sample from the 1881 Census of Great Britain [computer file].* Colchester, Essex: History Data Service, UK Data Archive [distributor].

Seymour, C. (1915). *Electoral reform in England and Wales: The development and operation of the parliamentary franchise, 1832-1885*, Volume 3. Yale University Press.

Southall, H., P. Ell, D. Gatley, and I. Gregory (August 2004). *Great Britain Historical Database: Census Data: Parish-Level Population Statistics, 1801–1951 [computer file].* Colchester, Essex: UK Data Archive [distributor] SN: 4560.

Stasavage, D. (2005). Democracy and education spending in Africa. *American Journal of Political Science 49*(2), 343–358.

Szreter, S. and G. Mooney (1998). Urbanization, mortality, and the standard of living debate: new estimates of the expectation of life at birth in nineteenth-century British cities. *The Economic History Review 51*(1), 84–112.

Thompson, B. (1984). Infant mortality in nineteenth-century Bradford. In R. Woods and J. Woodward (Eds.), *Urban disease and mortality in nineteenth-century England.* London and New York: Batsford Academic and Educational Ltd.

Toscani, F. (2012). The role of the middle classes in democratisation. *Unpublished Manuscript.*

Van Ginneken, M., U. Netterstrom, and A. Bennett (2011). More, better, or different spending. *Trends in Public Expenditure on Water Supply and Sanitation in Sub-Saharan Africa.*

Vine, J. S. (1879). *English municipal institutions: their growth and development from 1835 to 1879, statistically illustrated.* Waterlow & sons limited.

Wohl, A. (1983). *Endangered lives: public health in Victorian Britain.* JM Dent and Sons Ltd.

Yasumoto, M. (2011). *The Rise of a Victorian Ironopolis: Middlesbrough and regional industrialization.* Boydell Press.

Yatchew, A. (2003). *Semiparametric regression for the applied econometrician.* Cambridge University Press.

Zwane, A. P. and M. Kremer (2007). What works in fighting diarrheal diseases in developing countries? A critical review. *The World Bank Research Observer 22*(1), 1–24.

Tables

Table I: Variation in the franchise is idiosyncratic after controlling for urban crowding, population growth and incorporation year.

	1866 (1)	1873 (2)	1879 (3)	1885 (4)	1897 (5)
DV=Franchise (% Adult male population)					
Population growth	-0.79 (0.88)	0.53 (0.66)	-0.76 (1.01)	-0.26 (0.95)	-3.04*** (0.99)
Urban crowding	-4.13*** (0.73)	-3.87*** (0.76)	-3.94*** (0.99)	-2.08*** (0.78)	-2.11** (0.94)
Popn 10k-25k	-2.77 (1.91)	-1.66 (1.53)	-1.18 (1.77)	-1.18 (1.24)	-0.79 (1.19)
Popn 25k-50k	1.45 (2.39)	3.79** (1.78)	1.88 (1.50)	-0.23 (1.32)	-1.00 (1.42)
Popn 50k-100k	-11.23*** (3.09)	-1.34 (1.97)	4.59* (2.71)	0.90 (2.05)	-2.99 (2.06)
Popn 100k-250k	1.13 (4.65)	3.64 (2.81)	1.26 (2.63)	0.10 (2.27)	-3.15* (1.65)
Popn >250k	-17.25*** (2.22)	4.14 (2.74)	2.97 (2.74)	-1.99 (2.20)	-4.79** (2.02)
Incorporated 1835	-1.92 (2.05)	-2.74* (1.44)	-2.67* (1.58)	0.20 (1.39)	-0.69 (1.16)
% Men Head of Household	0.63*** (0.14)	0.67*** (0.16)	0.67*** (0.17)	0.93*** (0.12)	0.75*** (0.10)
No. obs	149	145	145	150	148
Adj. R-sq	0.43	0.48	0.45	0.49	0.54
F-stat	27.26	14.55	26.45	31.40	22.89
F-test (p-val)	0.00	0.00	0.00	0.00	0.00
DV=Residuals from franchise regression					
Farming town	1.06 (1.81)	1.47 (1.66)	1.43 (1.81)	1.09 (1.62)	0.72 (1.17)
Textiles town	-0.12 (2.11)	1.44 (1.27)	-0.02 (1.40)	-1.42 (1.18)	0.81 (1.15)
1871 popn density	-0.01 (0.04)	0.04 (0.04)	-0.00 (0.04)	-0.01 (0.03)	-0.02 (0.03)
Tax base per capita	0.69 (0.95)	-0.68 (1.04)	0.15 (0.65)	-0.65 (0.51)	-0.14 (0.46)
Parliamentary Borough	1.02 (2.46)	0.84 (2.12)	2.25 (1.99)	1.02 (2.01)	1.09 (1.27)
Num parishes	-0.15 (0.13)	0.04 (0.07)	-0.00 (0.08)	0.03 (0.09)	0.00 (0.04)
No. obs	141	137	137	141	139
Adj. R-sq	-0.02	-0.02	-0.03	-0.01	-0.03
F-stat	0.50	0.41	0.27	1.10	0.45
F-test (p-val)	0.81	0.87	0.95	0.37	0.84

Dependent variable in bottom panel is the residuals from the regression in respective column in the top panel. The coefficients for population growth, urban crowding and density are standardized. Tax base per capita in 1866 uses value from 1873 due to missing data. Once population, population growth, urban crowding, % men heads of household and whether incorporated in 1835 are controlled for, none of the remaining observable characteristics of towns predicts the level of the franchise.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table II: Fixed effects regressions show inverted-U-relationship, with and without control variables.

	Tax receipts p.c.			Public goods spend p.c.		
	(1)	(2)	(3)	(4)	(5)	(6)
Male franchise	0.446***	0.404***	0.302**	0.706***	0.575***	0.502***
	(0.125)	(0.123)	(0.120)	(0.168)	(0.150)	(0.146)
Male franchise sq	-0.050***	-0.046***	-0.038***	-0.068***	-0.056***	-0.051***
	(0.013)	(0.012)	(0.012)	(0.016)	(0.014)	(0.014)
Tax base p.c.			0.177***			0.189***
			(0.053)			(0.051)
No. obs	4850	4850	4696	4850	4850	4696
No. towns	150	150	150	150	150	150
Year Fixed Effects	Y	Y	Y	Y	Y	Y
Town Fixed Effects	Y	Y	Y	Y	Y	Y
Popn. controls	N	Y	Y	N	Y	Y
Franchise turning point (%)	45	44	40	52	51	50
F-test (p-val)	0.00	0.00	0.00	0.00	0.00	0.00
U-test (p-val)	0.00	0.00	0.02	0.00	0.00	0.02

Dependent variables are standardized. Franchise coefficients represent the effect of a 10% increase in the franchise. Population controls include town population (in six bins), urban crowding, decadal population growth, and female franchise. Regressions use annual financial data from 1867–1900, with franchise data lagged three years as discussed in the text. Missing values for tax base per capita are replaced using linear interpolation. The number of observations is reduced in these regressions due to missing data in earlier years. Standard errors are adjusted by clustering by town, and are displayed in parentheses.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table III: Inverted-U-shape relationship is robust to inclusion of lagged dependent variable and interactions between town characteristics and time-polynomial.

	Tax receipts p.c.					Public goods spend p.c.		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Male franchise	0.118***	0.401***	0.257**	0.362***	0.172***	0.573***	0.372***	0.596***
	(0.041)	(0.120)	(0.115)	(0.123)	(0.061)	(0.146)	(0.141)	(0.167)
Male franchise sq	-0.014***	-0.046***	-0.031***	-0.042***	-0.017***	-0.056***	-0.035***	-0.058***
	(0.004)	(0.012)	(0.012)	(0.013)	(0.006)	(0.014)	(0.013)	(0.016)
No. obs	4690	4850	4850	4850	4690	4850	4850	4850
No. towns	150	150	150	150	150	150	150	150
Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Town FE	Y	Y	Y	Y	Y	Y	Y	Y
Popn. controls	Y	Y	Y	Y	Y	Y	Y	Y
Lagged DV	Y	N	N	N	Y	N	N	N
1873 tax base-time interaction	N	Y	Y	N	N	Y	N	N
1871 Popn-time interaction	N	N	Y	N	N	N	Y	N
% Heads of household-time interaction	N	N	N	Y	N	N	N	Y
Fran. turn point (%)	43	44	42	43	49	51	53	51
F-test (p-val)	0.00	0.00	0.01	0.00	0.01	0.00	0.03	0.00
U-test (p-val)	0.01	0.00	0.03	0.01	0.01	0.00	0.00	0.00

Dependent variables are standardized. Franchise coefficients represent the effect of a 10% increase in the franchise. Population controls include town population (in six bins), urban crowding, decadal population growth, and female franchise. Time interactions reflect the interaction between the value of the relevant observable characteristic and a fourth-order time polynomial. Regressions use annual financial data from 1867–1900, with franchise data lagged three years as discussed in the text. Standard errors are adjusted by clustering by town, and are displayed in parentheses.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table IV: Inverted-U-shape relationship is found only in towns where the poor did not have the right to vote in 1866, and where the franchise in 1866 was below the turning points estimated in Table II.

	Tax receipts p.c.					Public goods spend p.c.				
	Poor unenfranchised	Poor enfranchised	Below turn	Above turn	Above turn (linear)	Poor unenfranchised	Poor enfranchised	Below turn	Above turn	Above turn (linear)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Male franchise	0.368*	0.199	0.262	0.533	-0.184**	0.540**	0.191	0.525***	0.182	-0.273***
	(0.202)	(0.234)	(0.162)	(0.460)	(0.070)	(0.259)	(0.309)	(0.173)	(0.929)	(0.096)
Male franchise sq	-0.045**	-0.027	-0.031*	-0.058		-0.055**	-0.022	-0.048***	-0.035	
	(0.021)	(0.022)	(0.017)	(0.039)		(0.025)	(0.029)	(0.016)	(0.072)	
No. obs	2044	1622	2949	1852	1852	2044	1622	3884	930	930
No. towns	63	50	91	58	58	63	50	120	29	29
Year Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Town Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Popn. controls	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Fran. turning point (%)	41	37	43	46		50	43	55	26	
F-test (p-val)	0.09	0.20	0.16	0.03		0.11	0.62	0.01	0.03	
U-test (p-val)	0.06	0.29	0.08	0.45	n.a.	0.03	0.31	0.01	n.a.	n.a.

Specifications (1) and (6) restrict the sample to towns where the franchise was low enough that the poor are estimated to have not had the right to vote at the start of the period (1866). Specifications (2) and (7) indicate the towns where the poor already had the right to vote in 1866. The results show that the inverted-U-shape relationship is found only where the reforms led to the enfranchisement of the poor, consistent with the predictions of the model.
Specifications (3)–(5) and (8)–(10) analyze the effects of restricting the sample to towns with an 1866 franchise below and above the turning points estimated in Table II. Specifications (3) and (8) show evidence of the inverted-U relationship in towns that started with a franchise below the turning point, showing that the results are driven by towns that were "shifted across" the turning point by franchise extensions. Specifications (4)–(5) and (9)–(10) show that in towns starting with a franchise above the turning point, further increases in the franchise led to a monotonic decline in the level of taxation and expenditure per capita.
Dependent variables are standardized. Franchise coefficients represent the effect of a 10% increase in the franchise. Population controls include town population (in six bins), urban crowding, decadal population growth, and female franchise. Regressions use annual financial data from 1867–1900 (except when the lagged dependent variable is included), with franchise data lagged three years as discussed in the text. Standard errors are adjusted by clustering by town, and are displayed in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table V: Inverted-U-relationship holds when examining relationship over 5-year periods, and over shorter time horizon.

	DV=Average Tax receipts p.c.			DV=Average Public goods spend p.c.		
	(1)	(2)	(3)	(4)	(5)	(6)
Male franchise	0.501***	0.216**	0.453***	0.669***	0.479***	0.654***
	(0.182)	(0.099)	(0.132)	(0.211)	(0.129)	(0.162)
Male franchise sq	-0.068***	-0.023**	-0.052***	-0.082***	-0.044***	-0.065***
	(0.023)	(0.010)	(0.013)	(0.027)	(0.012)	(0.015)
No. obs	273	563	1001	273	563	1001
No. towns	142	150	150	142	150	150
Period Fixed Effects	Y	Y	Y	Y	Y	Y
Town Fixed Effects	Y	Y	Y	Y	Y	Y
Popn. controls	Y	Y	Y	Y	Y	Y
Franchise turning point (%)	37	47	43	41	55	50
F-test (p-val)	0.01	0.09	0.00	0.01	0.00	0.00
U-test (p-val)	0.01	0.03	0.00	0.00	0.01	0.00
Years included	1867–1876	1867–1881	1867–1901	1867–1876	1867–1881	1867–1901

The table presents the results from splitting the sample into seven 5-year periods, and using only non-interpolated franchise data as follows: 1867–71: 1866; 1872–76: mean of 1869 and 1871; 1877–1881: mean of 1873 and 1879; 1882-1887: mean of 1879 and 1883; 1888–1892: 1885; 1892–1896: mean of 1885 and 1897; 1897–1900: 1897. The first 5-year period includes years after 1869 since, as argued in the text, it would take three years for the council to be replaced. (The results are similar if instead only including the 1866-1869 data.)

Dependent variables are standardized. Franchise coefficients represent the effect of a 10% increase in the franchise. Population controls include town population (in six bins), urban crowding, decadal population growth, and female franchise. Standard errors are adjusted by clustering by town, and are displayed in parentheses.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Figures

Figure I: Variation in level of the franchise varied both over time and within individual cross-sections.

Note: The figure portrays the distribution of the franchise in three cross-sections. The large expansion of the reforms due to the 1869 reforms is clear from the rightward shift in the distribution between 1868 and 1878. The width of the distribution also decreases, reflecting the fact that the reforms standardized the franchise regulations across towns. A further, smaller, increase then occurred as a result of less important reforms in 1878 and 1882.

Source: Franchise series is calculated based on data from parliamentary papers and decennial censuses. See Section 5 and Online Appendix B for details.

**Figure II: Semi-parametric regression shows inverted-U-relationship with per capita tax receipts and expenditure.**
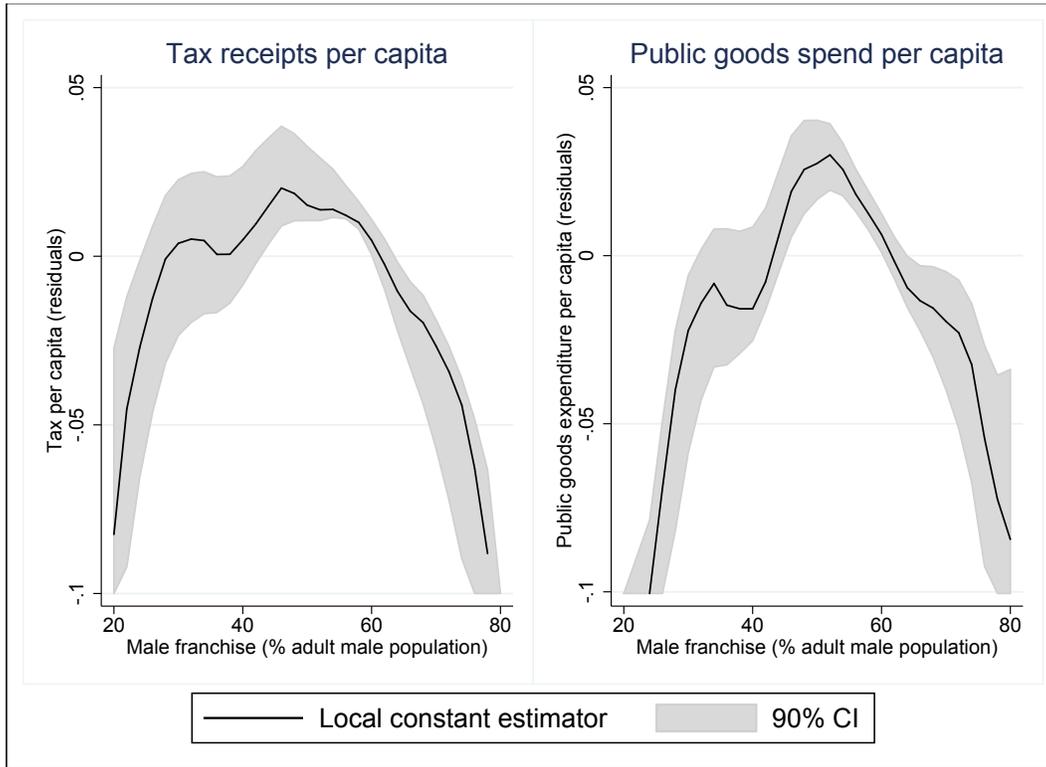
Note: The figure displays the estimated nonlinear part of the partially linear model $y = g(franchise) + \beta X + \epsilon$, where y is the tax receipts per capita (left hand panel) or the public goods expenditure per capita (right hand panel). The vector of control variables X includes year and town fixed effects, female franchise, population (in 6 bins), urban crowding and population growth. The relationship is estimated using annual financial data from 1867–1900, with franchise data lagged three years as discussed in the text.

The procedure is as follows. First, the parametric element of the specification is estimated using the Baltagi and Li (2002) fixed effects estimator for partially linear data models. The residuals are then calculated and plotted against the male adult franchise (lagged 3 periods) using a Nadaraya-Watson nonparametric regression with an Epanechnikov kernel, and bandwidth equals 3. For display purposes only the y-axis is truncated for residual values of less than -0.11. Confidence intervals are calculated using a wild bootstrap and 999 replications; the full procedure is described in Online Appendix F.

Figure III: Franchise extensions had sizable effect on the level of taxation and expenditure per capita, measured as a percentage of the median between 1867 and 1900.
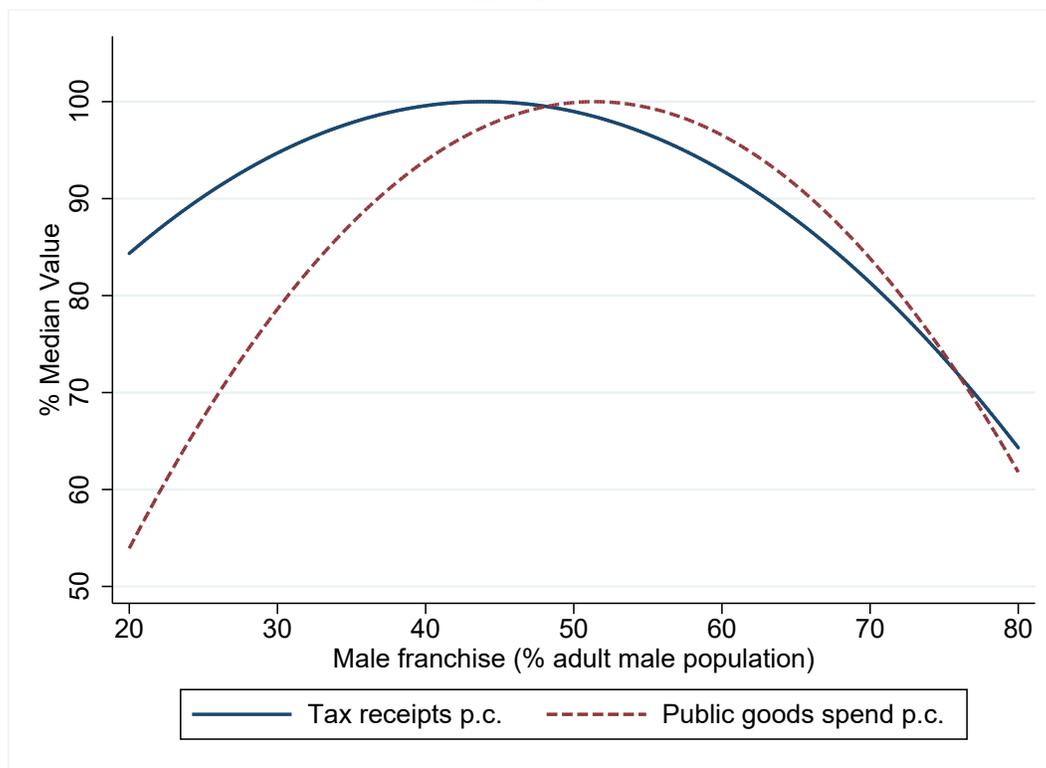
Note: Estimates based on results of specifications (2) and (5) in Table II.

Figure IV: The effect of the franchise on sanitary public goods changed over time; however the effect on new infrastructure, such as tramways, remained large.

Y-axis represents absolute value of the coefficient on quadratic franchise term from rolling regression of dependent variable on franchise, franchise squared and control variables. See Table II for further details of specification. Dependent variables are standardized in terms of standard deviations of "All public goods". First regression covers the period 1872-1886, the second 1872-1887 etc.

Online appendix - not intended for publication

A Proofs

Proof of Proposition 1

Proof. Individuals consume whatever remains after taxation $c_i = y_i(1 - \tau)$. Denote average income as $\bar{y} = \frac{Y}{N}$. Then the individual's problem is

$$\max_{\tau_i} U = u(y_i(1 - \tau_i)) + v(\tau_i \bar{y})$$

First note that this problem has a unique maximum since $U(c_i, G)$ is strictly concave. The assumptions that $\lim_{x \to 0} u'(x) = \lim_{x \to 0} v'(x) = \infty$ ensures an interior solution.

Since $g_i^* = \tau_i^* \frac{Y}{N}$ I proceed by identifying the optimal tax rate as a function of individual income. Taking the first-order conditions, the optimal τ^* is implicitly defined by the equation:

$$y_i u'(c_i^*) = \bar{y} v'(\tau_i^* \bar{y}) \tag{1}$$

where $c_i^* = y_i(1 - \tau_i^*)$.

As y_i increases, it must be the case that c_i^* increases. To see this, consider otherwise. Since consumption is lower, the value of the left hand side would increase relative to the right hand side. Further for consumption to fall, the tax rate must be higher. But then the right hand side of the equation will decrease, meaning there is no equilibrium.

Using implicit differentiation to identify $\frac{d\tau^*}{dy}$ yields:

$$\frac{d\tau^*}{dy_i} = -\frac{u'(c_i^*) + \frac{dc_i^*}{dy_i} y_i u''(c_i^*)}{-y_i^2 u''(c_i^*) - \bar{y}^2 v''(\tau_i^* \bar{y})}$$

The denominator of this expression is strictly positive, since both $u(\cdot)$ and $v(\cdot)$ are strictly concave by assumption. Then $\frac{d\tau^*}{dy_i} \geq 0$ when the numerator is positive:

$$-u'(c_i^*) - y_i(1 - \tau_i^*)u''(c_i^*) \geq 0$$

$$-c_i u''(c_i^*) \geq u'(c_i^*)$$

$$r_R(c_i^*, u) \geq 1$$

where $r_R(c_i^*, u)$ denotes the coefficient of relative risk aversion. Implicitly define $\tilde{y}$ by $r_R(\tilde{y}(1 - \tilde{\tau}_i^*)) = R_R(\tilde{c}^*) = 1$. Then by assumption 2, for any $y_i < \tilde{y}$ $R_R(c_i^*) > 1$. Further, since r_R is monotonically decreasing, it is sufficient to show that there is j with $c_j^* \geq \tilde{c}^*$. Consider an individual j with $y_j > \tilde{c}^* + \hat{G}$. Since $v'(\hat{G}) = 0$, j will consume strictly more than $\tilde{c}^*$ This completes the proof. ◻

Proof of Proposition 2

Proof. First, note that preferences over τ are single peaked, since $U(\cdot)$ is strictly concave. Then for a given electorate we can apply the standard Median Voter Theorem. (Note that the median voter here is not necessarily equivalent to the voter with the median income). From Proposition 1, we know that τ_i^* reaches a unique maximum at $y_i = \tilde{y}$, and the optimal tax rate is decreasing in y_i for $y_i > \tilde{y}$.

Define τ^0 as the median tax rate under E_0, and τ_i^m as the median optimal tax rate when i is the poorest enfranchised citizen. Order the voters in order of income. That is voter $i+1$ is the next richest voter after voter i. For all citizens $\{i|y_i \geq \tilde{y}, \ i \neq E_0\}$, $\tau_i^* > \tau_{i+1}^* \geq \tau^0$. Thus as each of these citizens are enfranchised τ^m (weakly) increases. Further, this increase is strict at some point since $|\{i|y_i < \tilde{y}, i \neq E_0\}| \geq 2$. By proposition 1, the optimal tax rate is increasing in y_i for $y_i < \tilde{y}$. Then all citizens $\{i|y_i < \tilde{y}\}$, $\tau_i^* > \tau_{i-1}^*$. As a result, if the median tax rate decreases as the franchise is increased, it will always decrease for further

extensions.

Now suppose τ^m never decreases as the electorate increased. Then $\tau_i^m \geq \tilde{\tau}$ $\forall i$ with $y_i < \tilde{y}$. But this is not the case, since by assumption there are at least two citizens for which $\tau_i^* < \tilde{\tau}$.

To complete the proof, note that the level of the tax rate directly maps to the level of public goods expenditure per capita, since $g = \tau \frac{Y}{N}$

$\square$

Proof of Proposition 3

Proof. Consider the situation where each voter's income is a constant share, α_i, of average income $\bar{y}$. Then the first-order conditions become:

$$-\alpha_i \bar{y} u'((1 - \tau_i^*)\alpha_i \bar{y}) + \bar{y} v'(\tau_i^* \bar{y}) = 0 \tag{2}$$

First I show that spending per capita increases with $\bar{y}$. Note that we can divide through both sides by $\bar{y}$. Then suppose otherwise, which implies a reduction in τ_i^*. Since $u'', v'' < 0$, then this implies that both terms increase, which is a contradiction. Since this is true $\forall i$, then the median level of spending will also increase.

To identify the relationship with τ_i^*, we can use implicit differentiation of the first-order conditions. This identifies that:

$$\frac{\partial \tau_i^*}{\partial \bar{y}} \leq 0 \iff \tau_i \geq \frac{\alpha_i^2 u''((1 - \tau_i^*)\alpha_i \bar{y})}{\alpha_i^2 u''((1 - \tau_i^*)\alpha_i \bar{y}) + v''(\tau_i^* \bar{y})}$$

Note that this expression is less than 1 and positive (since both the numerator and denominator are negative). Thus in general, this relationship will depend on the level of income of the individual α_i, and the relative levels of (u'', v''). Thus the outcome on the optimal tax rate will vary dependent for each individual, and the implemented tax rate will

depend on the identity of the median voter (which may also change with a change in $\bar{y}$). However, as $v''(\cdot)$ approaches $-\infty$, the expression will tend towards 0, and hence always hold.

$\square$

A.1 Extension to progressive tax system

In the main text I present the model with a proportional tax rate both for simplicity and because it closely matches the historical setting of the empirical analysis. However, the result of proposition 1 holds for a more general, progressive, tax structure where the consumption of individual i is:

$$c_i = y_i - t(y_i)$$

and $t(y_i)$ is a tax burden varying according to income, characterized by

$$t(y_i) = s(y_i)T$$

where T is the total tax revenue (and hence public goods spending) and $s(\cdot)$ is a function identifying the share of the total taxation paid by an individual. Note that if $s(y_i) = \frac{y_i}{Y}$ then this simplifies to the proportional tax system presented in the main paper.

I consider tax systems that are (weakly) progressive as defined by constraints on the tax elasticity $\epsilon(y)$:

$$\epsilon(y) = \frac{t'(y)}{t(y)}y$$

A tax system is, as usual, defined as progressive if $\epsilon(y) > 1$, and regressive if $\epsilon(y) < 1$. For a proportional tax system $\epsilon(y) = 1$. I assume that there is some y such that the tax system is progressive at y and that, in addition, the tax system is increasingly progressive

at higher incomes: $\epsilon' \geq 0$ with weakly increasing marginal tax rates: $s''(y) \geq 0$.[35] To ensure marginal tax rates of between 0 and 1 I assume that $s'(y) \in [0, \frac{1}{\hat{G}+1}]$ $\forall y$. Finally, I assume that $s(y) > 0$ $\forall y > 0$—that is, all citizens bear some of the tax burden.

With these assumptions I re-state the proof of proposition 1 as follows.

Proof. The proof proceeds by first characterizing the conditions under which the optimal level of taxation is increasing in income and showing that this function has a single turning point.

Individuals face the following optimization problem:

$$\max_{T} U = u(c_i) + v\left(\frac{T}{N}\right)$$

This problem has a unique maximum since $U(\cdot)$ is strictly concave. Taking the first-order conditions, the optimal T^* is implicitly defined by the equation:

$$
\begin{aligned}
F(T^*; y, Y) &= -\frac{dc}{dT} u'(c^*) + \frac{1}{N} v'\left(\frac{T^*}{N}\right) = 0 \\
&= -s'(y) u'(c^*(y)) + \frac{1}{N} v'\left(\frac{T^*}{N}\right) = 0
\end{aligned}
\tag{3}
$$

where for simplicity I drop the i subscripts on y_i and c_i and denote i's consumption at their optimal level of taxation as $c^* = (y - s(y)T^*)$. The assumptions that $\lim_{x \to 0} u'(x) = \lim_{x \to 0} v'(x) = \infty$ ensure an interior solution.

In the remainder of the proof I only display the arguments of the c^*, s, s', T^* if needed for clarification.

Lemma 1 The optimal level of consumption is increasing in y:

$$\frac{dc^*}{dy} > 0 \ \forall y$$

---

[35]Note that increasing marginal tax rates are implied by an increasing tax elasticity if the tax is progressive but not if the tax is regressive.

Proof. First note that we can write:

$$\frac{dc^*}{dy} = 1 - s'T^* - \frac{dT^*}{dy}s$$

Since, by assumption, $1 - s'T^* > 0$ then $\frac{dc^*}{dy} < 1$ if and only if $\frac{dT^*}{dy}s > 0$. Now consider $y_2 > y_1$ with associated consumption $c_2^* < c_1^*$ and $T_2^* > T_1^*$. But then $u'(c_2^*) > u'(c_1^*)$ and $v'(T_2^*) < v'(T_1^*)$ violating the first order conditions. $\qquad\square$

Using implicit differentiation to identify $\frac{dT^*}{dy}$ yields:

$$\frac{dT^*}{dy} = -\frac{F_y(T^*;y)}{F_{T^*}(T^*;y)}$$
$$= -\frac{[-ds'u'(c^*) - s(1 - s'T^*)u''(c^*)]}{s^2 u'' + \frac{1}{N}v''\left(\frac{T^*}{N}\right)}$$

The denominator of this expression is negative since both $u''(\cdot)$ and $v''(\cdot)$ are strictly negative and $s > 0$. Then the sign of this derivative is determined by the sign of the numerator and $\frac{dT^*}{dy} \geq 0$ if and only if:

$$-[-s'u'(c^*) - s(1 - s'T^*)u''(c^*)] \leq 0$$

Denoting the coefficient of absolute risk aversion as r_A and the coefficient of relative risk

aversion as r_R, then the optimal tax rate will be increasing if:

$$s'u'(c^*) + s(1 - s'T^*)u''(c^*) \leq 0$$

$$s(1 - s'T^*) \geq \frac{-s'u'(c^*)}{u''(c^*)}$$

$$s(1 - s'T^*) \geq \frac{s'}{R_A(c^*)}$$

$$s(1 - s'T^*) \geq \frac{c^* s'}{(c^*)R_A(c^*)}$$

$$s(1 - s'T^*) \geq \frac{c^* s'}{R_R(c^*)}$$

$$R_R(c^*) \geq \frac{c^* s'}{s(1 - s'T^*)}$$

$$R_R(c^*) \geq \frac{(y - sT^*)s'}{s(1 - s'T^*)}$$

$$R_R(c^*) \geq \frac{ys' - s}{s(1 - s'T^*)} + 1$$

$$R_R(c^*) \geq \left(\frac{ys'}{s} - 1\right)(1 - s'T^*) + 1$$

$$R_R(c^*) \geq \frac{(\epsilon(y) - 1)}{(1 - s'T^*)} + 1 \tag{4}$$

Note that in this sequence we rely on lemma 1 to show that $s(1 - s'T^*) > 0$.

Inequality 4 establishes the conditions under which the optimal tax rate will be increasing in individual income. To complete the proof I proceed in two steps. First I show that there is at least one income y_1 where the inequality holds strictly (the optimal tax rate is rising in income) and some point $y_2 > y_1$ where the inequality strictly fails to hold. In the second step, I then show that there is no point $y_3 > y_2$ where the tax rate is again increasing in income.

Now, consider any income $\hat{y}$ such that $\epsilon(\hat{y}) > 1$ (i.e. the tax system is progressive). Then the right hand side of (4) is greater than 1, since $(1 - s'T^*) > 0$ by Lemma 1. By assumption there exists $\hat{c}$ such that $R_R(\hat{c}) < 1$. An individual with income $\hat{y} = \hat{c} + \hat{G}$ will consume at

least $\hat{c}$ and so will have relative risk aversion less than one, and so inequality (4) will strictly fail to hold.

I now show there is $\underline{y}$ such that (4) is strictly satisfied. By assumption 2 there exists y such that $R_R(c^*(y)) > 1$ and so it is sufficient to show that for low enough y the right hand side of (4) is less than or equal to 1.

First, consider the case where the tax schedule is at some point regressive. Then the right hand side of 4 is always less than one. Now consider the case where the $\epsilon(y) \geq 1$ $\forall y$. It is sufficient to show that:

$$\lim_{y \to 0} \frac{ys'}{s} = 1 \tag{5}$$

since $(1 - s'T)$ is bounded above by our assumption on s' and the fact that $T^*(y) < \hat{G}$ $\forall y$. As such, if (5) holds then the right hand side of (4) will tend to 1 as $y \to 0$.

We can write 5 as follows

$$\lim_{y \to 0} \frac{f(y)}{g(y)} \left(\frac{f'(y)}{g'(y)} \right)^{-1}$$

If we can apply L'Hopital's rule then $\frac{f(y)}{g(y)} = \left(\frac{f'(y)}{g'(y)} \right)$ and we are done. To apply this rule, three conditions need to be met i) $\lim_{y \to 0} y = 0$ ii) $\lim_{y \to 0} s(y) = 0$ and iii) $s'(y) > 0$ if $y > 0$. The first condition is trivial. To see the second, suppose otherwise that $\exists L$ such that $lim_{y \to 0} s(y) = L > 0$. Then $\lim_{y \to 0} \epsilon(y) < 1$ and the tax system is regressive at some point. Similarly for the third condition, consider that $s'(y) = 0$. Then $\epsilon(y) = 0$ and the tax system is regressive.

So far I have shown that there is some point at which the optimal tax function is increasing and a point with higher income at which it is decreasing. However, to complete the proof I must show that T^* cannot not again increase after it has begun to fall. Since T^* is continuous, it is sufficient to show there is not a point $y_3 > y_2$ such that $\frac{dT^*(y_3)}{dy} = 0$.

Suppose otherwise that such a point (or points) exists and consider the lowest such point.

Define the following function:

$$h(y) = R_R(c^*(y)) - \frac{(\epsilon(y) - 1)}{(1 - s'T^*(y))} - 1 \tag{6}$$

Then $h(y_2) < 0$, $h(y_3) = 0$ and $h'(y_3) \geq 0$. Differentiating:

$$h'(y) = \frac{R'_R(c^*(y))}{dy} - \frac{\epsilon'(y)}{(1 - s'T^*(y))} + \frac{\epsilon(y)(-s'\frac{dT^*}{dy} - s''T^*)}{(1 - s'T^*)^2} \tag{7}$$

By assumption, $R'_R(c^*(y)) < 0$, $\epsilon'(y) > 0$ and $s'' > 0$. But then if $\frac{dT^*}{dy} = 0$ then $h'(y_3) < 0$ and we have a contradiction. This completes the proof. $\square$

B   Data

The majority of the data used in the paper are drawn from reports to Parliament downloaded from the House of Commons Parliamentary Papers Database[36]. A full list of the reports used is available upon request. Other sources are discussed below.

B.1   The sample

The main sample includes only Municipal Boroughs that were both incorporated (i.e. had councils elected under the system described here) and had control of sanitary expenditure in 1867 (i.e. the start of the study period). This does not include London, which was governed separately. A total of 214 towns had been incorporated by 1867; however only 154 had control of sanitary expenditure prior to this date. These towns are identified using a House of Commons paper (House of Commons, 1872b). Specifically, town councils are identified as having had control of expenditure if they are specified to either "have become urban sanitary authorities in place of Local Boards under The Local Government Act 1858"

---

[36]See http://parlipapers.chadwyck.co.uk/

(category 2 in the report) or to have "acted as sanitary authorities under Local Acts before the date of The Public Health Act 1872" (category 3). For each year, observations are then included if either the town reported sanitary information (as either a Local Board or Improvement Commission prior to 1872) or if b) the town is included in category 3 and never reported separate sanitary accounts—indicating that the accounts were consolidated (this is also supported by hand-checking the original data sources).

In addition, four towns are excluded due to specific data issues:

- Folkestone: The town council is stated as having control of sanitary expenditure, however the post 1872 reports of sanitary expenditure are not controlled by the Town Council

- Hastings: The population of the sanitary authority jumped considerably at some point in 1860s, leading to potential downward bias in the level of per capita expenditure pre-reform.

- Shaftesbury, Cardigan and Congleton: values of the franchise are very high (over 90%).

The total population in the included towns in the 1881 census was 6,875,689, comprising 92% of the total population in the 214 towns of 7,446,209. The sample includes 35 of 41 towns with an 1881 population above 50,000 and all towns with an 1881 population above 100,000.[37]

B.2 Financial data

Information is collected from the annual financial accounts reported to Parliament and collated in the *Local Taxation Returns* contained in the Parliamentary Papers collection.[38]

---

[37]These figures include West Ham and Croydon, which are suburbs of London. The six large towns that were not included are Birkenhead, Bury, Huddersfield, St. Helens, West Bromwich (all incorporated after 1867) and Walsall (where the town council did not control sanitary authority at the start of the period).

[38]A full list of the papers used is available from the author upon request.

These accounts contain detail on the sources of revenue and types of expenditure in each town annually. Each town reported separately as both a municipal borough and as a sanitary authority (as a local board, improvement commission or urban sanitary authority): these accounts are aggregated together. This information is used to construct an annual panel dataset between 1867 and 1910.[39] Financial values are then translated into current prices using the Rousseaux Price Index (Mitchell, 1971, pp. 723–4) following Millward and Sheard (1995).

Defining ongoing public goods expenditure

Prior to 1884 the financial data does not distinguish between one-off and ongoing expenditure items: as such the accounts include a number of very high expenditures, reflecting investment activities. To separate ongoing expenditure from investment expenditure for different types of public good, I first identify "investment periods" by analyzing deviations in trend expenditure in each of the following categories "sewerage and sewer systems", "water supply", "highways, watering and scavenging", and "other public works".

The first three of these categories are defined separately in the financial reports (albeit with some changes over time in the name). However, from 1890 onwards some towns (those that were not made County Boroughs) began to receive much higher transfer funding for spending on roads from their County Council. As such, I adjust expenditure on "highways, watering and scavenging" to remove the amount received from this source. To do so, I separate between revenue from County Councils from the "Exchequer Account" and "Other", since it was the latter that was predominantly consisting of payments for main roads. The "other public works" series is the aggregate of (loan and nonloan) expenditure on "other public works", "markets", "lighting", "lighting and sewers", "electric lighting", "tramways" "municipal buildings", "bridges", "housing", "asylums", "libraries", "burial", "baths", "hospitals", and "other". In non-investment periods, the level of ongoing expenditure is simply

---

[39]Comprehensive data is not available prior to 1867.

the per capita expenditure in that period. In investment periods, the level of ongoing expenditure is the level of expenditure in the next non-investment period. For instance, if 1873 and 1874 were investment periods, but 1875 was not, then the level of expenditure in 1873 and 1874 is set equal to that in 1875.

For the period following 1871, a year is identified as the beginning of an investment period for each good if:

1. Expenditure per capita exceeds the median percentile of expenditure per capita (across all towns and years) in the relevant category; and:

    - the town started expenditure on the relevant good in that period (the spending in the previous period was 0); or

    - there is a 100% year-on-year growth in expenditure on the good, and the expenditure p.c. exceeds the median future per capita spending for the town; or

    - the two previous years of data are missing, and the expenditure p.c. exceeds the median future per capita spending for the town; or

    - the level of expenditure p.c. is higher than the previous year and twice the median future per capita spending for the town.

The years following the start of an investment period are identified as investment periods if either:

1. expenditure p.c. is greater than the previous period; or

2. the expenditure p.c. exceeds the median future per capita spending for the town; and either:

    - the expenditure is twice the town's average expenditure over the period; or

- the level of expenditure exceeds the median percentile of expenditure per capita (across all towns and years) in the relevant category.

Between 1867 and 1871, public goods expenditure is not disaggregated in the financial reports, and so I cannot use the process above. Instead, investment periods are identified as being twice the level of ongoing expenditure in 1872, and the above process is then applied to total public goods expenditure in those towns.[40]

Definition of dependent variables used in regressions

Tax receipts: Aggregation of all different "rates" collected by towns as municipality and sanitary authority.

Sanitary public goods expenditure: Sum of ongoing expenditure per capita on "sewerage and sewer systems", "water supply", "highways, watering and scavenging". See previous subsection for details of construction of series.

All public goods expenditure: After 1872, sum of "sanitary public goods expenditure" and ongoing expenditure on "other public works" series (see previous subsection for details). Prior to 1872, total of expenditure on "public works" and on sewerage and lighting.

Tax base per capita

Information on the value of the tax base (the "rateable value" of the district) is reported annually in the *Local Taxation Returns* from 1872 onward, with the exception of 1883. For many years, the tax base is reported separately for the town as a sanitary district, and as a municipal borough. Before 1872 information regarding the annual value of the tax base was not reported alongside the financial accounts. However, there is some data available regarding the size of the tax base in 1867 and 1870—however, this relates only to the sanitary districts and not the municipal boroughs. I use this information to construct an annual time series by i) using the *maximum* reported tax base by a town in each year and ii) linearly interpolating

---

[40]For a small number of towns the first period that disaggregated data was available is later than than 1872: in this case investment periods are defined relative to the first period data is available.

values for missing years.

B.3   Electoral data

Information as to the number of electors was collected from returns to Parliament supplemented by information for 1879 reported in Vine (1879). Information for the total number of electors in each town was collected for years 1850, 1852, 1854, 1852–1866, 1869, 1871, 1873, 1879, 1883, 1885 and 1897. Information broken down by gender was collected for 1871, 1885, and 1897. Values relating to the number of electors in Shaftesbury (for all years), Carlisle (1854) and Buckingham (1866, 1869, and 1873) were excluded, since there were clear discrepancies in the returns (for instance, where the number of parliamentary electors was reported rather than the number of municipal electors).

The time series for total number of electors was estimated as follows. First, the franchise is calculated as a percentage of the total population, using the series relating to the number of electors above. The missing years are then interpolated using a constant compound growth rate—with the exception of the years 1867 and 1868 which are replaced with the 1866 value, since reforms in 1869 led to a large jump in the level of the franchise. Missing values for 1864 and 1865 are replaced with the value from 1866. A compound growth rate is used in order to match the assumption made on the growth of population between dicennial censuses. Linear interpolation between periods could bias the results toward finding a downward relationship between a high level of the franchise and spending since it leads to higher estimated values of the franchise in later periods while, at the same time, the estimated population is also higher

To estimate the male / female franchise used in the main specifications, I first estimate the proportion of male electors in 1871, 1885, and 1897. This series is then interpolated at a constant growth rate for the intervening years. (In general this proportion did not tend to change substantially between periods). Multiplying these two series provides an estimate of

74

the number of male and female electors in each year. The franchise measure is then estimated using the estimated adult male population discussed in the following two subsections.

The key franchise variable used in the paper is calculated using an adjustment factor relating to proportion of males and females that were of voting age (21 and 30 respectively). The main measure uses individual-level census data obtained from the North Atlantic Population Project (Minnesota Population Center, 2008; Schürer and Woollard, 2003). The individual-level data is aggregated to identify the age distribution of voters at the level of administrative sub-districts.[41] Each town was then matched to the relevant sub-districts using the 1881 census: often each municipal borough was spread across several of these sub-districts (the boundaries did not, unfortunately, overlap directly). To estimate the town-level age distribution I then average across the different sub-districts, weighted by the proportion of 1881 population in each of the sub-districts (which is also identified in the 1881 census).

While this measure should accurately account for variation in the age distribution across towns, one potential concern is the use of a constant adjustment factor for every year. To check whether this is an issue, I compare the estimated proportion to data from the period 1861–1870 collected from the decennial reports of the Registrar General. Unfortunately, this data is only available at the level of the registration district rather than sub-district, and so can be matched to towns less precisely.[42]

The left hand panel of Figure A.VI compares the estimated percentage of the male population over 20 using the two measures in large (over 20,000 population) towns—which correspond most closely to registration districts and hence are more comparable over time. The right hand panel compares the estimated franchise in 1881 using the two measures. The resulting comparison shows a very high degree of correlation over time in the town age distribution, providing confidence that our use of a constant adjustment factor is appropriate.

---

[41]More precisely, these are the registration sub-districts used by the Registrar General.

[42]Smaller boroughs were often only a small part of a registration district. As such this measure combines urban and rural areas.

Further, the results are robust to these different measures of the franchise.

B.4 Census data

Characteristics of urban areas, including population and number of houses, were gathered from a series of census reports between 1861 and 1901, and the parish-level

tatistics for the 1911 census gathered by Southall et al. (2004). Between censuses the population is interpolated at a constant annual growth rate. In several cases, however, towns underwent boundary changes between census years. To adjust for this, I have identified the towns that underwent boundary changes using the census and the year of the boundary changes using both the census reports themselves and the annual reports of the Local Government Board. The population series is adjusted to the revised population (provided in the census reports) at this date and binned into six categories: less than 10,000 citizens, 10,000-25,000, 25,000-50000, 50,000-100,000, 100,000-250,000 and more than 250,000 citizens.

In addition, I use the 100% sample of the 1881 census (discussed above) to estimate the percentage of males that were heads of household in 1881. I also identify "farming towns" as those with more than 10% of the population living in households engaged with agriculture (either as a farmer or laborer), and "textiles towns" as those with more than 5% of the work force in textiles.

B.5 Descriptive statistics

Table G displays summary statistics for the main variables used in the regressions. Figure A.VIII displays the changing distribution of the public goods expenditure per capita.

C   Analysis of variation in the franchise

C.1   Before the 1869 reforms

Table A.VI analyzes the relationship between the system of indirect tax paying ("compounding") in towns and the extent of the franchise before the 1869 reforms.[43]

Columns 1 to 4 use the level of the male franchise in 1866 as the dependent variable. Columns 1 and 2 show that a higher franchise was associated with a higher proportion of "compounders"—renters paying their taxes through their landlord—in the municipal electorate. Similarly, columns 3 and 4 show that the franchise was higher where a higher proportion of the town's population was under the auspices of the Small Tenements Rating Act (STRA). As discussed previously, if a parish opted into the STRA, the local overseers could collect taxes for poor renters through their landlord and those renters would have the municipal vote.

Building on this analysis, columns 5 and 6 indicate show how one effect of the 1869 reforms was to remove this variation. The dependent variable in these regressions is the *change* in the franchise between 1866 and 1873. The change was smaller where more of the population were covered by the STRA prior to the election, supporting the argument that the reforms increased the electorate through enfranchising these poor renters.

As an alternative way to test whether the 1869 reforms were associated with the poor gaining the vote, I analyze the composition of the electorate before and after the reforms. Unfortunately we do not have information directly on the composition of the electorate. However, we can glean some insight by comparing the representation of Parliamentary voters in the electorate before the election.

The right to vote in parliamentary elections is an indicator that a citizen was relatively

---

[43]This analysis uses data reported in House of Commons (1866, 1867). These papers include data on the approximately 150 municipal boroughs which had boundaries coextensive with parliamentary constituencies in 1866.

wealthy since (unlike the municipal franchise) most citizens could only vote in parliamentary elections if they occupied a property of at least £10 annual rental value. In 1866 this requirement excluded, on average, around two-thirds of citizens. If extensions of the municipal franchise increased the representation of relatively poor citizens, then the rich would be more over-represented the smaller the franchise. I then measure the over-representation of the wealthy through comparing the percentage of parliamentary voters in the municipal electorate to the percentage of parliamentary voters in the entire population. Specifically, I measure over-representation as follows:

$$\text{Over-representation} = \frac{\text{\% Parliamentary electors in municipal electorate}}{\text{\% Parliamentary electors in population}} \tag{8}$$

where "population" refers to the number of male occupiers in the town—that is the potential electorate under the male household franchise. If the electorate were entirely representative, the measure would equal one. If the wealthy were over-represented, on the other hand, then the number will be greater than one.

In 1866 there was a clear negative relationship between the extent of over-representation and the extent of the municipal franchise, as shown in the left hand panel of Figure A.VII, This relationship indicates that the electorate was more representative of relatively poor citizens when the franchise was higher. After the reforms of 1869, however, the downward-sloping relationship had disappeared—in 1876 there is no relationship between the extent of the franchise and the make-up of the pre-reform electorate. Further, the largest increases in the franchise occurred in those towns where the parliamentary electors were most over-represented, providing further evidence that the effects of the reforms was to extend the vote to poorer citizens.

C.2 Major legislation affecting the municipal franchise

1835 Municipal Corporation Act: Established the structure of municipal councils in 178 towns with historic charters, with unincorporated towns allowed to petition for incorporation at a later date. Under the terms of this Act, councils were chosen under a system of annual elections (with one third of councilors replaced each year) by an electorate consisting of all male householders subject to residence and tax-paying requirements. Prior to 1835 female householders were able to vote in some towns, but were disenfranchised by the Act. In order to vote citizens had to have resided in the relevant municipal borough for three years and paid local property taxes (the "rates") for 2.5 years prior to the election. This included a stipulation that individuals were ineligible to vote if they had received poor relief in the twelve months prior to an election. Precisely, they had to have occupied a property (e.g., a house or shop) in the town and lived within seven miles of the borough.

1850 Small Tenements Rating Act: This Act gave local authorities the ability to collect taxes directly from landlords for poorer tenants, on the condition that the tenants were granted the municipal franchise. This practice was known as "compounding", with the tenants whose taxes were collected in this way known as "compounders". In particular, the Act applied to those in tenements of annual rental value of 6 pounds or under. This decision was not taken by the municipal council, but by the local vestry, who held responsibility for tax collection.

1869 Assessed Rates Act: This Act enshrined the right of compounders to vote.

1869 Municipal Franchise Act: This Act reduced the period of residency from three years to one—and the length of tax-paying required from two and half years to six months. The Act also enfranchised female householders aged 30 or older.

1869 Municipal Franchise Act: This Act reduced the period of residency from three years to one—and the length of tax-paying required from two and half years to six months. The Act also enfranchised female householders aged 30 or older.

1878 Parliamentary and Municipal Registration Act: This Act clarified the registration rules for both Parliamentary and Municipal elections. Of particular relevance to this paper, this including further clarification that all "compounders" (see above) had the right to vote.

1882 Municipal Corporations Act: Consolidating Act bringing together several previous small amendments to the 1835 Municipal Corporations Act. In addition, it allowed that "every person qualified to elect councillors was also qualified to be elected" (Keith-Lucas, 1952, p.167).

1888 County Electors Act: Allowed for occupiers of vacant land over 10 pounds to be granted the right to vote, as long as they paid assessed taxes and had resided in the borough for six months prior to the election.

D   Additional specifications and robustness tests

Figure A.V displays the magnitude of the effects presented in Table II.

Table A.IX presents the results of the panel regressions including polynomials in the franchise of up to level six.

Table A.X includes additional control variables in the main specifications. Specifications (1) and (7) include both the current value of the franchise, and franchise lagged three periods as in the main regressions. Once the lagged terms are included the current franchise terms are generally statistically insignificant, reassuring us both that effect is causal, and that the lagged franchise is the correct approach. Specifications (2), (3), (8) and (9) include lagged values of the respective dependent variables as an additional measure to counter potential serial correlation. Specifications (4) and (9) control for additional complex time trends related to the level of urban crowding in 1871, while (5) and (10) do similarly for the 1871 population growth.

Table A.XI checks the robustness of the results to varying the sample of towns included in the regression. This includes including outliers of the franchise ((1) and (6)), including municipal boroughs without sanitary authority ((2) and (7)), removing towns with boundary changes ((3) and (8)), only including towns with observations in each period ((4) and (9)) and limiting the sample to three periods around the 1868 reforms ((5) and (10)).

Table A.XII contains additional checks that the results are not driven by observations with particular characteristics. Specification (1) and (7) excludes towns not incorporated in 1835. The remaining specifications remove observations in the bottom or top 10% of the sample for various observable characteristics.

E Poverty and expenditure amongst the urban populace 1860-1900

How poor were the poor during this period? Answering this question is complicated, since it relies on understanding not only average incomes—a challenging enough task—but also the income distribution. Further, the extent of living standards will depend also on the composition of households since many living costs, such as rent or fuel, are a fixed cost for the household. These are significant challenges, and I do not aim to address them fully in this article. However, I can use existing data to make some crude generalizations that provide some insight into the composition of the urban electorates that are the focus of this study. I undertake this task in two steps. First, I use Rowntree's well-known 1901 survey of York to identify the financial constraints faced by households at different levels of income—i.e., how much income was needed to escape poverty? This survey provides very basic estimates of the poverty line, which I then "back-cast" to estimate the proportion of the population living in different levels of poverty in earlier years.

This analysis provides very crude estimates of the proportion of the population in poverty, but it does not provides any detail as to what the poor spent their income or, how this changed as they became richer. This is important for our analysis since it is these trade-offs that the poor faced when voting for or against taxes. To address this issue I analyze budget data collected by the United States Commissioner of Labor to estimate income elasticities of demand for different categories of expenditure.

E.1 The extent of poverty

To identify the level of income associated with poverty, I use Rowntree (1901)'s detailed 1901 survey of York households. This survey estimates the income of all households in the city of

York in 1899.[44] Based on qualitative reports of investigators, Rowntree estimates that 28% of the entire population of the city were in living in poverty—defined as displaying existence of "obvious want or squalor"—at this time (p117). Approximately 10-13% of the population were estimated as living at a level of poverty below "the minimum expenditure necessary for the maintenance of physical efficiency", with the remainder explained as being poor due to "improvident expenditure" (particularly alcohol).[45]

Rowntree's analysis suggests that individuals earning below 18 shillings per week were living in "chronic want", and those living at an income between 18 and 21 shillings per week were living hand to mouth, with any extraordinary expenditure requiring cutting back on food. These calculations are based on detailed calculations based on household size, adjusting for the fact that poverty depends on both total income and the composition of the household—including both household size and the number of children in the household.[46]

Ideally I would use this detailed analysis of the composition of households when assessing the overall distribution of poverty over time. Unfortunately, Rowntree does not explain exactly how his level of "primary poverty" is distributed across household income groups. As such, I make the simple assumption that the 10% (28%) of population he classifies as being in primary (secondary) poverty relate to the lowest income households unadjusted for household size or composition.

Using this assumption, I estimate the proportion of households in poverty by using Rowntree's income categories. In particular I use the following three categories:

- 20 shillings per week: corresponding approximately to the proportion in "primary

---

[44]This is one of the best known sources of information regarding the extent of poverty in the period. For further discussion of other sources see Gazeley and Newell (2007). There are some differences between the methods used to estimate poverty in these different sources, particularly over adjustments for household size. Given the crude estimates used here these differences are not likely to be very important.

[45]Gazeley and Newell (2000) re-analyze Rowntree's figures using a different adjustment for household size and argue that the correct figure is approximately 6%. However, this does not qualify the general conclusions relating to the number of households whose fluctuations in income led to changes in food consumption; or the total perception of the population living in poverty.

[46]See Gazeley and Newell (2000) for a detailed critique of Rowntree's methodology.

poverty";

- 25 shillings per week: Rowntree's identifies that moderate-sized families in this income category often lived in poverty; and

- 28 shillings per week: corresponding to the estimated income threshold beneath which households were in "secondary" poverty.

Specifically, the proportion of households within each category is calculated by adjusting the percentage of working class households into a percentage of population using a fixed ratio, and assuming that households were uniformly distributed within income categories. The former assumption implies that household size was fixed across groups. This is clearly inaccurate, but is difficult to adjust for accurately due to data constraints. However, using simple adjustments to take this into account led to similar results.

Having identified these thresholds, I "back-cast" the proportion of households beneath these thresholds in 1860 and 1880, using figures from MacKenzie (1921). MacKenzie provides estimates of the proportion average family income at the 10th, 25th, 50th, and 75th percentiles of the income distribution for the years 1860, 1880 and 1914; based on adjustments from figures of A.L. Bowley—a source often used by modern economic historians.[47] I adjust these figures into 1899 constant values using the wage series of Crafts and Mills (1994), and adjust for the proportion of agricultural laborers in the labor force (based on the original article). The resulting proportions are shown in the table below.

The first point of interest is that the figures from Rowntree correspond relatively closely to the figures from 1914.[48] This likely reflects the fact that first, there was relatively little real wage growth between 1899 and 1914 (the Crafts and Mills series estimates growth of

---

[47]Reflecting this fact, the average growth rates in the median income were close to the average growth rates in the Crafts and Mills (1994) wage series. This provides further reassurance that I am accurately capturing the growth in income.

[48]I have also estimated figures for 1899 directly by interpolating between 1880 and 1914, but the results were very similar to the 1914 figures, so for simplicity I use the MacKenzie figures.

around 3% over this period) and second that York was a relatively prosperous town (Gazeley and Newell, 2007). This comparability provides some confidence that MacKenzie's estimates are accurately capturing the income distribution of urban households.

The results suggest that a large proportion of households faced significant financial constraints during the period of study. In 1860—near the beginning of our period—almost 40% of urban households are estimated to have been living "hand to mouth". By 1880 the proportion of the population facing these constraints had fallen considerably; but between 40% and 56% of households nevertheless earned incomes that were associated with Rowntree's secondary poverty.

E.2 Spending of the poor

What did the poor spend their money on? Rowntree provides evidence that for the very poorest category rent was a major expense; accounting for almost 30% of income on average. This proportion fell dramatically as income increased however, accounting for 19% for those with income between 18 and 20 shillings per week, 17% for those between 20 and 25 shillings per week, and 16% for those earning between 25 and 30 shillings per week.[49] Further, he indicates that even the poorest paid rates (largely through their landlord), with the combined total of rents and rates accounting for approximately 20% of income.

Rowntree's evidence is less thorough, however, in estimating other types of expenditure—such as food—since he collected detailed budget data for just 18 households. Instead, I investigate the effect of changes in income on the composition of household expenditure using data from 1889 and 1890 surveys of the United States Commissioner of Labor (USCL).[50] These surveys provide detailed information on the income and expenditure of 1,024 British families headed by industrial workers. These families are not a representative sample since

---

[49]The corresponding figures for higher income households were: 31s-40s: 14%; 41-50s: 12%; 51-60s:12% and over 60s: 9%.

[50]The data were obtained from the IPCSR (Haines, 2006).

they were chosen on the basis of industry (including woolen and cotton textiles, pig iron, bar iron and steel making, coke and glass manufacture, and coal mining).[51] As a result, while the average incomes appear representative of their industries, the average earnings appear much higher than the population as a whole and are "not generally representative of the laboring poor" (Horrell and Oxley, 1999, p. 499). Nevertheless, the budgets can be used to estimate the changes in composition of income at least amongst this class of citizens. A further advantage of using the USCL data is that it allows me to adjust for household size allowing us to assess the poorest citizens more accurately. In particular, I identify the poverty line—the minimum level of income required to maintain physical efficiency—adjusted for the composition of the household, and then assess how close households are to that poverty line.

To identify the poverty line I use the estimated equivalence ratios calculated by Gazeley and Newell (2000). These estimates identify the minimum income needed for a childless couple, and then identify the multiple of that income needed to maintain a family with different numbers of children—up to families with 6 children. I exclude families with more than two adults or more than 6 children from the analysis, reducing the sample from 1,024 to 921 (all families had at least two adults).

The results for this analysis indicate that only 8 families in the sample fall beneath this poverty line, reflecting the bias in sample discussed above. As such I cannot identify the budgets of the very poorest individuals. However, I can identify groups of workers relatively close to this poverty line. In particular, I use three definitions of poverty: those with an income of 1.25 times the poverty line, 1.5 times the poverty line, and 2 times the poverty line. The 1.5 times group relates most closely to Rowntree's definition, taking household income of around 18-20 shillings as the definition of primary poverty and an income of around 25-30 shillings as the definition of secondary poverty.

I will shortly use the data to estimate income elasticities of demand for different expen-

---

[51]For more discussion of the representativeness of the sample, see Horrell and Oxley (1999).

diture categories. However, as a preliminary step Table 1 displays the raw share of income spent on different expenditure categories for these three groups. Note that the first group is relatively small (including only 50 households), meaning that we should be careful about drawing conclusions. In addition, the table also displays the proportion of households spending more than their income. A significant proportion of households were spending more than their income—almost 20% in the most generous poverty definition.

Food expenditure is split into "basic" and "non-basic" categories. Basic foods include butter, bread, condiments, flour, lard, potatoes, rice, tea and other foods. Non-basic foods include meat, poultry, pork, fish, fruit, vegetables, cheese, eggs, coffee, sugar, molasses and milk. We can see that the share of food in expenditure falls across the three categories, but the share of these non-basic foods increases slightly. A further point of interest is that even households in the poorest group spent money on both amusements (including reading), liquor and tobacco. At first glance one might think that this discretionary expenditure means that the household is not that poor. However, both contemporary and current evidence suggests that this kind of expenditure is common even amongst the very poorest. Rowntree (1901) argues that much of the secondary poverty he identifies is due to expenditure on alcohol— and that this is was itself an "outcome of the adverse conditions under which many of the working classes live" (p144). A recent modern study shows that those earning less than \$1 per day—the modern poverty line—frequently spend a significant proportion of their budget on alcohol, tobacco and festivals even at the expense of more calories (Banerjee and Duflo, 2007).

To understand the effect of increasing income more formally, I undertake a simple regression analysis. Using regressions allows us to use the variation in income within the broad categories discussed above, and also adjust for differences in household composition. Adjusting for the make-up of the household is important since the food needs of a household will depend on the number (and age of children) in the household, as well as the occupation of

household members. Those working in heavy industry, for instance, will have greater food requirements. Further, these variables will also be correlated with income per household member since how many individuals are working and the industry of employment will both affect the total income of the household.

I estimate the income elasticity of demand for this group on a number of expenditure items, using the following specification:

$$ln(e_i/N_i) = \beta_0 + \beta_1 ln(\text{income}_i/N_i) + \gamma X_i + \epsilon_i$$

where i indexes households and j indexes an expenditure category (e.g., food). The variable e_i thus identifies the spending of household i on category j. The variable *income* represents the total household income, and N_i is the total size of household i. Since both the independent and dependent variables are in logs, the coefficient β_1 in this specification represents the income elasticity of demand for the good j.

The vector X contains a number of characteristics of the composition of the household—the number of children split by age categories (0-4, 5-9, 10-15, and over 15), the number of working children, whether the wife works and eight dummy variables for industry of employment: pig iron, bar iron, steel, coal, coke, cottons, woolens, and glass.

In addition to calculating the income elasticities, I carry out a similar analysis to identify the effect of increased income on the probability of borrowing during the period. The probit specification I use is:

$$\text{borrow}_i = \beta_0 + \beta_1 ln(\text{income}_i/N_i) + \gamma X_i + \epsilon_i$$

Where $borrow_i$ is a binary variable taking the value 1 if a household spent more than their income, and zero otherwise.

The results of this analysis are displayed in Table 2. Each cell represents the estimate

of β_1 from the regression specification above, along with the estimated standard error. The first eight rows refer to the income elasticity specifications, where the dependent variable is log expenditure on each of the expenditure categories.[52]

The results indicate that in the poorest group additional expenditure led to large increases in the share of expenditure spent on higher quality food and on rent. Noticeably, the income elasticity of food as a whole is close to one—suggesting that these individuals may have been sufficiently poor that Engels' Law did not apply.

Expanding the sample to include wealthier households (column 2) shows a similar pattern, with high income associated with a shift towards non-basic food items. However, rent now appears to increase proportionally with income, as does clothing. Both leisure and the other category are now classed as luxury goods—the latter category is driven in large part by furniture spending. Once households with income per family member of up to two times the poverty line, the income elasticity of both rent and non-basic food falls significantly. However, there is now evidence that an increase in income is associated with a decrease in the probability that individuals are relying on debt to fuel their expenditure.

In summary, this analysis suggests that at very low levels of income, individuals used added income to increase their spending on rent and to switch to higher quality foods, including meat, vegetables and fruit. As income increased further, individuals continued to increase the share of their spending on quality food, but were also able to purchase more leisure goods, such as liquor and tobacco. As income increased even further, the share of expenditure on both rent and good declined, with income instead being directed further towards these more discretionary goods, and also a reduction in borrowing.

---

[52]There are fewer categories here than in the previous table. This is because I group some categories to overcome expenditures of zero on certain items.

F   Details of bootstrap procedure for semi-parametric confidence intervals

The confidence intervals presented in Figure II are estimated as follows:

1. Estimate fitted values $\hat{y}_{i,t}$ and residuals $\hat{\epsilon}_{i,t}$ using the procedure of Baltagi and Li (2002).

2. Randomly assign each cluster (i.e., a town) a weight d_i, where d_i has a $1/6$ probability of taking each value in: $\{-\sqrt{1.5}, -\sqrt{1}, -\sqrt{0.5}, \sqrt{0.5}, \sqrt{1}, \sqrt{1.5}\}$.

3. Construct disturbed residuals $\epsilon_{i,t}^{*} = \hat{\epsilon}_{i,t} + d_i$ and new dependent variable $y_{i,t}^{*} = \hat{y}_{i,t} + \epsilon_{i,t}^{*}$.

4. Re-estimate procedure of Baltagi and Li (2002) using the new dependent variable and compute fitted value for each point on a 31 point grid.

5. Construct a 90% percentile confidence interval using 999 replications.

G   Supplementary Tables

Table A.VI: Variation in the extent of the franchise due to indirect tax payment

	DV= 1866 Male Franchise				DV=Δ Male Franchise 1866-73	
	(1)	(2)	(3)	(4)	(5)	(6)
% electors compounding	0.19***	0.15***				
	(0.04)	(0.04)				
% popn under STRA			0.05*	0.06**	-0.07**	-0.07**
			(0.03)	(0.03)	(0.03)	(0.03)
Population		-1.17		-0.06		0.85
		(1.32)		(1.58)		(1.53)
Population growth		-0.37		-1.14		2.10
		(1.38)		(1.64)		(1.36)
Urban crowding		-4.12***		-4.93***		0.92
		(0.80)		(1.26)		(1.60)
Incorporated 1835		-2.05		-3.72		1.90
		(3.17)		(3.69)		(3.57)
Rateable value p.c.		-0.26		0.68		-1.36
		(1.44)		(0.76)		(1.33)
Textiles town		-0.85		3.18		0.61
		(2.42)		(2.99)		(2.96)
Farming town		1.31		1.91		-4.05
		(1.96)		(2.43)		(2.88)
1871 population density		-0.06		-0.06		0.03
		(0.07)		(0.10)		(0.12)
No. obs	151	150	96	95	92	91
R-sq	0.15	0.35	0.03	0.30	0.06	0.22

Robust standard errors in parentheses. The dependent variable in columns 1-4 is the level of the male franchise in 1866, and in columns 5 and 6 the dependent variable is the change in the male franchise between 1866 and 1873 (i.e, following the 1869 reforms). *% electors compounding* is the proportion of municipal electors reported to be paying their rent through their landlord in 1866. *% population under STRA* is the proportion of town population living in parishes where the Small Tenements Rating Act—which enabled compounding for those occupying houses valued under £6, and ensured affected renters were given the municipal vote— was in place. Information on the percentage of compounders and percentage of population under the STRA is drawn from House of Commons (1866, 1867), and is available for towns that were also Parliamentary Boroughs. Columns 3-6 include only towns where the Parliamentary and Municipal boundaries coincided to ensure accuracy of the % STRA measure.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.VII: Change in the franchise after 1866 is uncorrelated with other town characteristics.

	1873	1879	1885	1897
	(1)	(2)	(3)	(4)
DV=Franchise (% Adult male population)				
Tax base per capita	-1.29	-0.64	-0.80	-0.08
	(1.12)	(0.86)	(0.72)	(0.69)
Farming Town	-0.07	2.30	1.08	-0.67
	(2.34)	(2.52)	(2.69)	(2.35)
Textiles town	1.92	-0.28	-1.77	2.41
	(2.49)	(2.64)	(2.66)	(2.95)
1871 popn density	0.07	0.05	0.01	0.01
	(0.07)	(0.07)	(0.06)	(0.07)
Parliamentary Borough	-0.04	3.43	0.69	-0.65
	(2.68)	(3.39)	(3.36)	(3.01)
Num parishes	0.20	0.19	0.16	0.18
	(0.18)	(0.16)	(0.14)	(0.17)
No. obs	137	137	141	141
Population controls	Y	Y	Y	Y
Adj. R-sq	0.10	0.09	0.10	0.02
F-stat	0.81	0.68	0.65	0.33
F-test (p-val)	0.57	0.66	0.69	0.92

Dependent variable in each regression is the change in the franchise between 1866 and each year. Population controls include town population (in six bins), population growth, urban crowding, whether incorporated in 1835, and % males that were heads of household in 1881. Tax base per capita is measured in the final year of the change (1873, 1879 etc); number of parishes and population density are measured in 1871.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.VIII: Descriptive statistics of main variables included in regressions

Variable	Obs	Mean	Std. Dev.	Min	Max
Spending per capita (£p.c.)	4850	.56	.39	0	3.03
Tax receipts per capita (£p.c.)	4850	.57	.31	0	2.06
Franchise (%)	4850	55.78	11.53	20.66	80.18
Population (10,000s)	4850	4.84	8.02	.1	67.92
Population/number of houses	4850	5.19	.89	3.86	11.37
Population growth (%)	4850	.97	1.11	-2.29	7.61
Tax base per capita (£p.c.)	4312	4.06	1.36	1.11	9.69

Table A.IX: Linear and higher level polynomials in the franchise

	Tax receipts p.c.						Public goods spend p.c.					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Male franchise	-0.05	0.40***	0.32	0.27	2.20	26.25	0.02	0.58***	0.64	-0.02	2.27	38.30
	(0.03)	(0.12)	(0.51)	(1.75)	(6.15)	(20.94)	(0.04)	(0.15)	(0.57)	(2.14)	(8.23)	(30.20)
Male franchise^2		-0.05***	-0.03	-0.01	-0.88	-14.55		-0.06***	-0.07	0.15	-0.88	-21.36
		(0.01)	(0.11)	(0.57)	(2.70)	(11.67)		(0.01)	(0.11)	(0.67)	(3.53)	(16.42)
Male franchise^3			-0.00	-0.00	0.18	4.17			0.00	-0.03	0.19	6.16
			(0.01)	(0.08)	(0.57)	(3.36)			(0.01)	(0.09)	(0.73)	(4.61)
Male franchise^4				0.00	-0.02	-0.65				0.00	-0.02	-0.97
				(0.00)	(0.06)	(0.53)				(0.00)	(0.07)	(0.71)
Male franchise^5					0.00	0.05					0.00	0.08
					(0.00)	(0.04)					(0.00)	(0.06)
Male franchise^6						-0.00						-0.00
						(0.00)						(0.00)
No. obs	4850	4850	4850	4850	4850	4850	4850	4850	4850	4850	4850	4850
No. towns	150	150	150	150	150	150	150	150	150	150	150	150
Population controls	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Town FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Franchise coefficients represent the effect of a 10% increase in the franchise. Population controls include town population, urban crowding, decadal population growth, and female franchise. Standard errors are adjusted by clustering by district, and are displayed in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.X: Robustness to additional controls

	Tax receipts p.c.					Public goods spend p.c.				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Male franchise	0.09**	0.12***	0.11***	0.24*	0.27**	0.25***	0.17***	0.18***	0.53***	0.46***
	(0.04)	(0.04)	(0.04)	(0.13)	(0.13)	(0.07)	(0.06)	(0.06)	(0.15)	(0.16)
Male franchise sq	-0.01**	-0.01***	-0.01***	-0.03**	-0.03**	-0.02***	-0.02***	-0.02***	-0.05***	-0.04***
	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
Male franchise no lag	0.02					-0.05				
	(0.04)					(0.06)				
Male franchise sq no lag	-0.00					0.00				
	(0.00)					(0.01)				
Lag 1 tax p.c.		0.73***	0.59***							
		(0.02)	(0.02)							
Lag 2 tax p.c.			0.20***							
			(0.02)							
Lag 1 spend p.c.							0.68***	0.61***		
							(0.02)	(0.02)		
Lag 2 spend p.c.								0.11***		
								(0.02)		
1871 Crowd-time interaction	No	No	No	Yes	No	No	No	No	Yes	No
1871 Growth-time interaction	No	No	No	No	Yes	No	No	No	No	Yes
No. obs	4382	4690	4533	4850	4850	4382	4690	4533	4850	4850
No. towns	150	150	150	150	150	150	150	150	150	150
Population controls	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Town Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Franchise turning point (%)	46	43	44	39	42	53	49	52	52	52
F-test (p-val)	0.05	0.00	0.00	0.01	0.02	0.00	0.01	0.01	0.00	0.01
U-test (p-val)	0.02	0.01	0.01	0.08	0.05	0.00	0.01	0.00	0.00	0.00

Franchise coefficients represent the effect of a 10% increase in the franchise. Population controls include town population (in six bins), urban crowding, decadal population growth, and female franchise. Standard errors are adjusted by clustering by district, and are displayed in parentheses.
$*$ $p < 0.10$, $**$ $p < 0.05$, $***$ $p < 0.01$.

Table A.XI: Robustness to varying the group of towns included in the regression.

	Tax receipts p.c.					Public goods spend p.c.				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Include outliers	All MBs	No boundary change	Balanced panel	Balanced 3 periods	Include outliers	All MBs	No boundary change	Balanced panel	Balanced 3 periods
Male franchise	0.34***	0.33***	0.44***	0.40*	0.35**	0.51***	0.50***	0.48***	0.60**	0.55***
	(0.11)	(0.11)	(0.14)	(0.22)	(0.15)	(0.12)	(0.13)	(0.13)	(0.24)	(0.19)
Male franchise sq	-0.04***	-0.04***	-0.04***	-0.05**	-0.03**	-0.05***	-0.05***	-0.05***	-0.06***	-0.06***
	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)
No. obs	4904	6183	2722	2856	418	4904	6183	2722	2856	418
Population controls	150	207	84	84	145	150	207	84	84	145
Year Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Town Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
No.groups	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Franchise turning point (%)	43	43	49	39	52	51	50	51	49	49
F-test (p-val)	0.00	0.00	0.01	0.01	0.07	0.00	0.00	0.00	0.01	0.02
U-test (p-val)	0.00	0.01	0.00	0.08	0.03	0.00	0.00	0.00	0.01	0.01

"Include outliers" regression sample excludes observations with franchise in top or bottom 1% of franchise distribution. "All MBs" includes towns that did not have complete sanitary authority in 1867. "No boundary change" excludes all municipal boroughs undergoing boundary changes between 1871 and 1901, or with large (greater than 10% disparities) between municipal borough and urban sanitary authority population in 1871. "Balanced panel" includes only towns with observations available for all 34 periods. "3 periods" restricts the analysis only to years 1868, 1876 and 1882. Missing data in the samples is largely a result of i) Towns not reporting as sanitary authority in all years prior to 1872 (particularly 1867) ii) missing franchise data iii) Values of franchise in top or bottom 1% of distribution Franchise coefficients represent the effect of a 10% increase in the franchise. Population controls include town population (in six bins), urban crowding, decadal population growth, and female franchise. Standard errors are adjusted by clustering by district, and are displayed in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.XII: Robustness to excluding towns with extreme values of different characteristics

	Tax receipts p.c.						Public goods spend p.c.					
	(1) Inc. 1835	(2) Popula- tion	(3) Growth	(4) Crowd	(5) % house- holds	(6) Rate- able value	(7) Inc. 1835	(8) Popula- tion	(9) Growth	(10) Crowd	(11) % house- holds	(12) Rate- able value
Male franchise	0.36***	0.22*	0.36***	0.36**	0.36**	0.32**	0.57***	0.49***	0.44**	0.53***	0.55***	0.43**
	(0.13)	(0.13)	(0.14)	(0.14)	(0.15)	(0.14)	(0.15)	(0.15)	(0.19)	(0.18)	(0.18)	(0.17)
Male franchise sq	-0.04***	-0.03*	-0.04***	-0.04***	-0.04***	-0.04***	-0.05***	-0.05***	-0.04**	-0.05***	-0.05***	-0.04***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)
No. obs	3728	3880	3886	3880	3936	3915	3728	3880	3886	3880	3936	3915
No. towns	115	128	148	135	120	120	115	128	148	135	120	120
Population controls	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Town Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Franchise turning point (%)	46	44	43	42	44	42	52	53	54	55	51	50
F-test (p-val)	0.01	0.13	0.01	0.00	0.03	0.01	0.00	0.01	0.08	0.02	0.01	0.03
U-test (p-val)	0.01	0.07	0.01	0.02	0.01	0.03	0.00	0.00	0.03	0.01	0.00	0.01

Franchise coefficients represent the effect of a 10% increase in the franchise. Population controls include town population (in six bins), urban crowding, decadal population growth, and female franchise. Standard errors are adjusted by clustering by district, and are displayed in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.XIII: Estimated proportion of urban households in different income groups 1860-1900

% of households	1860	1880	1914	Rowntree (1901)
Income < 20s	39%	16%	5%	10%
Income < 25s	62%	40%	18%	19%
Income < 28s	76%	56%	27%	28%

Source: Income figures refer to weekly income, and are in real terms. Estimates based on author's calculations based on information from Rowntree (1901); MacKenzie (1921); Crafts and Mills (1994). See text for details of methodology.

Table A.XIV: Estimated income elasticities of demand by expenditure category for different income groups

	Income ≤ 1.25x poverty line	Income ≤ 1.5x poverty line	Income ≤ 2x poverty line
Income elasticity			
Food-basics	-0.27	0.39*	0.46***
	(0.54)	(0.20)	(0.08)
Food-non-basics	1.77***	1.31***	1.03***
	(0.42)	(0.17)	(0.07)
Food-total	0.87***	0.87***	0.76***
	(0.27)	(0.11)	(0.05)
Rent	1.99***	1.04***	0.58***
	(0.45)	(0.21)	(0.08)
Clothing	0.50	1.14***	0.87***
	(0.62)	(0.26)	(0.11)
Lighting / fuel	0.53	0.40*	0.08
	(0.97)	(0.22)	(0.09)
Leisure	0.91	1.70**	1.21***
	(2.32)	(0.64)	(0.29)
Other	2.18	1.88***	1.75***
	(1.33)	(0.52)	(0.22)
Change in probability of borrowing	1.73**	-0.19	-0.25***
	(0.92)	(0.30)	(0.11)
N	50	163	431

Robust standard errors in parentheses. Income elasticities based on regressions of log expenditure on log income per household member, with control variables of: number of children in age categories 0 to 4; 5 to 9; 10 to 15; and over 15, number of children working, whether wife working, and dummy variables for industries pig iron, bar iron, steel, coal, coke, cottons, woolens, and glass. "Change in probability of debt" represents the marginal effect of log income per household member on a binary variable identifying whether the household spent more than income, measured at the means of all control variables. Some regressions have fewer observations than the total in the group, due to zero expenditures on that category by some households.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.XV: Household budgets for different income groups

|	Income ≤ 1.25x poverty line	Income ≤ 1.5x poverty line	Income ≤ 2x poverty line
Share of income			
Food-basics	30%	27%	25%
Food-non-basics	23%	24%	25%
Food-total	53%	51%	50%
Rent	15%	14%	13%
Clothing	14%	15%	15%
Lighting / fuel	9%	8%	7%
Amusements / vacations	1%	2%	3%
Liquor and tobacco	4%	4%	4%
Other	6%	6%	7%
Savings	-1%	0%	2%
Proportion borrowing	34%	26%	19%
N	50	163	447

Basic foods include butter, bread, condiments, flour, lard, potatoes, rice, tea and other foods. Non-basic foods include meat, poultry, pork, fish, fruit, vegetables, cheese, eggs, coffee, sugar, molasses and milk. Clothing is the aggregate of clothing for husband, wife and children. Amusements / vacations includes reading expenditure. Other includes contributions to labor, religious, charitable and other organizations, taxes (except property taxes), property insurance, life insurance, sickness insurance, furniture and other expenditure.
Source: Author's calculations using data from 1889 and 1890 surveys of the USCL.

H   Supplementary Figures

Figure A.V: Franchise extensions had sizable effect on the level of taxation and expenditure per capita, measured as a percentage of the median between 1867 and 1900.
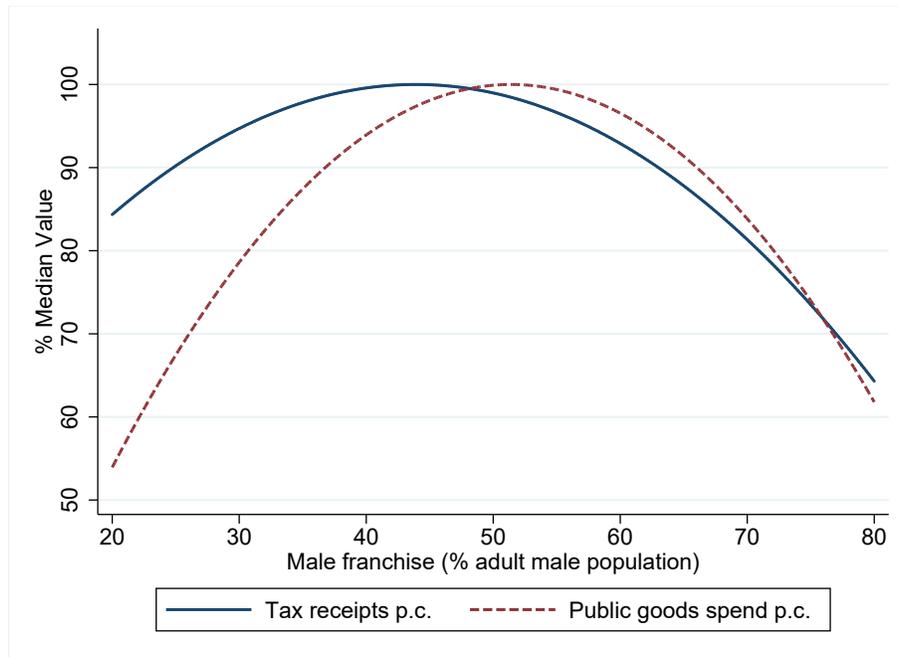

Note: Estimates based on results of specifications (2) and (5) in Table II.

Figure A.VI: High correlation in franchise variable using different age distribution measures
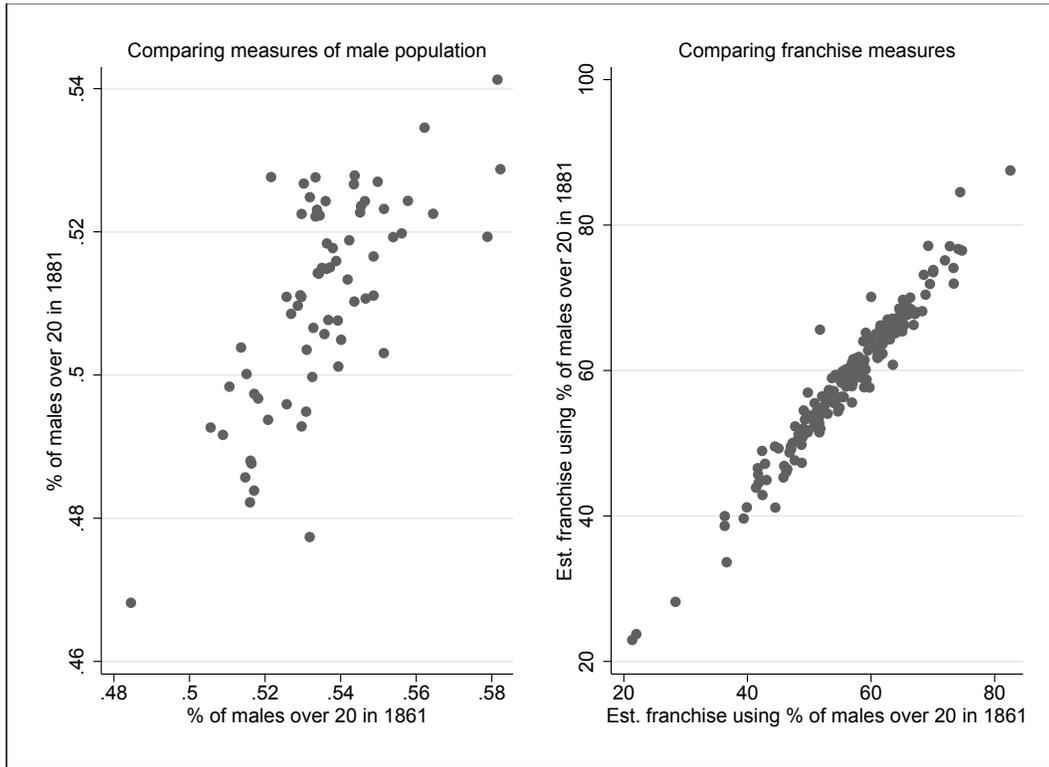
The left hand panel indicates the high correlation between two different measures of the male age distribution. The x-axis uses data at Registration District for the period 1861–1870, and the y-axis (used in the franchise measure) uses Registration Subdistrict data from the 1881 census. The right hand panel compares the estimated franchise using these two different measures. See Appendix B for details of sources.

Figure A.VII: Over-representation of wealthier citizens predicts extent of franchise before, but not after 1869 reforms.
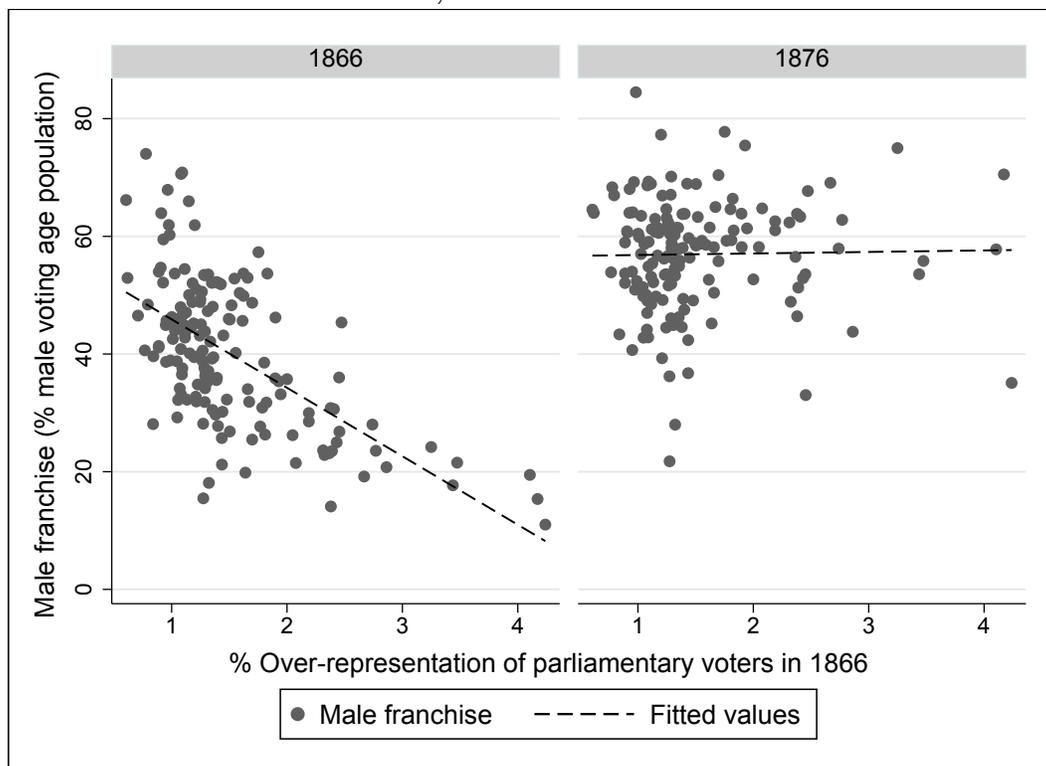
Over-representation of parliamentary voters denotes the extent to which citizens qualifying to vote in Parliament were over-represented in the municipal electorate (see Equation 8). After the 1869 reforms there is no evidence that these wealthier citizens were over-represented amongst the electorate. Source: Author's calculations using data from House of Commons (1866), and municipal franchise series (see Appendix B).

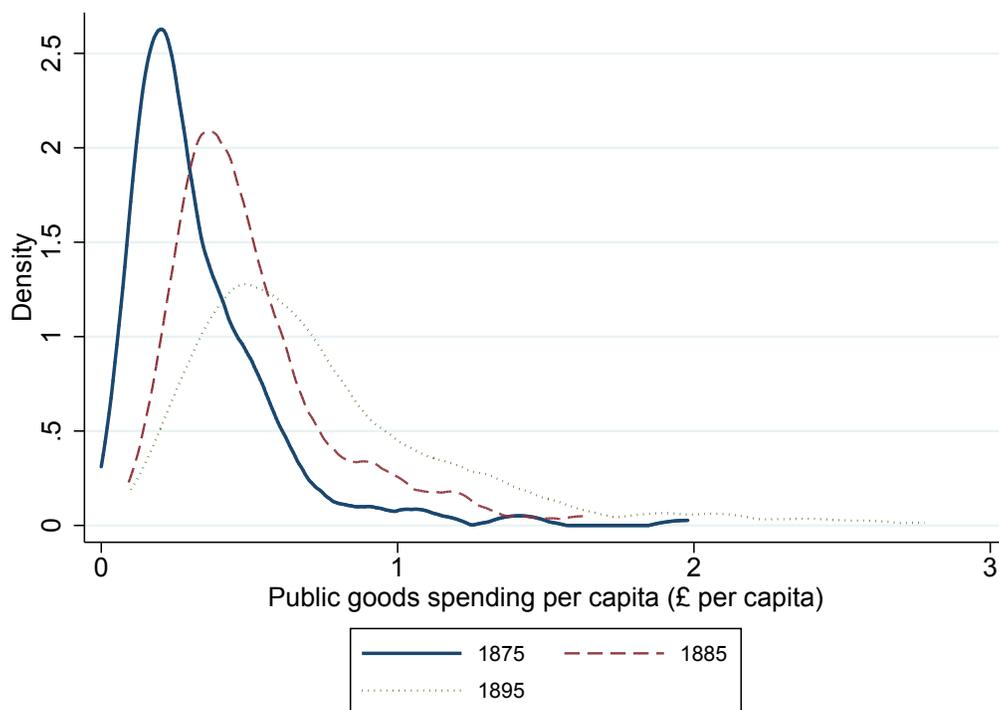**Figure A.VIII: Variation in level of public goods expenditure continued over time.**

Figure presents the distribution of the ongoing public goods expenditure per capita series at three cross-sections. There is clear growth in the level of expenditure over time, but there continued to be great variation across towns. See Appendix B for details of series construction.