Factory Location: Resistance to Technology Adoption and Local Institutions*

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Abstract

This paper studies technology adoption and factory location in England during the Industrial Revolution. First, we document a negative relationship between industrialization in the 19th century and pre-industrial economic activities. Second, we show that while local self-governing institutions developed in commercially prominent cities, these cities failed to adopt the new industrial technologies during the 19th century. We argue that while these institutions were complementary to early modern economic growth, they were detrimental to industrialization. We hypothesize that because local self-governance led to the development of representative institutions, these facilitated collective action and enabled workers threatened by labor mechanization to resist technology adoption. Higher resistance to technology adoption, in turn, resulted in the relocation of economic activities away from traditional centers of production. *JEL* Codes: D74, N33, O14, P16

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1 Introduction

Understanding spatial differences in economic growth is a key goal of economics. As part of this endeavor, a large body of literature studies the geographic persistence of economic activities and indicates institutions protecting property rights (Acemoglu et al., 2001) and facilitating collective action (Guiso et al., 2016; Dell et al., 2018) as fundamental causes of long-run growth. Instead, less is known about the determinants of reversals of fortunes. While significant contributions theorize about the rise and fall of economic activities (Olson, 1982; Mokyr, 1994; Acemoglu, 2008; Rubin, 2017; Galor, 2022), empirical evidence is scarce, and has not yet clarified what role institutions promoting early economic growth might play in these patterns. We propose that while the ability to perform collective action promotes early growth by increasing public goods provision, it can prevent industrial development by facilitating resistance to technology adoption. Such a dynamic might therefore lead to a reversal of fortunes whereby institutions determine the rise and fall of economic activities.

In this paper, we test this hypothesis in the context of the under-explored change in the geography of economic activities that occurred during the Industrial Revolution. Anecdotal evidence indicates that factories developed in entirely new urban centers such as Tilburg and Essen or previously minor towns such as Mulhouse, Liege, Manchester, and Birmingham. Instead, the old commercial cities failed to establish themselves as the leaders of the new industrial technology (Mokyr, 2009). Motivated by this observation, this paper studies the role of city-level self-governing institutions in this transformation. We hypothesize that local self-governance facilitated early economic growth. However, because local self-governance led to the development of representative institutions, these prevented factories' development by facilitating collective action and resistance to technology adoption.

First, we document a systematic negative relationship between the local level of economic activities during the pre-industrial period and the number of factories per capita in the nineteenth century. Second, we test the hypothesis that local self-governance promoted growth during the pre-industrial period but prevented factory development. We argue that local self-governance increased pre-industrial economic activities by allowing optimal taxation and facilitating collective action. However, the ability to perform collective action increased workers' organizational focus. Because during the early phase of industrialization, deskilling technologies put downward pressure on wages, workers resisted factories' development. For this reason, locations with more social and political capital more successfully resisted the new technology.

We begin our empirical analysis by relating the location of textile factories operating in 1838 from the British Parliamentary Papers (British Parliamentary Papers, 1839) to a measure of local wealth registered in 1334, at the end of the Commercial Revolution.[1] In that year the first national direct tax voted by English parliaments to the crown was levied (Hadwin, 1983).[2] The data shows a stark negative relationship between the level of economic activities during the pre-industrial period and the number of factories per capita. This negative relationship holds over time and for a variety of measures of pre-industrial development. We then ask whether local institutions can explain the observed pattern.

To address this question, we focus on a set of distinctive urban centers (*Boroughs*) whose institutional history can be traced back to the medieval period.[3] While since the Glorious Revolution, the British state progressively centralized taxation and the administration of justice, well into the nineteenth century a group of boroughs maintained a different level of autonomy and enjoyed the rights to send representatives to Parliament (Webb and Webb, 1908b; Chandler, 2013b). At the moment of the Municipal Reform Act in 1835, the Royal Commission listed 220 cities with autonomic rights, while, on the eve of the parliamentary reform in 1832, 203 cities in England had the right to elect members of Parliament.

Angelucci et al. (2022) uncovered that these institutional heterogeneities found their roots in the period of the Norman conquest (1066). In 1086 the land was censed and divided between the king and the lords. Cities belonging to the King (*royal boroughs*) paid ordinary tributes directly to the King, while cities subject to a lord (*non-royal borough*) paid ordinary tributes to the lord. As urban settlements grew in wealth and population, the expansion of taxable wealth determined incentives for the King to change the institutional structure of royal boroughs. The King started to auction off the right to collect taxes in his dominion, increasing the income derived on top of the fixed yearly tributes established by the first census conducted in 1086. As a response, "burgesses, generally, made efforts to acquire the right of farming their own boroughs" (Ballard, 1913, p. lxxvi). The acquisition of such rights came through the purchase of what was called a Charter of Liberties. On the contrary, in non-royal boroughs, given the proximity and small number of boroughs under the

[1]Factories are defined as production units whose machines were moved by steam engines or water wheels.

[2]This measure is based on local levels of wealth calculated from movable goods, mainly grain, and livestock and captures taxation of the surplus available and destined for markets (Jenks, 1998).

[3]Boroughs were urban centers recognized through an incorporation act. They differed from large towns because they could act in law, own property, sue and be sued, and provide collective services (Chandler, 2013a).

control of the local *Lord of the Manor*, lords rarely develop incentives to give up their right to directly collect taxes and appoint officials. By the onset of the fourteenth-century crisis, royal and non-royal boroughs had taken diverging institutional paths, eventually determining boroughs' inclusion in Parliament. During times of war, or in exceptional circumstances, the King had the authority to impose additional taxes, known as extraordinary taxation, in addition to the usual tributes. However, the difficulties in assessing wealth in those boroughs that acquired the rights to exclude the Crown's officials induced the King to summon to Parliament those boroughs (Angelucci et al., 2022).

Exploiting the comparability of royal and non-royal boroughs before the acquisition of autonomic rights, we study the effect of self-governance on economic growth through six centuries. We show that these diverging institutional paths between English cities provide an explanation for the reversal that occurred during the Industrial Revolution.

Fiscal autonomy by effectively determining a taxation system independent of the local income level, eliminated the distortionary nature of proportional taxation, increasing incentives for economic investments.[4] Moreover, the right to elect the administration and regulate trades within local cohorts increased the extent to which local merchants' and craftsmen's interests were represented, fostering a legal environment that was conducive to trade. This argument goes hand in hand with the classic idea that property rights protection incentivizes investments (Acemoglu et al., 2005). Finally, independent urban cities might foster technological innovation in the pre-industrial period (Mokyr, 1995). This might be the case because cities with more open institutions both facilitate the attraction and the creation of creative talent (Serafinelli and Tabellini, 2022). These key administrative differences are therefore consistent with higher income growth over time, the persistent presence of markets, and a larger share of artisans. Accordingly, royal boroughs should have set off on a steeper growth path since the Commercial Revolution, the period of multiplication of markets and fairs that characterized the 12^{th} and 13^{th} centuries (Britnell, 1996).

Conversely, we argue that urban autonomy negatively affected factory development. Since the late eighteenth century, the multiplication of labor-saving technologies and the rise of the factory system had disruptive consequences on the labor force. The lack of complementarity between traditional skills and the new technologies implied that workers faced the perspective of wage reduction and skill redundancy

[4]Once the burgesses acquired the right to farm their own borough, the level of taxation was fixed and independent on the level of local income.

(Olson, 1982; Mokyr, 1994; Mokyr, 1998). Therefore, urban communities where these groups were more successful in voicing their grievances, appealing to the authorities, and performing collective action were more likely to divert technology adoption.

We compare the economic performance of royal and non-royal boroughs over time. We find that royal boroughs had a higher level of economic activity in the pre-industrial period, were more likely to develop the *first generation* of factories (1769-1788) but had a lower number of factories in 1838. These results strongly indicate a change in the dynamic of factory locations between the 1760s and the 1830s.

To guarantee that the effect of local institutions on economic growth does not reflect alternative factors, we condition on the key variables discussed in the literature on textile factory location (Crafts and Wolf, 2014). We include population in 1801, access to trade (proximity to the coast, rivers, and roman roads), proximity to coal fields, soil quality, and restrict to within county comparison, a higher administrative geographic division than the borough.[5] Moreover, we show that unobservable characteristics that might affect selection into royal status and economic growth should have twice the explanatory power of our model to confound the results (Oster, 2019). We show that these results are robust to a large battery of sensitivity checks that address concerns about the model specification, the geographic level of analysis, and inference.

While the size of the unobservables should be implausibly large to explain the results, it is still possible that borough-level time-invariant characteristics affect the outcomes. To exclude this possibility, we construct a city-level panel from 1675 and 1831 featuring the share of the population employed in the textile sector (Keibek, 2017). This database not only allows us to control for borough-level time-invariant characteristics but also to establish the timing of the reversal.

We find that royal and non-royal boroughs did not differ in their share of workers in the textile sector until around the 1770s. However, between 1775 and 1831, we estimate a persistent decline in this measure in royal boroughs with respect to non-royal. The timing of this decline coincides with the invention of the critical technologies of the industry, such as the Arkwright's water frame in 1769 and the Crompton's mule which came into general use in the 1780s. These results suggest that in absence of institutional differences textile factories would have been equally distributed across royal and non-royal boroughs. Moreover, using data on steam engines adoption from Kanefsky and Robey (1980); Nuvolari et al. (2011); De Pleijt et al. (2020), we find that the difference in the pattern of adoption of steam engines between royal and

[5]Our sample consists of 41 English counties.

non-royal boroughs increased in the years coinciding with these innovations.

Our main results show that local self-governing institutions positively affected economic development in the pre-industrial period and on the location of the early factories, while diverting the adoption of technologies during the Industrial Revolution. What mechanisms explain these results?

We distinguish between three main hypotheses. First, the possibility that judicial and administrative independence still operating during the nineteenth century might affect technology adoption. This hypothesis reflects the idea that self-governing institutions tend to produce an oligarchic elite who over time might impose entry barriers limiting entrepreneurial activities and constraining growth (Mokyr, 1994; Acemoglu, 2008; Stasavage, 2014). Second, the possibility that economic differences alone could explain the lack of technology adoption. Because more developed cities had a higher proportion of economic losers (share of artisans and manufacturers), these differences alone might have determined a more diffused resistance to technology adoption, independent of institutional differences. Finally, we consider the hypothesis that results depend on both economic incentives and the level of social and political capital (Olson, 1982; Mokyr, 1992). Because self-governing cities promoted collective action and developed representative institutions (Parliamentary representation), previous experiences of political organization might have made it easier to successfully organize against machinery.

To test these different hypotheses, we use several pieces of information. First, we determine whether the city still enjoyed self-administrative rights on the eve of the Municipal Reform Act in 1835 from the Parliamentary Commission on Municipal Corporations. Second, we obtain information on political representation coding the cities' rights to elect members of Parliament and the extension of the local franchise. Finally, we determine the size of the potential losers using the share of handicrafts and artisans in 1831. Comparing these three variables and performing mediation analysis (Imai et al., 2010), we find that Parliamentary representation is the only explanatory variable that has a negative effect on factory development.

We hypothesize that parliamentary representation increased resistance to technology adoption by facilitating collective action. Historians of popular politics have highlighted the importance that parliamentary election, in particular in boroughs with broader political representation, had in providing a coordinating platform for popular collective action, fostering the development of "paraparliamentary" politics: political parties, citizens' associations, pressure groups, and social movement (Phillips, 1982; Morris, 1990; O'Gorman, 1992; Tilly, 1995). We produce two pieces of evidence in

support of this hypothesis.

First, we exploit the heterogeneity in the size of the electoral franchise across boroughs enjoying parliamentary representation. Consistent with our hypothesis, the analysis shows that large electorates (Sedgwick, 1970; Bogart, 2016) are less likely to develop factories than other enfranchised boroughs.

Second, we study the effect on two of the key strategies of collective action used to resist machines: petitions and riots. Resistance to technology adoption typically involved two phases. Initially, workers tried to appeal to the authorities and secure the application of labor regulations, and the intervention of Parliament in their favor.[6] When Parliament or the local magistrates refused to act, workers would resort to riots and machine braking (Randall, 1991; Mokyr, 1998; Berg, 1980). The importance and the extent of the resistance to technology adoption in these years are reflected by the decision of the British government to deploy 12,800 soldiers to repress the Luddites revolt in 1812 (Berg, 2005).

To obtain information on petitions, we digitize all the parliamentary petitions including the word "manufacture" from 1688 to 1834 from the *Journal of the House of Commons* and construct a borough-level measure of petitions. Moreover, we obtain information on riots between 1700 and 1829 by putting together several sources (Charlesworth et al., 1996; Bohstedt, 2010; Caprettini and Voth, 2020; Chambru and Maneuvrier-Hervieu, 2022). We find that royal boroughs had a higher number of petitions and riots relative to non-royal boroughs and that the magnitude is larger in larger franchises.

This paper makes several contributions to the literature. First, we provide a new stylized fact on the geography of the Industrial Revolution, showing a negative relationship between traditional economic development and technology adoption during the 19$^{\text{th}}$ century. This finding contributes to the literature on the regional variation within the English process of industrial development (Allen, 2009a; Crafts and Wolf, 2014; Kelly et al., 2014; De Pleijt et al., 2020; Heblich and Trew, 2019; Desmet et al., 2020; Heldring et al., 2021; Heblich et al., 2022; Voth et al., 2022; Mokyr et al., 2022) In particular our analysis provide granular level findings that are consistent with recent contributions on the mechanics of the Industrial Revolutions (Kelly et al., 2023). Moreover, this finding contributes to the extensive literature on persistence and relocation of economic activities throughout history. The literature has highlighted the role of non-geographic agglomeration (Krugman, 1991), location fun-

[6] Statute of Artificers 1562 regulated wages and apprentices and was repealed only in 1814 (Derry, 1931).

damentals (Davis and Weinstein, 2002; Maloney and Valencia Caicedo, 2016), history dependence (Michaels and Rauch, 2018), economic shocks (Hanlon, 2017) and the role of trade networks and connectivity in determining city location (Barjamovic et al., 2019; Bakker et al., 2021), and economic growth (Acemoglu et al., 2005; Redding and Sturm, 2008; Donaldson and Hornbeck, 2016; Pascali, 2017; Gibbons et al., 2018). Our results indicate the importance of local institutional factors and resistance to technology adoption in determining the relocation of economic activities.

Second, providing empirical evidence on the role of local institutions in explaining the reversal and distinguishing between different mechanisms, we contribute to the seminal works on the determinants of the rise and fall of economic activities (Olson, 1982; Mokyr, 1994; Acemoglu, 2008; Bosker et al., 2013; Stasavage, 2014; Rubin, 2017). By elucidating the importance of political representation in explaining resistance to technology adoption, our results connect the literature on the relationship between inclusive institutions and growth (North, 1973; Acemoglu et al., 2001; Acemoglu et al., 2002; North and Weingast, 1989; Mokyr, 2009; Acemoglu et al., 2019) with the literature on collective action, resistance to technological innovation and economic development (Mokyr, 1992; Tilly, 1995; Mokyr, 1998; Nuvolari, 2002; Acemoglu, 2008; Stasavage, 2014; Ogilvie, 2014 Aidt and Franck, 2015; Desmet and Parente, 2014; Caprettini and Voth, 2020).

Finally, we relate to the literature on the relationship between local institutions and social and political capital in the long run (Guiso et al., 2016; Dell et al., 2018; Angelucci et al., 2022; Serafinelli and Tabellini, 2022; Buonanno et al., 2019). While this literature has shown how self-governance and inclusive institutions foster "smithian" growth by affecting trust and cooperation, our results indicate that cooperation and trust might hinder "shumpeterian" growth when the transition to the new technology implies high costs for part of the stakeholders. Our results resonate with recent work on the positive interaction between the autocratic state and the technology frontier (Beraja et al., 2022, 2023) and with works on the potentially detrimental role of social capital (Satyanath et al., 2017).

The rest of the paper is structured as follows. Section 2 describes the historical context of textile factories development and local institutions in England. We describe the data used in Section 3. In Section 4 we include the evidence about the negative relationship between local pre-industrial and industrial growth. We show the role of local institutions in explaining this reversal pattern in Section 5. We study the mechanisms for the relationship between local institutions and factory location looking at the role of parliamentary representation and resistance to technology adoption

in Section 6. Finally, Section 7 concludes.

2 Historical Context

2.1 Mechanization and the Rise of Textile Factories

2.1.1 The New Industrial Cities

Between the 1760s and 1830s, the textile sectors went through a radical transformation that saw the introduction of new technologies and the complete transition from domestic work to the factory system (Kapás, 2012). The rise of the factory system in textiles was characterized by two movements during the first years of mechanization. Factories first emerged in the ancient centers of textile production of Derbyshire and Nottinghamshire but soon started to move to other regions, such as Manchester. Since 1800, mechanization in the regions of Lancashire and Yorkshire went hand in hand with the decline of the once prosperous textile centers of the West Riding and London (Pollard, 1968). Moreover, even within the growing industrial regions of the North, old-established towns such as Preston and Wigan were the latest to develop the new industry (Walton, 2000).

Contextually, factories moved from the countryside to urban centers. While early factories were built in sparse villages, during the final decade of the eighteenth century, the remote country factories were already giving way to new multi-storey factory blocks, generally built in towns (Chapman, 1965). This transition was induced by the spread of the steam engine which did not require the proximity to water streams. The proximity to urban centers represented an advantage for several reasons. First, factories benefited from access to larger markets and connections to transportation networks, such as roads and navigable rivers (Crafts and Wolf, 2014; Trew, 2014; Bogart et al., 2017). Second, capital markets and the high-skilled laborers needed for the development and maintenance of the machines were concentrated in urban areas (Mokyr, 1995). Additionally, urban areas had the advantage of providing a larger pool of potential workers in immediate proximity (Pollard, 1963).

2.1.2 Mechanization in Textile

Before the transition, the industry was organized on a cottage base, either through the putting-out system, whereby the raw material and technologies were put out to people working in their cottages by a central merchant, or by independent producers. Textile

production relied on two main crafts: *spinning*, the twist of raw fiber into yarns, and *weaving*, the craft of fabrics by interlacing yarns. Spinning was mechanized first. The key innovations were the Arkwright's water frame, patented in 1769, Hargreaves' jenny, patented in 1770, and the Crompton's mule which came into general use in the 1780s (Chapman, 2018; Hills, 1972). These machines allowed a single worker to handle several yarns at the time and led the transition to the factories when coupled with water and steam power in the 1790s (Berg, 2005). Weaving was mechanized by the power loom. The first vintage was patented in 1785 by Cartwright but was first successfully operated by Horrocks in 1795. Further improvements during the first years of the nineteenth century made the power loom profitable and paved the way for the craft's complete transition into the factory by the 1820s. Both in spinning and weaving, the introduction of new technologies led to the concentration of workers in factories. On the one hand, the concentration of machines under one roof allowed factory owners to rely on a unique source of inanimate power (Berg, 2005; Allen, 2018). On the other, the cost and complexity of the new machines imposed coordinating and monitoring costs that were best addressed through the increased control over the workforce realized through its concentration in the factories (Pollard, 1963; Marglin, 1974).

2.1.3 Labor Regulation, Social and Economic Changes

Until its repeal in 1814, labor regulation was still formally based on the sixteenth-century Elizabethan legislation of the Statute of Apprentices requiring craftsmen to qualify by a seven years servitude. Wages were decided by collective bargaining between masters and men, fixed in local books of prices, and enforced by magistrates (Jones, 1987; Clapham, 1916).[7] Because the innovations were deskilling in nature, the lack of complementarity between traditional skills and the new technologies implied that workers faced the perspective of wage reduction and skill redundancy (Randall, 1991; Mokyr, 1992; Nuvolari, 2002). In the spinning industry, mechanization implied a decline in the strength needed to operate the spindle, increasing manufacturers' reliance on female labor. In turn, the reliance on female and child labor allowed manufacturers to bypass traditional artisan customs and avoid resistance to technology adoption (Berg, 2005). Moreover, the introduction of factories themselves was partly motivated by the desire to reduce costs (Jones, 1987).[8] These circumstances gave

[7]Masters were specialized artisans who would own some capital and produce employing some apprenticeships and journeymen (Epstein, 2008).

[8]In the Macclesfield silk industry, for example, factories were introduced in 1815 after a dispute with weavers concerning a 25 percent reduction in the piece rate as an attempt to cut wage costs

rise to conflict between larger masters and poorer craftsmen and journeymen who organized collective action to pressure employers and local magistrates, and petition Parliament.[9]

Attempts to revive the regulations by textile workers are recorded on many occasions since the mid-eighteenth century.[10] When appeals to the law revealed unsuccessful, workers often resorted to protests and riots (Randall, 1991; Mokyr, 1998).[11] By the end of the eighteenth century, its application became mostly inoperative, liberating the forces of economic change. In the cotton sector, for example, the average firm moved from employing 10 skilled workers in the 1790s to 400 (mostly) unskilled workers in the 1830s (Mokyr, 2001). A transition that largely happened through the substitution of low wages women and children to skilled laborers. Handloom weavers were displaced in large numbers. About 240,000 weavers became redundant since the introduction of the power loom. While in 1820, only 10 percent of cloths were woven by power, by 1835, the number had passed to 71 percent (Allen, 2018). Records of the average weekly earning for handloom weavers in the West Riding indicate a real-term decline in wages of 55 percent between 1817 and 1837.[12] Brown (1990) estimates a similar number between 1806 and 1836, while indicating a real wage decline for the whole cotton sector, of 28 or 23 percent, depending on the type of fabrics. Figure D.1 from Allen (2018) shows the dynamic from 1770 to 1830.

by using child labor to undermine the position of local weavers in wage negotiations (Jones, 1987).

[9]The relationship between technological innovation and conflict within the craft is analyzed by (Epstein, 2008, p. 698) who highlights the differences between "poorer craftsmen, who had low capital investments and drew their main source of livelihood from their skills, and who therefore (frequently in alliance with the journeymen) opposed capital-intensive and labor-saving innovations, and the wealthier artisans who looked on such changes more favorably."

[10]Weavers in 1756 obtained an act of Parliament providing for the fixing of piecework prices by the magistrates (Webb and Webb, 1894). Silk weavers of Spitafiled obtained Parliament intervention in 1793 (Clapham, 1916). Woolen workers pressured local judges and Parliament between 1802-1806 leading to a confrontation between woolen journeymen and masters that saw the master's victory in 1809 (Holdsworth, 1933). Framework knitters of Nottingham, at the beginning of the nineteenth century succeeded in compelling the reluctant justices to allow a penalty for a breach of the apprentice regulations (Derry, 1931).

[11]The spinning jenny was attacked by several mobs in 1767, 1769, and 1779. Assaults on the Arkwright-type of factories were first recorded in 1779 (Nuvolari, 2002). The Luddites' attacks on the power loom reached their peak in 1812 when the British government deployed 12,800 soldiers to repress the revolt.

[12]Own calculation given wage series and the price of wheat indicated in Symons et al., 1839, p. 556.

2.2 Local Institutions and Parliamentary Representation

2.2.1 Municipal Institutions: Boroughs

Until the 1835 Municipal Corporations Act, the British local government was divided in two. On the one hand, a system of 39 counties,[13] each one led by a monarch's representative, who together governed over 10,000 parishes through a body of magistrates called justices of the peace (Webb and Webb, 1906). On the other hand, a network of about 600 towns (*boroughs*) with varying levels of self-governing rights and representative institutions rooted in medieval customs and liberties. These boroughs differed from large towns because they could act in law, own property, sue and be sued, and provide collective services (Chandler, 2013a). In the medieval period, boroughs could acquire the right to hold markets and fairs, and levy taxes on persons trading or exercising a craft within the borough. While since the beginning of the eighteenth-century boroughs' rights became more uniform (Weinbaum, 2010), two features remained distinct in a subset of boroughs: the constitutional rights to appoint local officials and justices of the peace and the rights to send representatives to Parliament (Fletcher, 1842).[14]

2.2.2 Boroughs' Self-Governance

In 1835, the Royal Commission identified 220 boroughs that had the right to appoint local officials and administer justice (Fletcher, 1842). Their typical administrative structure comprised a governing body – a mayor or other chief magistrate and one or more councils who often acted as justice of the peace – and a larger body of freemen or a court leet.[15] The majority of these boroughs were governed by a *Closed Body*, a municipal corporation formed by a small number of self-appointed men who transmitted power by cooptation and a somewhat larger council of freemen, a shrinking group of adult males by the eighteenth century (Webb and Webb, 1908b).[16] Corporations drew revenue from property ownership, market tolls, and other dues. They were

[13]The 1851 census Map of England and Wales in Satchell et al. (2016) counts 41 counties as Yorkshire is divided between East, West and East Riding of Yorkshire.

[14]In England, by the 1830s, 220 boroughs had administrative rights while 203 could send representatives to Parliament (Fletcher, 1842).

[15]Chief magistrate and administrative bodies had different names depending on the boroughs' constitution. In manorial boroughs (belonging to a lord), the mayor's office was held by the manorial bailiff or constable, and the court leet could take the role of the freemen assembly (Webb and Webb, 1908b).

[16]Freemen are rightful members of the borough community who acquired their rights through birth, marriage, servitude, residence, gift or purchase, or a combination of any of these (Sweet, 1998).

responsible for administering charitable revenues, administering justice, both criminal and civil and at times organizing the town jail. Corporations maintained key infrastructures such as markets, roads, rivers, port facilities, and lighting arrangements through municipal by-laws and traditionally regulated aspects of production and trade, lobbying the national government in defense of the town's economic interests. While the corporation's ability to enforce these regulations declined through the eighteenth century, in their most extreme form, towns' governing bodies could allow only freemen to maintain shops or workshops, tax outsiders and limit the number of apprentices that manufacturers might take on (Innes and Rogers, 2000).

2.2.3 Boroughs' Parliamentary Representation

Before the 1832 Great Reform Act, 203 boroughs held the right to send 'burgesses' to the House of Commons, a privilege regarded as increasingly relevant since 1760 (Webb and Webb, 1908a).[17] In several cases, boroughs' politics was influenced by the effort of local patrons to capture the political process. The nobility and the gentry could acquire a position as representatives of the borough holding manorial rights, through long-standing relationships with the corporation or by transferring money (Bogart, 2016 and Sedgwick, 1970). However, the patrons' ability to control the boroughs varied widely in the extent of political representation.[18] Local studies find that boroughs with a larger local franchise were more difficult to control, elections more likely to be contested, and voters displayed a higher level of political engagement and consciousness (Phillips, 1979; Sweet, 1998; O'Gorman, 1992). In these boroughs, the interests represented by the enfranchised population were much broader than the corporate body representing the urban elite. The electorate included 60% of working men, such as small craftsmen, artisans, skilled and unskilled laborers, 27% of the middling sort, and 13% between gentlemen, members of professions, and commercial elite (Phillips, 1982).[19] These boroughs also had a vibrant political life that included members not directly represented by the franchise and displayed a concentration of

[17] Borough seats formed the majority of the seats in the House of Commons of England and Wales (432 to the counties' 122).

[18] The franchise was divided into boroughs in which freemen were electors; boroughs in which the franchise was restricted to those paying scot and lot, a form of municipal taxation; boroughs in which only the owner of a burgage property qualified a person to vote; boroughs in which only members of the corporation - a restricted group of officials chosen by cooptation - were electors; boroughs in which male householders were electors and finally boroughs in which freeholders of land had the right to vote (Porritt, 1903, p. 29).

[19] Average computed from the elections held between 1761 and 1802 in the electoral boroughs of Norwich, Maidstone, Northampton, and Lewes described by (Phillips, 1982, p. 208).

provincial newspapers and an early development of clubs and societies (Rogers and Rogers, 1989; Tilly, 1995; Innes and Rogers, 2000).

2.2.4 Origins of Local Institutions

As extensively discussed by Angelucci et al. (2022), the origin of boroughs' institutional heterogeneity goes back to the Norman conquest (1066). In 1086 the land was censed and divided between the king and the lords. The cities' administration reflected this division with cities within the king's land paying tributes directly to the king, while cities within the lords' land paying tributes to the lords. The amount of taxes due by each borough was established by a first census conducted in 1086, the Domesday Book. The sheriff and his officers collected all the king's income arising within a borough but were accountable only for a fixed sum (*farm*) and appropriated any additional surplus (Ballard, 1913, p. lxxv). Angelucci et al. (2022) noticed that as urban settlements grew in wealth and population, the expansion of taxable wealth determined incentives for the king to change the institutional structure of royal boroughs. The king started to auction off the right to collect taxes in his dominion, increasing the income derived on top of the fixed *farm*. As a response, "burgesses, generally, made efforts to acquire the right of farming their own boroughs" (Ballard, 1913, p. lxxvi). The acquisition of such rights came through the purchase of a Charter or Farm Grant and conditionally on bidding speculators' offers.[20] On the contrary, in non-royal boroughs, given the proximity and small number of boroughs under the control of the local *Lord of the Manor*, either lay or clerical, lords rarely develop incentives to give up their right to directly collect taxes and appoint officials.

As a result, the twelfth and thirteenth centuries saw a growing number of royal cities obtaining the right to collect taxes, administer justice, and select their officials. These self-administrative rights were formalized throughthe King's concession of *Charter of Liberties*).[21] Moreover, Angelucci et al. (2022) shows that the acquisition of these rights made royal cities more likely to be summoned to Parliament, determining a growing institutional divergence between royal and non-royal towns. While these self-administrative liberties often coincide with the development of mer-

[20] Ballard (1913, p. lxxvi) gives the example of the men of Derby who in 1163 paid what he considered a considerable amount (40 marks) so that the unpopular man William Asturcarius could not farm the borough.

[21] Reeves (*prepositi*): officials who were responsible to the sheriff for the income arising from the area (see Ballard, 1913, p. lxxxv) and bailiffs. This right, "not only relieved them of the direct financial control of the sheriff but gave them for the first time a basis of real municipal unity under officers of their own choice. No longer presided over by royal nominees, the portmoot [city council] acquired new freedom of action." (Tait, 1968, p. 234)

chant oligarchies, in several cases, local institutions were surprisingly open. This is the case of Norwich, for example, where the entire freeman citizenry nominated and elected the Common Council, the sheriffs, the mayor, and the members of Parliament (Evans, 1974).[22]

3 Main Data

3.1 Factories and Steam Engines

We digitized the location of textile factories in 1838 from British Parliamentary Papers (1839). In that year, Parliament mandated a report on the count of factories, the number of persons employed, and the nature and amount of the moving power in all the factories producing cotton, worsted, woolen, flax, and silk. A factory (or industrial mill) is a production unit whose machines were moved by steam engines or water wheels. We collect information about the number of factories, the number of males, females, and children (below age 13) employed, the number of steam engines and water wheels present in the factories, and their total moving power (in horses). Our database counts 3462 working factories, of which 1622 were producing cotton, 411 worsted, 1003 woolen, 168 flax, and 258 silk. Appendix A.1 provides additional information on the digitization of this information. Figure 1 shows the geographic distribution of textile factories in 1838. While we observe the number of operating factory on in the year 1838, we complement this database with two sets of information varying over time. First, we use data listing the location and year of adoption of steam engines between 1698 and 1804. These data were originally compiled by Kanefsky and Robey (1980) and refined by Nuvolari et al. (2011) and De Pleijt et al. (2020). Second, we estimate the share of workers occupied in the textile sector every 25 years between 1675 and 1831. We use information from probate records described in Keibek (2017). Appendix A.4 provides additional details on this data. Finally, we digitize the location of the first Arkwright-type factories built between 1768 and 1788 from Chapman (1981). Our database includes information on 235 Arkwright-type cotton factories.

[22]The author, by analyzing the surnames of the appointed officials argues that elections were not only formal but that Norwich was effectively democratic in the seventeenth century.

3.2 Early and Modern Economic Activities

Lay Subsidy in 1334 and 1527. The Lay Subsidy was the first national direct tax voted by English parliaments to the crown (Hadwin, 1983). For each place (smallest administrative unit), total wealth was calculated from movable goods, mainly grain, and livestock; it was levied at the rate of a fifteenth for rural areas and a tenth for boroughs and ancient demesnes (Darby et al., 1979). The measure represents a reliable proxy of local economic performance as it captures taxation of the surplus available and destined for markets (Jenks, 1998). We obtained the information from the Gazetteer of Markets and Fairs in Letters (2021) that reports the total assessed wealth in a place determined by the Lay Subsidy of 1334 from the original source in Glasscock (1975). We record the value of a place when reported in the Gazetteer and assign missing values otherwise. We obtain an equivalent measure of taxation per capita in 1527 from Heldring et al. (2021).

Markets and Fairs. The presence of Markets and Fairs in 1600 and fairs in 1587 are registered in the *Gazetteer of Markets and Fairs in England and Wales to 1516* (Letters, 2021). This source provides information on markets and fairs in towns and villages throughout England in medieval times (until 1516) and their survival in 1600. We construct two measures. First, a measure equal to one if the location had one surviving market or fair in 1600. Second, we compute the total number of markets and fairs listed in the Gazetteer.

Share of Handicrafts and Occupational Structure in 1831. Information on the share of individuals occupied in Trade and Handicraft activities is from the occupational census of 1831 in Gatley (2005). The census registered parish-level information on the number of males above 20 years of age employed in the following sectors: agriculture, machine makers, trade and handicraft, professionals, capitalists and bankers, laborers not in agriculture, servants, and others.

3.3 Geographic and Population Characteristics

We code geographic characteristics to capture advantages in the location of factories following Crafts and Wolf (2014). We measure the proximity to an ancient navigable river, the network of Roman roads, the cost, open coalfield, and wheat suitability. These variables are constructed to capture features of the environment that, if shaped by human intervention, reflect choices predating by several centuries the period of analysis. Coalfields are from the Digital Geological Map Data of Great Britain described in Smith (2009). We use the information on bedrocks to capture exposed

coalfields. Data on wheat suitability are from the GAEZ-FAO Database described in Fischer et al. (2021). We compute the parish distance from a Roman road using information from DARMC Roman Road Network database, a digital version of the Roman roads classified in the Barrington Atlas (McCormick et al., 2013). Distances to medieval navigable rivers have been computed using the Ordnance Survey Open Rivers map, from which we have selected the part of major rivers described as navigable in medieval England in Edwards and Hindle (1991). We have selected the part of the rivers from the possible head of navigation until the river mouth. Additionally, we obtain the population in 1801 and 1831 from the 1801 to 1891 Census Report of England and Wales: Parish and Registration District Population database provided by the Cambridge Group for the History of Population and Social Structure.

3.4 Boroughs' Institutional Characteristics

We construct a sample of cities comparable over time, focusing on medieval boroughs. These were recognized urban settlements, distinguished from villages by the privileges granted them by the king or the local lord through an incorporation act or Charter guaranteeing their privileges (Ballard, 1913). We digitize information on medieval boroughs from Beresford and Finberg (1973) and Ballard (1913). We collect information on the year of first mention, administrative status, and local institutions for each borough. We consider boroughs' medieval privileges (Charter of Liberties) taking as data limit the end of the reign of Edward the I in 1307. We code royal boroughs as medieval boroughs defined as royal or at least partly subject to the King's jurisdiction (mixed) by Beresford and Finberg (1973) and established before the Lay Subsidy Tax was collected in 1334. Moreover, we collect information about when and whether the town acquired the right to send representatives to Parliament, and who had the right to participate in the elections from Bogart (2016).[23] Finally, we determine whether the boroughs had municipal independence in 1835 using information from the Report of the Municipal Commissioners synthesized by Fletcher (1842). Appendix A.2 describes the variables coding. Our dataset results in 591 boroughs. Among these, we count 163 royal boroughs, 181 that obtained at least one Charter of Liberties by 1307, 199 that became a parliamentary constituency, and 208 that had urban autonomy before 1835 (Table A.2). Figure 2 represents the geographic distribution of boroughs, the variation between royal and non-royal, and the main network of transportation.

[23]Information about the year of enfranchisement are from www.historyofparliamentonline.org.

3.5 Geographic Units

We define a quasi-parish geographic unit constant over time using the 1851 census Map of England and Wales in Satchell et al. (2016). When information from the factory census (British Parliamentary Papers, 1839) and the list of boroughs (Beresford and Finberg, 1973) reflect administrative units that do not coincide with parishes in the 1851 census, we match them at the minimum common geographic unit across the datasets (quasi-parish). The result is a sample of 9,643 quasi-parish of which 99% percent corresponds to a parish in the 1851 census Map of England and Wales in Satchell et al. (2016). These geographic definitions are then applied to all the datasets used to compute the relevant information from the eleventh to the nineteenth century. We define a borough throughout the paper as a geographical unit that was a medieval borough. Among the 591 boroughs, 86% are matched at the parish level, 3 boroughs are matched at the place level, 30 at the hundred level, 4 at the registration district level, 5 at the registration subdistrict level, and 39 at a different level.[24] Because the final geographical units are composed of different numbers of smaller divisions, in all the estimations, we use frequency weights given by the number of places inside a geographical unit.

Tables A.3, A.4, and A.5 provide summary statistics for all the variables used in the paper. Section A.6 describes the coding procedures. Information used to establish the mechanisms and provide robustnesses is presented in the relevant sections.

4 Stylized Fact: Economic Reversal

In this section, we present the stylized fact about the negative relationship between income in the pre-industrial period and factory location in nineteenth-century England. We first introduce the empirical specification used to estimate this fact (Section 4.1). Section 4.2 presents the results. Section 4.3 discusses the estimation robustness.

4.1 Empirical Framework

We run regressions of the following form:

$$Development_{i(t)} = \alpha + \beta Wealth_i^{1334} + \delta X_i + \gamma Pop_{i(1801,1831)} \mathbb{1}_{t>1801} + County_i + \varepsilon_{i(t)} \quad (1)$$

[24] Parishes in England are composed of several places. Registration subdistricts and districts are used in the 1831 Census divisions and include different parishes. Hundreds are historical county subdivisions.

where i refers to the geographic unit and t to the specific period of time in which the variable is measured. Regressions are cross-sectional and separately consider the relationship between wealth in 1334 and economic development measured at different moments in time.[25] The measure of wealth in 1334 is captured by the 1334 Lay Subsidy, the first national direct tax voted by English parliaments to the crown and represents the first systematic information on local economic performance since the Commercial Revolution. Our key outcome of interest is the number of factories in 1838. The coefficient β captures the relationship between early development and industrial growth. By including county dummies ($County_i$) β only reflects within-counties variation.

$Pop_{i(1801,1831)}$ represents measures of the population in 1801 and 1831, included if the outcome variable is measured after 1801. The vector X includes geographic characteristics that might affect economic growth. The choice of the control variables reflects both location advantages such as access to trade networks and agricultural productivity and the specific characteristics highlighted by the studies on textile factories in nineteenth-century England. These are soil quality, climatic conditions, access to coal, and water flows (Farnie, 1979; Crafts and Wolf, 2014). We capture soil quality using a granular measure of wheat suitability. This measure reflects local agricultural comparative advantages and captures variations in soil value. We discard measures of humidity because Crafts and Wolf (2014) shows that all of England is above the threshold level of humidity required for spinning. We include the availability of water flows as a means of transportation and power for mills measuring the city or parish's proximity to the closest navigable river. Moreover, because market access and connectivity were crucial to growth, we include two additional measures. First, we compute the distance to the closest coastal shore. This captures both access to foreign markets and a means of transportation in absence of inner waterways. Second, we include the distance to the closest Roman road, an ancient network of roads extending across England. Both measures of the network of Roman roads and navigable rivers largely predate the eighteenth century and can therefore be taken as exogenous with respect to industrial development. Finally, coal represented a key feature of the decision about where to locate a factory. To capture variation in access and prices, we compute a measure of proximity to a coal source. Because we are interested in natural advantages, rather than advantages acquired through effort, we only measure exposed coalfield that could have affected the location decision in the early period of factory development

[25] (t) indicates that the variable is measured in a period t, not that it changes over time.

4.2 Empirical Analysis

We present systematic evidence of a negative relationship between factories' location and early development. We begin by showing the results using the full sample of parishes in England. Figure 3a shows a bin scatter plot displaying the unconditional strong negative correlation between the number of factories per 1000 inhabitants in 1838 at the parish level and log of wealth in 1334 in the same parish. By contrast, in Figure 3b, we show a positive correlation between the share of commercial professions (handicrafts and artisans) in 1831 and wealth in 1334. These results indicate on the one hand the geographic persistence of pre-industrial economic activities; on the other, a reversal of fortunes when it comes to industrial development during the nineteenth century.

In Table 1, we extend the analysis to include several additional measures of population, geographic controls, and county dummies. Panel A in Table 1 replicates the previous analysis for the whole of England reporting conditional estimates. Results confirm that the reversal is unique to industrial development. In fact, we find a positive correlation between wealth in 1334 and other measures of pre-industrial economic development, including wealth in 1527, market presence in 1600, and the share of handicrafts in 1831 (columns 1, 2, and 3, respectively). In column (4) we reproduce Figure 3a showing that parishes in England with higher wealth in 1334 had a lower number of textile factories in 1838. These trends are both unaffected by the inclusion of geographic controls that include agricultural suitability and coal proximity, and the presence of trade networks such as roman roads, navigable rivers, and proximity to the coast.

In Panel B of Table 1, we restrict our analysis to parishes that had a medieval borough. These results show the stability of the coefficient within the set of medieval boroughs and motivate our investigation of the role of municipal self-governance on pre-industrial growth and lack of technology adoption during the early nineteenth century. Before presenting our main results in Section 5, the next section discusses the several robustness checks we present to corroborate the main stylized facts.

4.3 Robustness

Appendix B shows that results in Panel B of Table 1 are robust to several alternative measures and specifications.

Alternative Measures. First, to make sure that the results do not depend on the coding of the outcome variable in Table B.6, we reproduce the main result using alternative measures of industrialization: the number of factories per 1000 inhabitants, the number of individuals working in factories, the number of steam engines, and the number of horsepowers per workers within those cities with factories. Second, to make sure that the results do not depend on the measure of the level of pre-industrial development, in Table B.7, we analyze the relationship between measures of economic development observed at different points in time and industrialization in 1838. Overall, we find negative relationships between pre-industrial economic development measured by the number of markets and fairs in 1800 and the share of handicrafts in 1831 and the number of factories per capita. We obtain a negative but not significant relationship between wealth in 1527 and factories in 1838.

Geographic Variation. To gain a better understanding of the geographical variation driving the results, we present in Table B.8 estimates excluding county fixed effect. Allowing between-country variation leaves the results unchanged. Moreover, Table B.9 presents the results excluding the counties where a large part of the textile industry was concentrated: Yorkshire and Lancashire. The stability of the coefficients indicates that the patterns are consistent across England and not driven by the weight that specific counties had in the process of mechanization of the textile sector. Additionally, we exclude Middlesex, where London is located, to show that patterns in the capital do not drive results.

Model Specification. Finally, we show that the results are robust to the use of alternative models. In particular, we refer to the literature on discrete choices that have modeled firm location as the result of a profit-maximization process. While McFadden (1978) and Carlton (1978) pioneered this approach using a multinomial logit model, Guimaraes et al. (2003) has shown that a Poisson model provides equivalent results but is computationally much more tractable. However, because the set of potential locations we analyze is large, and factories are geographically concentrated, our sample presents a large number of zeros.[26] Therefore, we model location choices as a Poisson process corrected for zero inflation, using a Zero-inflated negative binomial model, and present goodness of fit tests that support this modeling choice (Scott Long, 1997).[27] In Table B.10, we show that the negative relationship be-

[26]This implies that the assumption that the conditional mean and variance coincides is not satisfied and the Poisson regression model is biased and inefficient. Negative binomial models solve this issue (Scott Long, 1997).

[27]We model the zero production process as determined by the geographic characteristics: the presence of zero or positive factories in a given location depends on soil quality, distance to coalfields,

tween wealth in 1334 and factories in 1838 is confirmed using a Zero-inflated negative binomial estimation.

5 Main Results: Economic Effects of Local Institutions

Results in Section 4 show that cities with a higher level of economic activities during the early modern and modern period had a higher level of artisans in 1831 but still failed to adopt the factory system and the steam engine in the same period. To test our hypothesis that institutional factors explain the negative relationship between modern economic activities and industrial development, we rely on the medieval origins of urban institutional and economic divergence (Angelucci et al., 2022). As detailed in Section 2.2.4, at the time of the Norman conquest, in 1066, the land was divided between the king and the lords. This division determined a pattern of institutional divergence with the kings increasingly granting Charters of Liberties to boroughs under the crown's jurisdiction. We analyze the effect of royal status on the economic and institutional patterns of the urban settlements. To relate our analysis with the results found in Section 4, we consider a borough to be royal if it had royal patronage and was incorporated before 1334. Because by 1300 any town of any significance in 1750 had been already founded (Britnell, 2000), the study of early urban settlements allows us to trace back the origins of institutional variation and at the same time analyze the sample of cities existing at the eve of the Industrial Revolution.

Our analysis develops in three steps. First, using the specification described in Section 5.1, we show that boroughs selected by the king display a higher level of economic activity between the fourteenth and nineteenth centuries (Section 5.2). Second, we show that despite these advantages these cities failed to adopt the steam engine and to make the transition to the factory system in the textile sector by 1838 (Section 5.3). In Section 5.4, we provide evidence in favor of the identification assumptions needed for a causal interpretation of the results. Third, using time-varying information on the share of textile workers per city, in Section 5.5, we show that the divergence in economic activity between royal and non-royal boroughs during the Industrial Revolution coincides with the timing of the mechanization of production in the textile sector.

trade network, and population levels. We then analyze the relationship between the number of factories and our variable of interest.

5.1 Empirical Framework

We estimate the following equation:

$$Development_{b(t)} = \alpha + \beta Royal_b + \delta X_b + \gamma Pop_{b(1801)} \mathbb{1}_{t>1801} + County_b + \varepsilon_{b(t)} \quad (2)$$

where b refers to a borough and t to a specific period of time in which the variable is considered. To improve the comparability between observations we restrict the attention uniquely to units that had a medieval borough. Our regressions are cross-sectional,[28] and separately consider the effect of being a royal borough on local development in several periods from the early modern times to the Industrial Revolution. *Royal* is a dummy variable equal to one if the city under consideration was a royal borough and was incorporated before 1334. The vector X includes geographic characteristics that might affect growth: proximity to the Roman network of roads, navigable rivers, and the coast, agricultural comparative advantage (soil quality), and access to energy sources (proximity to coalfields). A discussion of the reasons we consider these controls is in Section 4.1. When studying nineteenth-century outcomes, we control for the population in 1801 (Pop).[29] $County_b$ is a vector of county dummies. Our identifying variation comes from comparing royal and non-royal boroughs with similar geographical and population characteristics within the same county. As a reminder, Figure 1 shows the distribution of factories in 1838. Figure 2 represents the geographic distribution of boroughs, the variation between royal and non-royal, and the main transportation network.

5.2 Effect on Pre-Industrial Economic Development

Table 2 estimates Equation 2 using as dependent variables all the measures of early economic development discussed in Section 3.2. Royal boroughs had a higher level of wealth in 1334 (column 1). Because the Lay Subsidy captures movable goods, this difference indicates more commercial activities. Column (2) confirms the positive effect on the Lay Subsidy tax in per-capita levels, which provides information on wealth per capita, using its level in 1527. In column (3), we show that royal boroughs were 12 percentage points more likely to have a market or fair in 1600. Given the contraction of the economy and the reduction in the number of markets in the period

[28] (t) indicates that the variable is measured in a period t, not that it changes over time.

[29] Because population size in 1831 is likely affected by the treatment, we exclude it from the model.

leading to the seventeenth century, market presence in 1600 indicates the continuity of economic activities in royal boroughs and the attraction that these cities had for artisans. Column (4) confirms that in 1831, cities with a royal borough counted a number of artisans as a share of the male population above twenty years of age, ten percentage points higher than cities with a non-royal borough. This large difference accounts for a 30% difference with respect to the average across cities.

5.3 Effect on Industrial Economic Development

From Table 2 emerges a picture in which royal boroughs had persistent economic activities, both in terms of trade and handicraft, in the pre-industrial period. We now provide evidence of a strong negative relationship between royal boroughs and industrial development.

In Table 3, we estimate the relationship between royal boroughs and industrial development using Equation 2.[30] In columns (1)—(3), we estimate the difference in the number of factories between cities with royal and non-royal boroughs. Column (1) shows the results concerning the first 200 Arkwright-type factories built in England. We find that these first factories were more likely to be located in royal boroughs. However, by 1838 factories had shifted toward non-royal boroughs. While on average a city had four factories, non-royal boroughs with similar geographical characteristics and populations, and within the same county had 8.4 factories more than royal boroughs—column (2). Results in column (3) report the difference between the number of factories in 1838 and those built in the 1768-1788 period. Results in columns (1)—(3) indicate that factory owners first decided to locate factories in royal boroughs but eventually moved away. Column (4) shows the same results using factories per capita. Non-royal boroughs had 1 factory more than royal boroughs for every 100,000 inhabitants.[31] Column (5) estimates the effect on the number of workers in textile factories. The coefficient shows an effect as large as 130% of the mean number of factory workers in the sample. The effect on steam engines, shown in column (6), is even larger, showing that a city that had a royal borough in 1838 had 6.2 fewer steam engines than a non-royal borough. Finally, in column (7), we restrict the analysis to observations with factories and estimate the relationship between royal boroughs and the intensity of capital per worker captured by the measure of horsepower per

[30] In this case, as for the case of the share of handicrafts in 1831, controls also include population levels in 1801.

[31] In 1831, the average population of a parish that was a medieval borough was around 88,000 inhabitants.

worker. Again, the magnitude indicates an economically significant effect, with factories in royal boroughs displaying a capital intensity of 0.26 units lower. This effect is substantial given that the average horsepower per worker in the sample is 0.2.

Tables 2 and 3 show that self-regulating cities display a peculiar trajectory of development. While local institutions determined a consistent concentration of economic activities during the early modern and modern period, leading to a higher share of artisans and traditional manufacturers in the 1831 census, these cities failed to attract modern factories and adopt the steam engine. When they did, they had a lower level of power per worker. These patterns suggest that the institutions that determined the growth of the early period created the conditions that prevented the adoption of the factory system.

5.4 Identification Assumptions and Robustness

In this section, we describe the key identification assumptions and the robustness of our results in terms of selection of unobservables, model specification, geographical variation, data aggregation, and inference.

5.4.1 Selection on Unobservables

Our key identification assumption is the absence of unobservable characteristics that might affect selection into the royal status and the patterns of economic and institutional divergence. We provide several pieces of evidence in favor of this assumption.
Balancing Test. First, Table E.14 shows a balancing test of royal and non-royal boroughs' characteristics. As already noted by Angelucci et al. (2022), royal boroughs were closer to Roman roads and to the coast. Additionally, we show that royal boroughs were farther away from coalfields and had a lower level of wheat suitability. This makes the introduction of these geographical controls fundamental to guarantee credible estimates of the effect of royal status on economic outcomes. However, despite having different geographical characteristics, royal boroughs were not chosen by the King because they were richer or larger during the Norman Conquest.[32] Hence, before the Commercial Revolution, royal and non-royal boroughs did not show significant economic differences, while economic differences were substantial by 1334, at

[32]In Table E.14 columns (6) and (7), using data from the Domesday Book we replicate the results in Angelucci et al. (2022), and we show that royal boroughs had small differences in wealth in 1066, 1070 and 1086, that are produced by few outlying observations. When we remove the boroughs with the top 5 percentile of wealth in the eleventh century, royal and non-royal boroughs are balanced in terms of their wealth. We also show that royal and non-royal boroughs' difference in population in 1086 is not statistically significant.

the end of the period of commercial expansion that characterized England during the thirteenth century (Britnell, 1996).

Additional Controls. Second, in Table E.15 we estimate the effect of royal status on both pre-industrial and industrial development without using any control and confirm all our results. Moreover, in Table E.16 we additionally control for the population in 1831, a potential bad control, in the estimation of the effect of royal status on the share of handicrafts in 1831 and factories in 1838 and we find identical results.

Quantification of Omitted Variable Bias. Third, even if our results are robust to the inclusions or exclusions of controls, Oster (2019) show that this is not enough to rule out biases from the presence of unobservable variables, as changes in the coefficient are affected by the explained share of variance of the dependent variable from omitted variables. In Table E.17 we follow Oster (2019) to evaluate the robustness of our results to omitted variable bias. We compute the bounds of our estimates of royal status on pre- and industrial growth and show that a zero effect is never included. Moreover, results show that unobservables explaining industry location should have twice the explanatory power of the controls included in our model to make the effect of royal status on factory location indistinguishable from zero. For the case of pre-industrial measures, if unobservables can move the effect to zero, they would need to represent between three and eighty times higher variation than our rich set of controls.

Overlapping Support. Fourth, the use of controls in Equation 2 requires overlapping support for the distribution of geographic characteristics across royal and non-royal boroughs (Imbens, 2015). Figure E.2, Panel A, assess overlap in covariate distributions across royal status.

5.4.2 Model Specification

A second assumption regards the linearity of the functional form. In Tables E.18 and E.19, we relax the functional form assumption showing that results on industrial and pre-industrial growth are robust to the closest neighbor matching and propensity score estimations. Figure E.2, Panel B provides the balance plot of the raw and matched samples using a propensity score predicted by boroughs' geographic characteristics. Additionally, we present results using alternative models that adjust for zero inflation in the number of factories. In particular, as discussed in Section 4.3, because of the skewed distribution of the outcome and a large number of zeros, we model location choices as a Poisson process corrected for zero inflation, using a Zero-inflated negative binomial (ZINB) model, and present goodness of fit tests that support this modeling

choice (Scott Long, 1997). We show that the effect of royal status on factory location is robust using the ZINB model in Table E.18.

5.4.3 Geographic Variation

As shown in Figure 1, the location of textile mills is highly concentrated in the Northern counties of Lancashire and Yorkshire. To avoid comparing very different parts of England, we always control for county-fixed effects and show that these specific regions are not driving our results. We show in Tables E.20 and E.21 that our results on the effect of royal status both on industrial and pre-industrial growth are robust to the omission of observations in Lancashire, Yorkshire, and Middlesex (that includes London city) counties.

5.4.4 Data Aggregation

As discussed in Section 3.5 and Appendix A.6, our unit of analysis is the minimum common geography across the datasets used. This creates two potential challenges. i) Information about important boroughs might refer to administrative units higher than the parish. ii) The location of economic activities and the original location of the borough might not overlap if the city expanded over time and economic activities moved out of the center. This is an important issue for the effect of royal status on factory location when information on factories had to be matched to units at higher geographical aggregation than the parish. To show that our results do not depend on the level of geographic aggregation, we estimate in Appendix E.4 several models using information at the place level, the smallest administrative unit available. In Table E.22, we consider the distance to the closest borough as a measure of political influence. Panel A compares places depending on whether their closest borough is royal or not. Panel B, extend the analysis to the first 5 closest boroughs. Panel C estimates the effect of the closest borough being royal by distance to the borough. We find that proximity to a royal borough decreases the number of factories. Moreover, while we use frequency weights in all our estimations to increase comparability across geographical units composed of different subdivisions, Table E.23 shows the robustness of our results of royal status on factory location to different weighting strategies.[33] Results in Table E.22 show that the unweighted estimations using data at the place level are consistent.

[33] As estimates of the effect of royal status on pre-industrial growth are also weighted, we conduct the same robustness check in Table E.24 and confirm all our results.

5.4.5 Inference

Finally, Table E.25 in Appendix E.5 shows that our results on the effect of royal status on industrial growth is robust to alternative forms of statistical inference. The data aggregation process implies that the treatment variable is assigned at the level of the geographic units in our database. The absence of subunits that receive the same treatment implies that we do not need to consider within-cluster unobserved heterogeneity between these observations. However, when using the database disaggregated at the place level, we need to worry about potential unobserved heterogeneity across space. In Panel A of Table E.25, we show that results using observations at the place level are robust to clustering the standard errors at higher geographic levels, such as parish, registration sub-districts, districts, and hundreds. Moreover, in Panel B of Table E.25, we show similar robustness clustering standard errors estimated using the quasi-parish sample.[34] Using the same sample, we confirm that also the results showing a positive effect of royal status on pre-industrial growth are robust to the different clustering of the standard errors (see Table E.26).

5.5 Timing of Textile Divergence

The previous results show a divergence in industrial development between royal and non-royal boroughs exploiting the cross-sectional variation. Here, we study the timing of the divergence. This is important for two reasons. First, by showing that the divergence in economic activities in the textile sectors coincides with the timing of mechanization, we provide evidence that royal status affected the location of industrial activities through its effect on technology adoption during the first phase of the development of the factory system. Second, by exploiting time-varying data we improve the credibility of a causal interpretation of our results by controlling for city-specific time-invariant factors that might affect economic growth. We provide two pieces of evidence. First, using an event-study, we analyze the divergence of city-level specialization in the textile sector. Second, we construct a measure of the stock of steam engines adopted in royal and non-royal cities and show that the divergence in textile growth between royal and non-royal boroughs coincides with the divergence in the adoption of the steam engine.

To study changes in the city-level specialization in the textile sector, we estimate the difference over time between royal and non-royal boroughs on the share of workers

[34] Because unobserved heterogeneity might arise from measurement error given by the data generation process, we control for dummies indicating the geographical level of each observation.

occupied in the textile sector. We use information from probate data described in Keibek (2017) and construct a measure of city-level textile sector specialization between 1675 and 1831, aggregating data over periods of 25 years. Appendix A.4 provides additional details on this data. We estimate the timing of divergence in textile manufacturing between royal and non-royal boroughs using the following equation:

$$Textile_{b,t} = \tau_b + \lambda_t + \chi_t Royal_b \times \mathbb{1}\left(year = t\right) + \varepsilon_{b,t} \tag{3}$$

where the proportion of workers occupied in textile manufacturing over the total labor force ($Textile$) varies both by borough (b) and by time (t), every 25 years. This panel specification allows us to control for both time and borough fixed effects (λ_t and τ_b), and estimate the time-series evolution difference between royal and non-royal borough (χ_t) from 1700 to 1831. This specification does not require the conditional exogeneity assumption discussed in Section 5.4, but the weaker requirement that in absence of mechanization royal and non-royal boroughs would have followed similar trends in the share of textile workers.

We report the results in Figure 4. While in the period between 1675 and 1750 royal and non-royal boroughs had similar trajectories in the local specialization in textile manufacturing, in the period between 1775 and 1799 these cities start diverging, with royal boroughs decreasing their specialization in textile. This divergence continues and maintains until the 1830s, consistent with the evidence provided in Table 3. The magnitude of the differences in the share of textile workers is economically and statistically significant. While we find no difference zero in the period between 1675 and 1750, the difference between royal and non-royal cities in their share of textile workers reached two percentage points 50 years later. In 1800 this different was as big as the average share of textile workers in the entire period under consideration (1.6%).

As discussed in Keibek (2017), using probate data to measure occupational structures has strengths and weaknesses. Probate data have broad geographical coverage, making them ideal for studying local economic development. However, since most households did not leave any will, this data over-represents wealthier individuals engaged in activities that require more capital. This issue creates complexity in estimating the share of workers in low-paying occupations, such as textile manufacturing. However, the estimation of Model 3 is not biased by this measurement error unless the data inaccuracy changes over time in a way that systematically differs between royal and non-royal boroughs. Taking these concerns aside, our results indicate that the percent difference in the share of textile workers between royal and non-royal bor-

oughs is significantly greater than any difference we find in the occupational categories available in the 1831 census (Table F.28).

We finally show that the period of divergence in textile specialization between royal and non-royal boroughs (between 1775 and 1789) coincides with important improvements in mechanization. Figure 5 shows descriptive evidence of the pattern of steam-engines adoption in royal and non-royal boroughs using data from Kanefsky and Robey (1980); Nuvolari et al. (2011); De Pleijt et al. (2020).[35] At the beginning of the 1700s, royal and non-royal boroughs had a similarly low level of steam engines. In the years following the introduction of the first commercially successful engine by Newcomen in 1712, their trajectories separated. Non-royal boroughs increasingly adopted more steam engines than royal boroughs. Two changes in the trend are apparent in the figure. First, after Watt improved the steam engine, we observe an increase in the adoption rate by royal boroughs in the 1770s. Second, an even steeper change in trend occurred in the 1790s. In these years, the combination of the steam engine and the spinning mule fostered the development of the factory system.

Together, Figures 4 and 5 and Table 2 show that even though royal boroughs were more prosperous before the emergence of steam engines, industrial development in the textile sector predominantly took place in non-royal boroughs exactly when the major technological innovations developed.

6 Mechanisms

These results raise the question of why we observe such a radical change in the geography of economic activities during the Industrial Revolution. Our main hypothesis is that self-governing cities promoted collective action and the formation of social capital through representative institutions. In turn, the previous experience with political organizations facilitated successful resistance to technology adoption. Historical evidence indicates that starting from the eighteenth century, boroughs with parliamentary representation developed a higher level of social capital and had a population more likely to engage in politics through protests, riots, and petitions (Porritt, 1903; Phillips, 1982; Tilly, 1995).[36] This was particularly true in boroughs

[35] As the adoption of steam-engines suffers from zero-inflation problem, this issue limits the statistical power to conduct annual event-studies similar to one done exploited the model in Equation 3.

[36] For example, the movement for the franchise extension originated in those cities directly represented in the House, not in the great towns, such as Manchester, Leeds, Birmingham, and Sheffield, which did not send members to Parliament (Porritt, 1903).

with large electorates. There, electoral campaigns were more partisan and issue-oriented and elections more contested, creating the conditions to include a broader part of the population in the political game.[37] These conditions provided incentives for the political organizers to appeal to the non-enfranchised population, encouraging the formation of "paraparliamentary" politics and large-scale petitions. The second half of the eighteenth century saw a multiplication of special interests associations (Morris, 1990). "Box clubs" bringing together members of a particular trade met regularly in pubs, with the innkeepers holding their funds and papers in locked boxes dedicated to them (Tilly, 1995, p. 143). In enfranchised boroughs, Parliamentary elections became a moment for non-electors to express their grievances and demands (O'Gorman, 1992).[38] The link between local elections and resistance to technology adoption is made explicit by Mr. Stark, a Norwich manufacturer interviewed in 1838:

> Between 50 and 60 years ago, [...] manufacturers in Norwich were in the most flourishing conditions. It is my opinion [that the] principal cause why the trade of Norwich has been so pirated [...] is, the want of keeping pace with the North in the introduction of machinery. [...] It may be asked, why was not this done? I believe simply on account of the existence of a violent and odiously virulent party spirit. [...] No man of either political party could introduce machinery into this city but he would in all probability, at some party election contest (particularly if he took an active part in it), be held up as an obnoxious individual, perhaps as one who had been the cause of the lowering of wages [...] my firm opinion is, that whilst the present detestable party animosity exists, no one will attempt to keep pace with any other manufacturing communities (Symons et al., 1839, p. 308).

In this section, we test this hypothesis and distinguish it from two main alternative explanations. First, the possibility that judicial and administrative independence operating during the nineteenth century might affect technology adoption. This hypothesis reflects the idea that self-governing institutions tend to produce an oligarchic elite who over time might impose entry barriers limiting entrepreneurial activities

[37] Phillips (1982) for example, opposes the nonpartisan and apolitical 1761 Norwich election to the heavily partisan and issue-oriented campaign of July 1802.

[38] O'Gorman (1992, p. 81) remarks that campaigning politicians "focused not only upon the rights of electors, but upon the place of the non-electors within the political community, rights of access to its benefits and, indeed, more general issues concerning relationships between the leaders of communities and the mass of the people within them."

and constraining growth (Mokyr, 1994; Acemoglu, 2008; Stasavage, 2014). Second, we consider the hypothesis that more developed cities experienced a lack of technology adoption independently of their institutions. Because a higher share of artisans implied a larger proportion of economic losers, economic differences could have determined alone a higher level of resistance to technology adoption diverting factory location. To this purpose, we decompose the effect of royal status on technology adoption and provide a mediation analysis distinguishing between the role of nineteenth-century self-governance, the share of handicrafts, and parliamentary representation.[39] We then study the effect on riots and petitions, the two key modes of political engagement to resist technology adoption. Finally, we show that the effects are larger in boroughs with larger electorates.

6.1 The Role of Parliamentary Representation

To test the role of parliamentary representation in explaining the effect of royal status on factory location, we augment Equation 2 including Parliamentary representation ($ParlRepr$) as a mediating factor of the effect of royal status on factory development ($Factories$). We then compare the role of Parliamentary representation to the two key alternative explanations discussed above, nineteenth-century self-governance, and the share of handicrafts.[40] We estimate the following model:

$$Factories_b = \alpha + \beta Royal_b + \omega W_b + \sigma ParlRepr_b + County_b + \varepsilon_b \tag{4}$$

Table 4 column (1) shows that when we include Parliamentary representation, the negative relationship between traditional economic activities and factories becomes positive. Moreover, the effect of parliamentary representation on factory location, conditional on royal status, is negative and statistically significant. This result suggests that royal status affects factory development in two ways. On the one hand, it has a negative effect on factory development through its role in the acquisition of Parliamentary representation. On the other, once this relationship is taken into

[39] In Tables C.11 we show, as in Angelucci et al. (2022), that royal boroughs were more likely to receive a Charter of Liberty before the 14^{th} century mentioning property rights, mercantile privileges, fiscal privileges, judicial independence, and political independence. Table C.13 extends the results by looking at self-governing rights in 1835, at the eve of the Municipal Corporation Act. We find that royal boroughs were more likely to be Corporate towns, to elect a major, had some form of criminal and civil jurisdiction independent from the county, and had a higher number of councilors in their Common councils and magistrates.

[40] W is a vector that includes geographical and population controls as well as other variables that we will use to control for additional mechanisms potentially related to parliamentary representation.

account, royal status has a positive direct effect on factories' location.

In column (2) of Table 4, we separately control for municipal self-governance in 1835. We find that the effect of royal status, conditional on 19^{th} century self-governance, is still negative and statistically significant indicating that controlling uniquely for 19^{th} century self-governance is not enough to explain the negative effect of royal status. Finally, we repeat the same exercise including the role of the share of handicrafts in 1831. In column (3) of Table 4 we find that the effect of royal status is still negative.

In column (4) of Table 4, we run a model including parliamentary representation, 19^{th} century self-governance, and the share of handicrafts in 1831. We find that the effect of parliamentary representation on factories' location is negative, suggesting that political franchise is the main mechanism explaining the lack of technology adoption in royal boroughs. Instead, we find that the effect of 19^{th} century self-governance on factories' location is positive and statistically significant, and the effect of the share of handicrafts is positive, albeit not significant. These results show that local self-governance in the nineteenth century had a positive effect on technology adoption, discarding the hypothesis that the urban elite through by-laws regulation had the willingness or the ability to enforce restrictive regulation. Instead, we find that richer places, conditionally on parliamentary representation, were more likely to develop the new industries. This fact weighs against the hypothesis that our results reflect local differences in prices of labor and capital (Allen, 2009a). Instead, Table 4 reconciles the negative relationship between pre-industrial growth and industrial development with the literature that highlights the positive relationship between modern economic activities and skill and technology adoption during the British Industrial Revolution (Kelly et al., 2014; Nuvolari, 2002; Heldring et al., 2021; Mokyr et al., 2022; Kelly et al., 2023).

6.1.1 Robustness and Alternative Mechanisms

Appendix F.1 shows that the negative relationship between parliamentary representation and factories' location is robust to alternative measures and specifications.

Medieval self-governance. While our specification in Table 4 captures alternative institutional channels through nineteenth-century self-governing institutions, medieval self-governance not formally transmitted to the nineteenth century might still affect economic outcomes through unobservables. For example, oligarchic elites might be more influential in royal cities even in absence of formal self-governance in the nineteenth century. To address this possibility in Table F.27, we control for a measure of

medieval self-governance.[41]

Guilds. Given the discussion about the relationship between medieval self-governance, guilds, and innovation and economic development (Epstein and Prak, 2008; Ogilvie, 2014; Desmet and Parente, 2014; De la Croix et al., 2017), we code information on medieval guilds from Gross (1890) and control for this measure in column (2) of Table F.27 in addition to medieval self-governance.[42]

Access to Physical and Human Capital. While Table 2 shows the strong presence of handicrafts in royal boroughs, these cities might have lacked other professions or access to the capital necessary to build the new factories. In Table F.28, we employ the first available census (1831) that provides information by occupations to show the distribution of professions across royal and non-royal boroughs. Results indicate clearly that the population in royal cities was more engaged in professions and handicrafts, less in agriculture, and had more access to capital. A larger group of non-agricultural workers and tradesmen, together with the lack of difference in the share of machine makers, indicates that human capital was still more readily available in 1831 in royal cities than in non-royal ones. These results rule out the possibility that lack of access to physical or human capital could explain our results.

Occupational Structure. Additionally, differences in the occupational structure might reflect differences in average wages that might have affected the location decisions of the early factory masters. To account for this possibility, in column 3 of Table F.27 we control for the whole distribution of occupations and show that the results are not affected. Given the higher correlation between soil suitability, wage structure and occupational distribution (Kelly et al., 2023), this estimate indicates that our results are not explained by differences in wages and skill distributions.

Other Measures of Pre-Industrial Development. Column (4) of Table F.27 shows that the results are unchanged when we control for all measures of pre-industrial economic development presented in Section 5.2 instead of only the share of handicrafts in 1831.

Real Property Value. An additional possibility is that differences in the land value that reflects institutional characteristics rather than natural endowments might explain the negative relationship between royal status and the number of factories. Royal cities might either provide services that increase the value of the land or have a more efficient administration able to enforce taxes more loosely imposed elsewhere.

[41] We define a borough as having self-governing rights if the borough received any Charter of Liberty by the fourteenth century.

[42] Our coding includes all boroughs that were granted the permission to form a guild by 1450 according to Gross (1890).

Both factors would discourage entrepreneurs from establishing factories there. To rule out this hypothesis, we collect information on the annual value of real property assessed in April 1815 reported in the British Parliamentary Papers (1815). These evaluations served as the basis of the land tax that was levied in the 1690s and whose rate remained unchanged since (Ginter, 1992). Columns (5) and (6) of Table F.27 show that controlling for land value and land value per squared meter does not affect the patterns found in Table 4.

Local Taxation. During the nineteenth century, the principal source of local financing was a tax on property (Chandler, 2013a). Local taxes were mainly used for the relief of the poor, the maintenance of infrastructures, and the administration of justice (Douglas, 1999). Differences in the level of taxation between royal and non-royal boroughs could therefore distort industrial development providing an alternative explanation for our results. However, given the limited size of local taxes during the period of the Industrial Revolution, this hypothesis seems unlikely. In Table F.29, we report estimates of local taxation as a share of the national income from Hartwell (1981). These figures indicate that local taxes fluctuated between 1.4 and 3.2% of national income between 1750 and 1850.

6.1.2 Quantification

Following Imai et al. (2010), we use the results in Tables 3 and 4 to provide a suggestive magnitude of the effect of royal borough mediated by parliamentary representation. Column (1) of Table 3 shows that royal boroughs have, on average, eight factories less than non-royal boroughs, that is, almost two times lower than the average number of factories in a city. This is the *total* effect of royal boroughs on the number of factories. However, from columns (4) of Table 4 it emerges that the *direct* effect of being a royal borough on the number of factories is instead positive and equal to a difference of around four factories. To compute the effect of royal status on factories *mediated* by parliamentary representation, we estimate the relationship between royal status and parliamentary representation, both alone and including a set of institutional and economic controls (Table F.31).[43]

Using these results, we find that the effect of royal boroughs mediated by parliamentary representation is statistically significant and equal to a negative difference of

[43]

$$ParlRepr_b = \psi + \rho Royal_b + \kappa W_b + County_b + \epsilon_b \tag{5}$$

eight factories between royal and non-royal boroughs (column 4).[44] This mediation effect is computed controlling for alternative mediating channels such as self-governance and the share of handicrafts.[45]

Underlying Assumptions. The interpretation of the mediation effect hinges on two assumptions about the exogeneity of the condition of being a royal borough and having parliamentary representation. The sequential ignorability assumptions imposed in Imai et al. (2010) require that i) conditional on controls, selection into royal status is not affected by unobservable characteristics that might influence economic outcomes and parliamentary representation,[46] and ii) conditional on controls and royal status, selection into Parliamentary representation is not influenced by unobservables factors relate to industrial development. We provide evidence in favor of i) in Tables E.17 and Panel A of F.30 and in favor of ii) in Panel B of Table F.30, all reported in Appendix E.1.

As noted in Section 5.4 the confounding effect of unobserved variables on the relationship between royal status and factories should be implausibly large. This suggests statistical independence between royal status and the potential outcomes in industrial development. Assumption i) also requires that royal status is also as-random when we consider its association with having parliamentary representation. In Panel A of Table F.30, we quantify the selection on unobservables in the estimation of the effect of royal status on parliamentary representation, conditioning of population, geographical controls, pre-industrial economic development, and institutional variables. We find that unobservable variables should explain about twice the variation in parliamentary representation explained by royal status to bring the effect of royal status to zero. To provide evidence in favor of assumption ii), in Panel B of Table F.30, we show that the effect of parliamentary representation on industrial development is not sensitive to the presence of unobservable characteristics conditional on royal status, geographic characteristics, population controls, and alternative mediating channels. Unobservable variables should explain between two and six times the variation explained by controls to have the effect of Parliamentary representation on the number

[44] Following Imai et al. (2010), the average mediation effect is obtained as the interaction between the effect of royal status on constituency (0.172), the coefficient ρ in Equation 5 and estimated in column (2) of Table F.31, and the effect of parliamentary representation on factories (-48.14), the coefficient σ in Equation 6 and estimated in column (4) of Table 4.

[45] The mediation effect controlling or not for these alternative channels of parliamentary representation is always negative and significant. However, controlling for self-governance and the share of handicrafts diminishes the mediation effect from -17.68 to -8.26 (see columns 2 and 4 of Table 4).

[46] This is the same assumption described in Section 5.4 conditional on a larger set of controls.

of factories statistically equal to 0.

6.2 Local Elections and Resistance to Technology Adoption

Our argument on the relationship between parliamentary representation and lack of technology adoption hinges on the idea that parliamentary representation generated the social capital required for effective resistance to mechanization.

Two were the key political strategy available to the working population: petitions and riots and protests. Riots and legal political activities were used in a complementary way to resist the transformation. The pattern usually involved the workers' attempt to petition Parliament and secure intervention in support of the old regulation or the adoption of new legislation that would prevent welfare-decreasing consequences for the workers.[47] However, because the British government was more favorable to the innovators, labor disputes often resulted in conflict outbreaks (Randall, 1991; Mokyr, 1998).

While already important in the mid 18th century (Loft, 2019), petitions' number grew during the first decades of the 19th century (Huzzey and Miller, 2020). Although mostly unsuccessful, at times, workers secured Parliament's intervention, regulating the trade to their advantage. For example, in 1773 the silk weavers from Spitalfields (London) obtained an act of Parliament that regulated the trade to their advantage, with fixed wages and governmental arbitration of disputes between workers and masters. For fifty years thereafter, the Spitalfields weavers avoided the wage reduction occurring in other branches of British manufacturing (Clapham, 1916; Tilly, 1995). In many other cases, petitioners were not as successful. The disputes in the woolen industry over the enforcement of the old regulation (rules on manufacturing, use of gig mills, number of looms that could be owned, and apprenticeship law) moved to Parliament in 1802-1803, were petitions on both sides of the conflict were sent (Randall, 1998). Parliament, after having rejected the legal and constitutional efforts to enforce a complete ban on gig mills in accordance with 5 and 6 Edward VI c. 22, decided to repeal all statutes regulating the trade (Belchem, 1995, p.34).

Riots followed a similar pattern., peaking in the Luddite revolt of 1812. Historians have highlighted riots' importance and frequency. Riots against the flying shuttle were widespread in 1758, 1785-7, 1810-13, and 1822. Hargreaves' spinning jenny was attacked by several mobs (1767, 1769, and 1779). Assaults on the Arkwright-type of factories were first recorded in 1779 and the Luddites' attacks on the power loom

[47] One example is the proposal to tax the new machines to provide relief to the displaced workers (Berg, 1980, p. 242).

in 1812 (Nuvolari, 2002). It is apparent that such protests could have an effect on the early entrepreneurs' decisions on factory location given their need to arrange for their own security (Pollard, 1964). For example, when in 1779 workers attacked ten factories, Arkwright's concerns for the workers' resistance induced him to put his mill at Cromford into a state of siege. For this purpose, fifteen hundred "stand of small arms and a great battery of cannon" were mobilized (Berg, 2005, p.164).[48] Anecdotal evidence suggests that entrepreneurs' decision of factory locations was influenced by the fear of workers resistance. This was the case in the Hargreaves and Arkwright's decision to move the first mills in 1768 to avoid attacks on the spinning machines (Allen, 2009b).

In this section, we present three pieces of evidence linking parliamentary representation, collective action, and lack of technology adoption. First, we show the heterogeneous effect of royal status on factory location by the size of the electorate. Second, we show the direct effect of royal status on riots and petitions. Finally, we show that the effect of royal status on riots and petitions is larger depending on the size of the electorate.

6.2.1 Local Elections

To analyze the heterogeneous effect of royal status on factory location by the size of the electorate, we classify boroughs electorate following Bogart (2016) and Sedgwick (1970) categorization. We estimate the following Model, that augments Equation 6 allowing for a different effect depending on the size of the electorate:

$$Factories_b = \alpha + \beta Royal_b + \omega W_b + \sigma ParlRepr_b + \xi LargeElectorate_b + County_b + \varepsilon_b \tag{6}$$

where $LargeElectorate$ is a dummy that proxied whether the parliamentary franchise encompassed a large fraction of the electorate, as defined in Bogart (2016) and Sedgwick (1970).

The results in column (1) of Table 5 show a clear picture: the average effect of royal boroughs on industrial development is stronger in parliamentary constituencies with large electorates. In Table F.32 in Appendix F.3, we confirm this result using additional institutional classification. We divide between rotten and non-rotten boroughs. Rotten boroughs are corrupted boroughs, typically captured by a local lord seeking access to Parliament where elections were ridden or nonexistent. We

[48] Original quote in Fitton and Wadsworth, 1958 p. 79

also analyze boroughs controlled by the local oligarchy and whose franchise only included members of the municipal corporation or the burgage holders. We find that boroughs controlled by a local oligarchy (corporation) or a local lord (rotten), where popular politics was restricted, attracted more factories than in other parliamentary constituencies.

6.2.2 Petitions to Parliament

To analyze petitions to parliament, we digitized and geocoded parliamentary petitions from the *Journal of the House of Commons*. We select petitions by searching for co-occurrences of the words 'manufacture' and 'petition' in the *Journal*, from 1688 to 1834. We then digitize the content of 2,435 days of work of the House and separately identify each paragraph. In the most restrictive procedure, we identify 4,398 single petitions and geocode 1,288 petitions. We propose several city-level measures of petitions to account for potential biases. The procedure is described in Appendix A.5.

In Table 5, we consider petitions as an outcome. In column (2) we find that royal boroughs had higher numbers of petitions than non-royal boroughs. Royal boroughs sent 73 percent more petitions to Parliament than non-royal boroughs. In Table F.34, we provide evidence that the main effect on petitions is robust to alternative measures of the outcome variable.

Controlling for parliamentary representation and whether constituencies included a large fraction of the electorate significantly reduce the effect of royal status on petitions (columns 3 and 4 of Table 5). Moreover, parliamentary representation, and in particular a larger franchise, are associated with a large number of petitions to the Parliament (columns 3 and 4). The results are in line with those presented in column (1). In fact, in Table F.32, we also find that petitions were lower in less democratic parliamentary constituencies, such as rotten boroughs or where the franchise was based on local corporations.

6.2.3 Riots

We finally analyze the effect on riots. In our main estimation, we pool together information on popular disturbances and industrial protests. The reason for this choice is that both represent a direct form of collective action of pre-industrial, and industrial

workers finalized to the solution of local grievances (Hobsbawm, 1952; Nuvolari, 2002; Bohstedt, 2010; Charlesworth, 2017). We digitized the Atlas of Industrial Protest in Charlesworth et al. (1996). This book contains information on the location of protests against machines and Luddites protests in England from 1756 to 1826. We integrate this information with data on attacks on machines and arsons between 1758 and 1832 from newspapers digitized by Caprettini and Voth (2020). Finally, we include information on popular disturbances collected by Bohstedt (2010) and geocoded by Chambru and Maneuvrier-Hervieu (2022). Appendix A.3 provides additional information on data on protests and riots.

Table 5 columns (5-7) presents results on protests and riots. The outcome variable is the log number of the protests registered from 1700 to 1829 across all the sources described above. The results indicate a pattern analogous to the one described in the case of the petitions. Inhabitants in royal boroughs were almost twice more likely to riot. The effect is mostly coming from parliamentary constituencies and predominantly larger electorates. In Table F.32, we show that the effect on riots is negative in rotten boroughs and boroughs controlled by a corporation.

Table F.33 provides additional evidence on the relationship between royal boroughs and collective action. In Panel A, we show that royal cities had a higher level of food riots, the prevalent mode of pre-industrial political action (Bohstedt, 2010). In Panel B, we analyze three different variables. First, column (4) shows the relationship between royal status and the Swing Riots. These were rural protests that occurred between 1830 and 1832 due to the introduction of the threshing machine in the harvest of wheat (Caprettini and Voth, 2020). Finally, results in columns (5) and (6) show that the results do not change when we only study industrial protests in the period of the Industrial Revolution.

While results in columns (5) and (6) confirm our main analysis, the analysis of the Swing Riots (4) and of pre-industrial protests (food riots) provides evidence that working people in royal boroughs had a higher level of organizational capacity that was independent of the specific economic threat represented by innovation in textile.

6.2.4 Child and Female Labor

Finally, Table F.35 reports the estimated effect of royal boroughs on child and female labor. We restrict the analysis to the sample of boroughs with an active factory to avoid capturing effects driven by the mere presence of an industrial workforce. We find that royal boroughs with factories employed both an economically and statistically significantly lower number of females (50 percent) and a lower number of

children, albeit not statistically significant.[49] These results indicate that workers in royal boroughs were more successful in avoiding skill dilution and are consistent with the hypothesis that royal boroughs affected workers' organizational capacity and bargaining power.

7 Conclusions

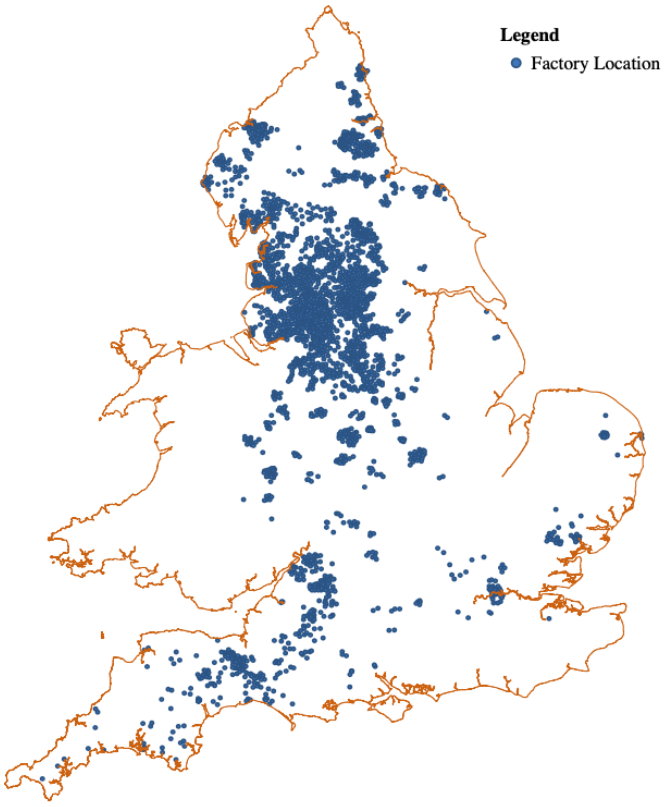
This paper studies the role of local institutions in facilitating collective action and promoting social capital in determining the rise of pre-industrial growth and the lack of technology adoption during the British Industrial Revolution. We document a strong negative relationship between early economic development and industrial development, both using a sample of all English parishes and a sample of cities. The pattern holds across several measures of economic activities over time including a striking negative relationship between the share of handicrafts and the number of factories in the 1830s. We show that this negative relationship cannot be explained by geographic factors such as access to transportation networks, proximity to coal or water power, and agricultural suitability.

We explain these results by analyzing the role of local institutions. We show that Parliamentary representation is the key driver of the observed patterns. Once we account for parliamentary representation, economic activities, and nineteenth-century self-governance positively affect industrialization, while Parliamentary representation captures the negative effect. Why Parliamentary representation has a negative effect on industrialization? We show that local representative institutions contributed to the local population's participation in local political activities, forming ties and decreasing the cost of voicing grievances. In turn, a higher level of organizational capacity of the working force affected their ability to effectively resist the development of the factory system pushing the relocation of productive activities away from the traditional centers of production. These results show the complex relationship between social capital and economic growth. We find that institutions facilitating collective action and civic capital formation promote (Smithian) growth by increasing public good provision, however, by facilitating collective action, these same institutions prevent (Shumpeterian) growth when technology adoption might hurt part of the population.

[49] Child and female employment is measured in 1838. The Cotton Mills and Factories Act of 1819 first regulated child work by forbidding children below 9 years to work and restricting the working hours of children between 10 and 16 years old to a maximum of 12 hours per day (British Parliamentary Papers, 1819).

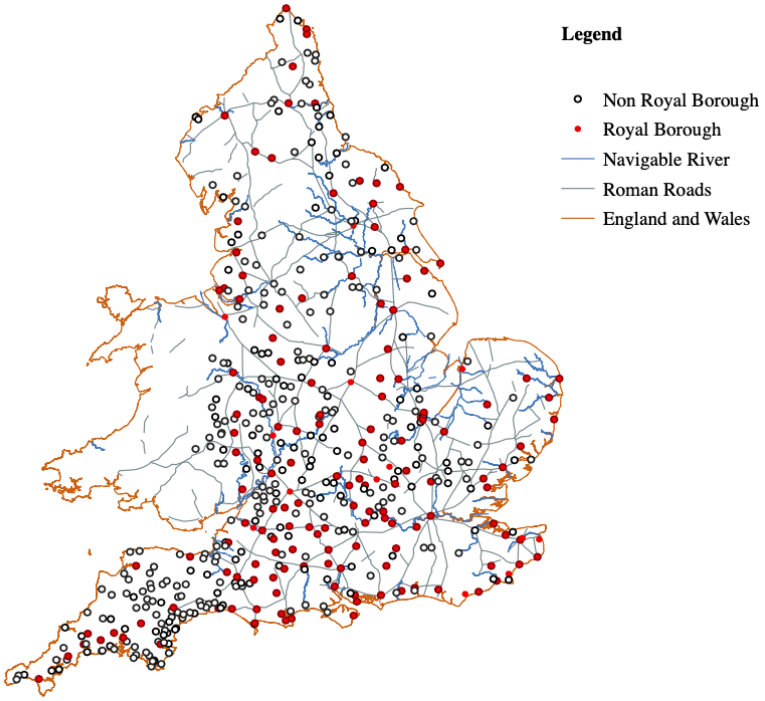
8 Figures and Tables

Figure 1: Map of Factories Locations



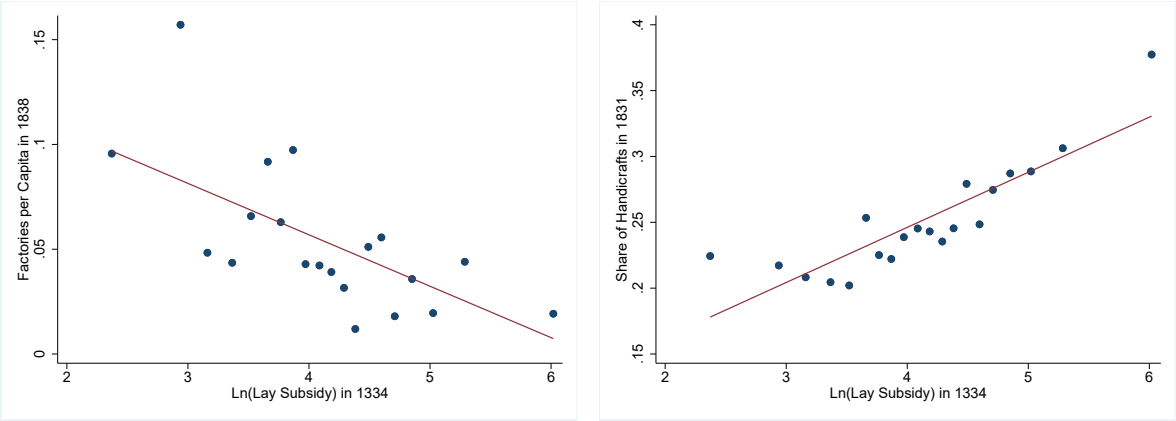
Notes: The figure represents the location of textile factories in England in 1838. Each dot is a factory.

Figure 2: Map of Boroughs Locations



Notes: The figure represents the location of royal and non-royal boroughs, the network of navigable rivers, and Roman roads.

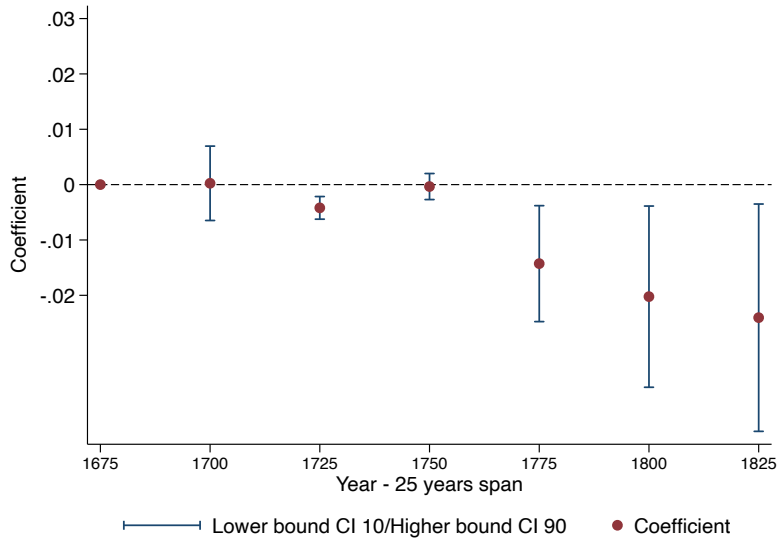
Figure 3: Industrialization and Early Economic Development



(a) Reversal in Industrial Growth (b) Persistence in Pre-industrial Growth

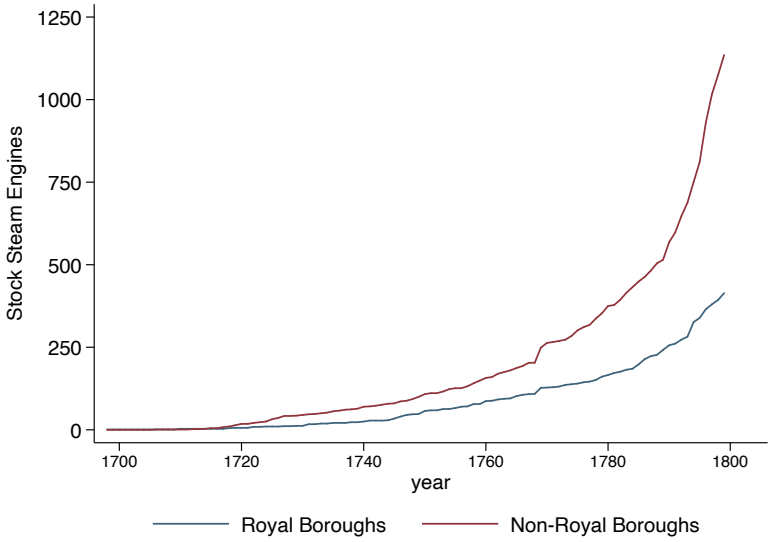
Notes: Binned scatterplots. The y-axes correspond to the number of textile mills per 1,000 inhabitants in 1838 (Panel 3a) and the share of handicrafts in 1831 (Panel 3b). Per-capita mills are computed using the population in 1831. The x-axes corresponds to the log value of lay subsidies (taxable wealth) in 1334. Observations are at the minimum common geographic unit (quasi-parish). Sample: all parishes in England.

Figure 4: Royal Boroughs and Temporal Changes in the Location of the Textile Industry



Notes: The figure shows the difference in the proportion of textile manufacturers (out of the total labor force) between royal and non-royal boroughs. Coefficients obtained regressing the ratio between workers occupied in textile manufacturing over the total labor force on the interaction between a dummy indicating whether the city was a royal borough and year fixed effects, controlling for city and year fixed effects. Each time observation includes the total number of textiles workers and labor force aggregated in the following 25 year spans 1675-1699 (1675), 1700-1724 (1700), 1725-1749 (1725), 1750-1774 (1750), 1775-1799 (1775), 1800-1824 (1800), 1825-1831 (1825). Standard errors clustered at the city and year levels. The 1675-year dummy has been omitted. Sample used: cities that had a medieval borough and had at least one observation in the historical occupations database.

Figure 5: Royal Boroughs and Steam Engines Adoption



Notes: The figure shows the total number of steam engines registered in a given year in royal and non-royal boroughs.

Table 1: Early Development and Industrial Location

Panel A: *Parish Level*

	Ln Lay Subsidy per Capita	Market Presence	Share Handicrafts	N. Factories
	(1527)	(1600)	(1831)	(1838)
	(1)	(2)	(3)	(4)
Lay Subsidy Value in 1334	0.2091***	0.2423***	0.0629***	-3.7047***
	(0.019)	(0.005)	(0.001)	(0.357)
Observations	6135	6290	6270	6290
Mean DV	2.7516	0.3519	0.2512	1.4948
Geo. Controls	Yes	Yes	Yes	Yes
Pop. Controls	No	No	Yes	Yes
County FE	Yes	Yes	Yes	Yes
R^2	0.4208	0.3238	0.3411	0.6889

Panel B: *Borough Level*

	Ln Lay Subsidy per Capita	Market Presence	Share Handicrafts	N. Factories
	(1527)	(1600)	(1831)	(1838)
	(5)	(6)	(7)	(8)
Lay Subsidy Value in 1334	0.2508***	0.1254***	0.0517***	-5.0839***
	(0.029)	(0.008)	(0.002)	(0.521)
Observations	2951	3071	3065	3071
Mean DV	2.7622	0.7489	0.3366	3.5106
Geo. Controls	Yes	Yes	Yes	Yes
Pop. Controls	No	No	Yes	Yes
County FE	Yes	Yes	Yes	Yes
R^2	0.5375	0.3954	0.4991	0.7727

Notes: Independent variable is the log value of lay subsidies (taxable wealth) in 1334. Outcomes variables are the log of lay subsidies per capita in 1527 (1 and 5), a dummy equal to one if the location had a market in 1600 (2 and 6), the share of handicrafts in 1831 (3 and 7), the number of factories in 1838 (4 and 8). Observations are at the minimum common geographic unit (quasi-parish). We use frequency weights given by the number of places inside a geographical unit. Sample in Panel A includes the whole of England. Sample in Panel B includes only the subset of cities, that is all the geographical units that were a medieval boroughs. Mean DV is the average of the dependent variable. We include geographical controls (Geo. Controls) in all columns, and population in 1801 and 1831 (Pop. Controls) in columns (3) and (4). County FEs are county dummies. Robust standard errors in parenthesis. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 2: Royal Boroughs and Traditional Economic Development

	Ln Lay Subsidy Value in 1334	Ln Lay Subsidy per Capita in 1527	Any Market or Fair in 1600	Share of Handicraft in 1831
	(1)	(2)	(3)	(4)
Royal Borough	0.755***	0.412***	0.121***	0.0980***
	(0.0377)	(0.0480)	(0.0114)	(0.00398)
Observations	3071	4096	4221	4214
Mean DV	4.319	2.434	0.741	0.328
Geo. Controls	Yes	Yes	Yes	Yes
Pop. Control	No	No	No	Yes
County FE	Yes	Yes	Yes	Yes
R^2	0.694	0.614	0.296	0.433

Notes: Independent variable is a dummy equal to one if the city had a medieval royal borough. Dependent variables are the average lay subsidies per capita paid in 1527 (1), a dummy equal to 1 if the borough had a market and a fair in 1600 (2), the share of males above 20 years of age employed as handicrafts in 1831 (3) and the number of textile mills in 1838 (4). Observations are at the minimum common geographic unit (quasi-parish). We use frequency weights given by the number of places inside any geographical unit. Mean DV is the average of the dependent variable. We include geographical controls (Geo. Controls) in all columns and population in 1801 (Pop. Control) in column (4). County FEs are county dummies. Sample of cities that had a medieval borough. Robust standard errors in parenthesis. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 3: Royal Boroughs and Industrial Development

	N. Factories			N. Factories per 1000 In.	N. Workers	Horse Power per Worker	N. Steam-engines
	1768-88	1838	Difference				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Royal Borough	1.310***	-8.406***	-9.716***	-0.0111*	-630.9***	-6.235***	-0.260***
	(0.125)	(1.123)	(1.080)	(0.00589)	(126.7)	(0.948)	(0.0594)
Observations	4221	4221	4221	4215	4221	4221	2116
Mean DV	0.254	3.986	3.733	0.0677	482.8	3.457	0.201
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.576	0.719	0.718	0.0914	0.718	0.731	0.510

Notes: Independent variable is a dummy equal to one if the city had a medieval royal borough. Dependent variables are the number of Arkwright-type cotton factories built between 1768 and 1888, the number of textile mills in 1838 (2), the difference between the number of Arkwright-type cotton factories built between 1768 and 1888 and the number of textile mills in 1838 (3), the number of textile mills per 1,000 inhabitants (4), the number of workers in textile mills (5), the total number of steam-engines in textile mills (6), and the horsepower per worker (7). Per-capita mills are computed using the population in 1831. Observations are at the minimum common geographic unit (quasi-parish). We use frequency weights given by the number of places inside any geographical unit. Mean DV is the average of the dependent variable. We include geographical and population in 1801 controls. County FEs are county dummies. Sample of cities that had a medieval borough. Robust standard errors in parenthesis. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 4: Channels: Parliamentary Representation and Economic Conditions

	N. Factories 1838			
	(1)	(2)	(3)	(4)
Royal Borough	9.248***	-6.623***	-5.388***	3.751**
	(1.449)	(1.573)	(1.061)	(1.508)
Parliamentary Representation	-31.30***			-48.14***
	(1.618)			(2.270)
19th Century Self-Governance		-3.259*		26.84***
		(1.907)		(2.628)
Share of Handicrafts 1831			-31.10***	0.791
			(5.331)	(6.238)
Observations	4214	4214	4214	4214
Mean DV	4.026	4.026	4.026	4.026
Controls	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes
R^2	0.742	0.719	0.720	0.752
AMedE Parl.	-17.68	.	.	-8.260
AMedE Parl. s.e.	1.128	.	.	1.128

Notes: The outcome variable is the number of factories in 1838. Royal Borough is a dummy equal to one if the city had a medieval royal borough. Parliamentary Representation is a dummy equal to one if the city was a parliamentary constituency before the Great Reform Act of 1832. 19th Century Self-Governance is a dummy equal to one if the city was a Corporate Town before the Municipal Corporation Act of 1835. Share of Handicrafts 1831 is the share of males above 20 years of age employed as handicrafts. Observations are at the common minimum common geographic unit (quasi-parish). We use frequency weights given by the number of places inside any geographical unit. Mean DV is the average of the dependent variable. We include geographical and population in 1801 controls. County FEs are county dummies. Av. Med. Eff. refers to the average mediation effect and its respective standard error (s.e.) calculated as in Imai et al. (2010) as the interaction between the estimated effect of Royal Borough on Parliamentary Representation (Table F.31) and the effect of Parliamentary Representation on the outcome. Sample of cities that had a medieval borough with non-missing observations in all the columns. Robust standard errors in parenthesis. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 5: Institutional Heterogeneity, Riots, and Factories

	N. Factories 1838	Ln Petitions 1688-1834			Ln Riots 1700-1829		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Royal Borough	16.69***	1.923***	0.879***	0.396***	1.376***	1.042***	0.751***
	(1.465)	(0.0732)	(0.0772)	(0.0742)	(0.0569)	(0.0614)	(0.0566)
Parliamentary Representation	-21.54***		1.848***	1.218***		0.590***	0.209***
	(1.552)		(0.0734)	(0.0794)		(0.0531)	(0.0552)
Large Parliamentary Electorate	-35.93***			2.331***			1.408***
	(1.913)			(0.107)			(0.0822)
Observations	4221	4221	4221	4221	4221	4221	4221
Mean DV	3.986	1.110	1.110	1.110	0.609	0.609	0.609
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.755	0.595	0.655	0.696	0.580	0.594	0.628

Notes: The outcome variables are the number of factories (column 1), the number of petitions to the Parliament (columns 2 to 4), and the number of riots (column 5 to 7). Parliamentary Representation is a dummy equal to one if the city was a parliamentary constituency before the Great Reform Act of 1832. Royal Borough is a dummy equal to one if the city had a medieval royal borough. Large Electorate is a dummy equal to one if the city was a constituency that had a large electorate, as defined by Bogart (2016) and Sedgwick (1970), respectively. Observations are at the minimum common geographic unit (quasi-parish). We use frequency weights given by the number of places inside any geographical unit. Mean DV is the average of the dependent variable. We include geographical and population in 1801 controls. County FEs are county dummies. Sample of cities that had a medieval borough. Robust standard errors in parenthesis. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

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Appendix

A Data

A.1 Industrial mills

We digitize the information in British Parliamentary Papers (1839) to obtain the location and characteristics of industrial mills. Between 1837 and 1838, four different inspectors were sent to England, Wales, Scotland, and Ireland to collect information at the parish level about the number of mills, the use of steam engines or water wheels, the moving power, and the total employment used in the mills, for the manufacturing of cotton, worsted, woolen and flax products. Out of the 685 parish entries, 422 were in England. We merge these parishes with the map (Satchell et al., 2016). For the other observations, we proceed in the following way:

I) When the name of the parish or county in the British Parliamentary Papers and on the map do not correspond, we manually correct the names or counties for these cases. II) When entries in British Parliamentary Papers (1839) do not correspond to parishes but to other administrative levels (registration districts, registration subdistricts, or hundreds), we match the mill entry to the closest geographic unit on the map. We match 401 entries to geographic units in the map provided by Satchell et al. (2016). 370 entries were matched to parishes, 14 to registration subdistricts, 17 to registration districts, and 1 to a hundred.

The locations matched at the registration subdistrict level are:

- BOW — MIDDLESEX
- BRIDGNORTH — SHROPSHIRE
- COGGESHALL — ESSEX
- CREWKERNE — SOMERSET
- DEVIZES — WILTSHIRE
- FAZELEY — STAFFORDSHIRE
- HACKNEY — MIDDLESEX
- LICHFIELD — STAFFORDSHIRE
- LIMEHOUSE — MIDDLESEX
- LUDLOW — SHROPSHIRE
- MARKET HARBOROUGH — LEICESTERSHIRE
- SHADWELL — MIDDLESEX

- STAFFORD — STAFFORDSHIRE
- WALTHAM ABBEY — ESSEX

The locations matched at the registration district level are:

- BOLTON — LANCASHIRE
- CARLISLE — CUMBERLAND
- COLCHESTER — ESSEX
- DERBY — DERBYSHIRE
- DURHAM — DURHAM
- EXETER — DEVON
- ISLINGTON — MIDDLESEX
- LEICESTER — LEICESTERSHIRE
- LONDON CITY — LONDON
- MALMSBURY — WILTSHIRE
- NEWCASTLE-UPON-TYNE — NORTHUMBERLAND
- NORWICH — NORFOLK
- NOTTINGHAM — NOTTINGHAMSHIRE
- OLDHAM — LANCASHIRE
- READING — BERKSHIRE
- SADDLEWORTH — YORKSHIRE, WEST RIDING OF
- TAUNTON — SOMERSET

Finally, the matched at the hundred level is Southwark Borough (Surrey).

A.2 Medieval Boroughs

We digitize the list of English medieval boroughs from Beresford and Finberg (1973). For each medieval borough, we collect information on the year of the first mention and the type of borough (royal, ecclesiastic, lay seignorial, or mixed category). We obtain information on 612 boroughs. 553 boroughs possess information about the type (143 were ecclesiastic, 158 royal, 236 lay seignorial, 15 mixed with a royal, and 16 mixed in other ways). 600 boroughs possess information about the year first mention–560 of which were first mentioned before the emergence of the Black Death in England in 1348. 544 boroughs possess information about both the year first of first mention and the type.

Second, we combine information on medieval boroughs with data from Gross (1890) about merchant guilds. We obtain 105 boroughs with a medieval guild.

Third, we collect information from Ballard (1913) and Ballard and Tait (1923) about the year and type of grants (Charter of Liberties) received by each borough. We code the following types of grants: Burgage Tenure and Law of Real Property; Tenurial Privilege; Burgess Franchise; Courts; Modes of Trial; Procedure; Punishments; Distress; Borough and Shire Bye-Laws; Markets and Fairs; Guilds and Trading; Borough Finances; Borough Officers; and Public Services. In Ballard (1913) and Ballard and Tait (1923) there exists 213 boroughs with grant information, 28 of which in Wales. To match the grant data with the medieval borough location, we made some manual name changes, we separate Cinque Ports (Kent and Sussex) as five different observations and Rye and Winchelsea (Sussex) as two different observations. We cannot match two boroughs with a grant (Agardsley and Folkestone) with any medieval borough. We end up with 188 medieval boroughs with grant information.

Fourth, we obtain information on Parliamentary constituencies before the Great Reform Act of 1832 from Bogart (2016). This dataset also reports information on rotten boroughs, the type of franchise, the number of votes in the constituency, and the size of the electorate (large, medium, and small). Among the type of franchises, Bogart (2016) codifies whether the franchise was in Burgage Holders; Corporation; Freeholder or Freeman; Householder; or Scot and Lot. Boroughs, where the franchise was held by freeholders (small and medium landowners), freemen (shopkeepers and guildsmen), or households, had the largest and more democratic electorate. When the franchise was held by households paying local taxes (scot and lot), the franchise was less extensive. There were 204 constituencies in England (the other 13 were in Wales). We could match 200 constituencies with a medieval borough. 3 observations can not be matched to a specific borough (Cambridge University, Oxford University,

Westminster), while we eliminate Newport (Cornwall) because it was in a parish where existed a second constituency (Launceston).

Fifth, we obtain information in borough self-governance in 1835 from Fletcher (1842). This dataset reports information on whether boroughs in 1835 were Corporate towns and then had some form of self-governance. Moreover, we know whether they were municipal, manoral or unreported boorughs. We also know the kind of self-autonomy possessed by Corporate towns in terms of rights to elect a major, whether the Common Council was self-elected, whether the admission to freemen was by gift, whether the borough had some form of criminal and civil jurisdiction independent from the county, and the number of councilors in their Common Council and magistrates. Out of the 268 boroughs that were Corporate towns, Fletcher (1842) reports information only on 263, 223 of which were in England and the rest in Wales. We matched two Corporate towns (Romney Marsh and New Romney) to an unique medieval borough, while in two cases we match two medieval boroughs to a single Corporate town. We then end up with 222 medieval boroughs that were Corporate towns in 1835.

Finally, we match the database on medieval boroughs, guilds, grants, and parliamentary constituencies with the map from Satchell et al. (2016). We proceed in the following way. I) we assign to each parish a borough if the name of the borough and its county corresponds to the name of a unique parish in that county. II) if the names do not correspond, we determine manually the parish of the borough. III), when two boroughs are associated with the same parish, we keep the medieval borough that has parliamentary representation. If no parliamentary representation is present, we keep the medieval borough with a grant. If no constituency nor grants are present, we keep the oldest borough. We drop the following 12 medieval boroughs (2 of which received grants):

- NEWPORT — DEVON
- TINTAGEL — CORNWALL
- DURHAM (OLD BOROUGH) — DURHAM
- KNUTSFORD BOOTHS — CHESHIRE
- DUNHEVED-BY-LANCESTON — CORNWALL
- WILLINGTHORPE — LINCOLNSHIRE
- NEWBOROUGH — STAFFORDSHIRE

- LITTLE TOTNES — DEVON
- SUTTON PRIOR — DEVON
- TEMPLEMEAD — SOMERSET
- ELVET — DURHAM
- WAVERMOUTH — CUMBERLAND

IV), out of the 605 medieval boroughs, we merged 470 at the parish level and 61 at place level—a lower geographical unit. The remaining 74 boroughs were merged at a higher geographical unit than a parish. We merge 68 medieval boroughs with the following hundreds:

- BATH CITY — SOMERSET
- BEDFORD BOROUGH — BEDFORDSHIRE
- BEVERLEY BOROUGH — YORKSHIRE, EAST RIDING
- BOROUGH OF WARWICK — WARWICKSHIRE
- BRIDGNORTH BOROUGH — SHROPSHIRE
- BRISTOL CITY AND COUNTY — GLOUCESTERSHIRE
- BURY ST EDMUNDS — SUFFOLK
- CAMBRIDGE BOROUGH — CAMBRIDGESHIRE
- CANTERBURY CITY — KENT
- CARLISLE CITY — CUMBERLAND
- CHESTER CITY — CHESHIRE
- CHICHESTER CITY — SUSSEX
- CITY AND COUNTY OF LICHFIELD — STAFFORDSHIRE
- CITY AND UNIVERSITY OF OXFORD — OXFORDSHIRE
- CITY OF COVENTRY — WARWICKSHIRE
- CITY OF NORWICH — NORFOLK
- CITY OF ROCHESTER — KENT
- COLCHESTER BOROUGH AND LIBERTIES — ESSEX

- DERBY BOROUGH — DERBYSHIRE
- DEVIZES BOROUGH — WILTSHIRE
- DORCHESTER BOROUGH — DORSET
- DROITWICH BOROUGH — WORCESTERSHIRE
- DURHAM CITY — DURHAM
- EVESHAM BOROUGH — WORCESTERSHIRE
- EXETER CITY — DEVON
- GLOUCESTER CITY AND COUNTY — GLOUCESTERSHIRE
- GUILDFORD BOROUGH — SURREY
- HASTINGS CINQUE PORT — SUSSEX
- HEREFORD CITY — HEREFORDSHIRE
- HERTFORD BOROUGH — HERTFORDSHIRE
- HUNTINGDON BOROUGH — HUNTINGDONSHIRE
- IPSWICH BOROUGH — SUFFOLK
- KINGS LYNN BOROUGH — NORFOLK
- KINGSTON-UPON-HULL: TOWN PART — YORKSHIRE, EAST RIDING
- LAUNCESTON BOROUGH — CORNWALL
- LEICESTER BOROUGH — LEICESTERSHIRE
- LEWES BOROUGH — SUSSEX
- LINCOLN CITY — LINCOLNSHIRE
- LUDLOW BOROUGH — SHROPSHIRE
- MALDON BOROUGH — ESSEX
- MALMSBURY — WILTSHIRE
- MARLBOROUGH BOROUGH — WILTSHIRE
- NEW SARUM CITY — WILTSHIRE
- NEWCASTLE-UPON-TYNE BOROUGH — NORTHUMBERLAND
- NORTHAMPTON BOROUGH — NORTHAMPTONSHIRE

- NORTHWICH — CHESHIRE
- NOTTINGHAM TOWN AND COUNTY — NOTTINGHAMSHIRE
- PETERBOROUGH CITY — NORTHAMPTONSHIRE
- PLYMOUTH BOROUGH — DEVON
- READING BOROUGH — BERKSHIRE
- SHAFTESBURY BOROUGH — DORSET
- SHERBORNE TOWN — DORSET
- SHREWSBURY BOROUGH — SHROPSHIRE
- SOUTHAMPTON TOWN AND COUNTY — HAMPSHIRE
- SOUTHWARK BOROUGH — SURREY
- STAFFORD BOROUGH — STAFFORDSHIRE
- STAMFORD BOROUGH — LINCOLNSHIRE
- SUDBURY BOROUGH — SUFFOLK
- TAUNTON BOROUGH — SOMERSET
- THETFORD BOROUGH — NORFOLK
- TOWN OF DOVER — KENT
- TOWN OF SANDWICH — KENT
- WALLINGFORD BOROUGH — BERKSHIRE
- WAREHAM BOROUGH — DORSET
- WINCHESTER CITY — HAMPSHIRE
- WINDSOR BOROUGH — BERKSHIRE
- WORCESTER CITY — WORCESTERSHIRE
- YORK CITY — YORKSHIRE, EAST RIDING

Medieval boroughs that couldn't be matched at the hundred level, are matched at the registration subdistricts or district level. We merge London with its registration district. We merge 5 boroughs with the following registration subdistricts:

- ABINGDON — BERKSHIRE

- BOOTHAM — YORKSHIRE, NORTH RIDING
- BOSCASTLE — CORNWALL
- BRACKLEY — NORTHAMPTONSHIRE
- BUNGAY — SUFFOLK

A.3 Protests and Riots

Atlas of Industrial Protests. Data from Charlesworth et al. (1996) include protests in the woollen manufacturing districts in Gloucestershire in 1756 and 1757; protests in the cotton machinery in Lancashire between 1768 and 1779; woollen industry in Wiltshire between 1776 and 1802; Luddite disturbances in the Midlands, Yorkshire, and Lancashire in 1811 and 1812; other attacks in 1826.

Swing Riots. We obtained digitized information on swing riots from Caprettini and Voth (2020). We match our geographies to the ones used in their paper (Southall and Burton, 2004) in the following way. We drop observations in Wales. We attempt to match our borough data (described in Appendix A.2) with the data from Caprettini and Voth (2020). We manually change the name of some parish if they do not correspond between data sources. We consider several scenarios for the match between our borough data and their unrest data:

1), all the cities that have been aggregated in Caprettini and Voth (2020) and we also aggregate in the our borough database. In that case, we match Caprettini and Voth (2020)'s observations with our identical geographical unit in the borough database.

2) all the cities that that have been aggregated in Caprettini and Voth (2020) that includes a borough that was not aggregated in our data. For this observations, we match Caprettini and Voth (2020)'s observations with the parish inside that geographical unit that was a medieval borough.

3), all the cities that have been aggregated in Caprettini and Voth (2020) that that do not includes any medieval borough in our data. In that case, we match Caprettini and Voth (2020)'s observations with a parish in Southall and Burton (2004)'s map. We either merge it with the parish that have the same name as the name reported in the original list of unrest in Caprettini and Voth (2020), or with the most prominent parish. Still, this procedure will not create a problem as the majority of our regressions conditioned on the fact of having a borough.

Out of the more than 10,000 observations in Caprettini and Voth (2020) we were not able to match with our borough data only 121 parishes.

A.4 Occupational Structure: Probate Data

The historical occupational data are at parish level, from Keibek (2017). We merged this data with the geographies created for the boroughs. We first match the name of the parishes in Satchell et al. (2016) with the name of the parishes in the historical occupational data. Then, for the unmatched observations with a historical borough, we manually link the observations from the historical occupational data and the geographical units used for the borough data. Out of the 605 boroughs, we end up with 524 boroughs with at least one information from the historical occupation data. Out of the 7839 original observations in the historical occupational data, we match 6471 with some map observation. We finally collapse all the data at the same geographical unit as the borough data.

We keep observations from 1675 onward, as before that time the data are less reliable. In the period between 1350 to 1399 on average a borough observation can be matched to around 0.014 probate observations that are used to construct the historical occupation structure. For the period between 1400 to 1499, the average number of observations is between 0.029 and 0.53. For the period between 1500 to 1599, the average number of observations is between 1.4 and 38.8. For the period between 1600 to 1675, the average number of observations is between 59.7 and 73.7. After that point, on average we can construct the historical occupation specialization of a borough using around 120 probate observations.

This data includes several occupational classifications. First, it classify occupation by broad sector (primary, secondary, tertiary, transport and communications, unclassified or people without an occupation). We compute for each borough and each period 25 years period from 1675 onward the total labor force. These sectors are then decomposed further. Within the people occupied in the secondary sector, the most observations are in order occupied in textile, building and construction, food industry and clothing (these are the subsectors that represents at least 10% of the secondary occupation data). We concentrate on textile manufacturing that compromises coarse fabric, cotton, lace, linen, ribbon and tape, silk, synthetic fibre, wool, wool and worsted, and worsted manufacture. Table A.1 reports the ranking of the top cities in 1675 and 1825 in terms of total and proportion (out of the total labor force) of people occupied in textile manufacturing.

Table A.1: Institutional Heterogeneity, Riots, and Factories

Rank	Total textile workers		Prop. textile workers	
	Top 25 cities in 1675	Top 25 cities in 1825	Top 25 cities in 1675	Top 25 cities in 1825
1	CITY OF NORWICH — NORFOLK	MANCHESTER — LANCASHIRE	PILTON — DEVON	BOVEY TRACEY — DEVON
2	DURHAM — DURHAM	WHALLEY — LANCASHIRE	ST GLUVIAS — CORNWALL	NORTH MOLTON — DEVON
3	COVENTRY — WARWICKSHIRE	PRESTBURY — CHESHIRE	CULLOMPTON — DEVON	KING'S STANLEY — GLOUCESTERSHIRE
4	COLCHESTER — ESSEX	STOCKPORT — CHESHIRE	MINCHINHAMPTON — GLOUCESTERSHIRE	WHALLEY — LANCASHIRE
5	EXETER CITY — DEVON	BOLTON — LANCASHIRE	CREDITON — DEVON	TROWBRIDGE — WILTSHIRE
6	GREAT BRADFORD — WILTSHIRE	CARLISLE — CUMBERLAND	TAMERTON FOLIOT — DEVON	FRAMPTON UPON SEVERN — GLOUCESTERSHIRE
7	READING — BERKSHIRE	NORTWICH — CHESHIRE	TAMERTON FOLIOT — DEVON	MORETONHAMPSTEAD — DEVON
8	CARLISLE — CUMBERLAND	DURHAM — DURHAM	KING'S STANLEY — GLOUCESTERSHIRE	CHORLEY — LANCASHIRE
9	CANTERBURY — KENT	LEICESTER — LEICESTERSHIRE	SILVERTON — DEVON	PAINSWICK — GLOUCESTERSHIRE
10	CHESTER — CHESHIRE	NOTTINGHAM — NOTTINGHAMSHIRE	BECCLES — SUFFOLK	CREDITON — DEVON
11	MANCHESTER — LANCASHIRE	WIGAN — LANCASHIRE	WITNEY — OXFORDSHIRE	TETBURY — GLOUCESTERSHIRE
12	LICHFIELD — STAFFORDSHIRE	PRESTON — LANCASHIRE	COLCHESTER — ESSEX	MITFORD — NORTHUMBERLAND
13	SALISBURY — WILTSHIRE	CHESTER — CHESHIRE	MORETONHAMPSTEAD — DEVON	MITFORD — NORTHUMBERLAND
14	SOUTHAMPTON — HAMPSHIRE	CITY OF NORWICH — NORFOLK	DURSLEY — GLOUCESTERSHIRE	BOLTON — LANCASHIRE
15	SHREWSBURY — SHROPSHIRE	CITY OF NORWICH — NORFOLK	GREAT BRADFORD — WILTSHIRE	WICKWAR — GLOUCESTERSHIRE
16	NORTWICH — CHESHIRE	LANCASTER — LANCASHIRE	CITY OF NORWICH — NORFOLK	WICKWAR — GLOUCESTERSHIRE
17	DEVIZES — WILTSHIRE	CHORLEY — LANCASHIRE	WILTON — WILTSHIRE	STOCKPORT — CHESHIRE
18	NEWCASTLE-UPON-TYNE — NORTHUMBERLAND	CHORLEY — LANCASHIRE	TIVERTON — DEVON	PRESTBURY — CHESHIRE
19	KENDAL — WESTMORLAND	ECCLES — LANCASHIRE	PLESHEY — ESSEX	ECCLES — LANCASHIRE
20	MINCHINHAMPTON — GLOUCESTERSHIRE	CROSTHWAITE — CUMBERLAND	STOKENHAM — DEVON	MERE — WILTSHIRE
21	STAFFORD — STAFFORDSHIRE	ULVERSTON — LANCASHIRE	TETBURY — GLOUCESTERSHIRE	MERE — WILTSHIRE
22	BOLTON — LANCASHIRE	MINCHINHAMPTON — GLOUCESTERSHIRE	MANCHESTER — LANCASHIRE	WHITCHURCH — HAMPSHIRE
23	WITNEY — OXFORDSHIRE	MINCHINHAMPTON — GLOUCESTERSHIRE	NEWBURY — BERKSHIRE	MINCHINHAMPTON — GLOUCESTERSHIRE
24	NEWBURY — BERKSHIRE	PAINSWICK — GLOUCESTERSHIRE	ALPHINGTON — DEVON	MANCHESTER — LANCASHIRE
25	WIGAN — LANCASHIRE	KING'S STANLEY — GLOUCESTERSHIRE	WOODBURY — DEVON	DURSLEY — GLOUCESTERSHIRE

This table shows the ranking of the cities in 1675 and 1825 in terms of total number of workers occupied in textile manufacturing or in its proportion with respect to the total labor force.

A.5 Petitions

We obtained information on petitions from the Journal of the House of Commons. The Journal contains a formal corrected archive of parliamentary business from 1688-1834, not including speeches and debates. From the whole corpus, we divide the text depending of the day of business it refers to. We select all days whose report includes the words "petition" and "manufacture" together. We obtain 2,435 days of parliamentary business. Because the Journal of the House of Commons organizes different entries in different paragraphs, we parse the documents with Python, and save each paragraph as a single item. We obtain 17,075 distinct paragraphs mentioning "petition". We refine the search to identify new petitions matching the introductory formula: "A Petition of X ... setting forth that ...". We count 4,398 single petitions. For each paragraph mentioning the world "petition," we isolate references to "cities," "boroughs," and "towns." We correct the spelling of the entries corresponding to the three indicated geographies. Each geography was manually matched to the 1851 map using the geographic level indicated in the petition among Hundreds, Registration Districts, Registration Subdistrict, Parishes, and Places. We match 3,343 petitions to the map. Among these, 1,288 report the introductory formula.

To separate petitions that are likely made by nobles or clergymen from those made by working people, we categorize petitions in the following way. Petition mentioning the following words are categorize as by nobles or clergymen: "clergy", "sir", "esquire", "gentleman", "duke", "earl", "colonel", "baron". These words were selected among the petition corpus because associated with the nobility or clergy. We obtained 162 petitions likely made by nobles or clergymen among those matched to a city, a town, or a borough. We further categorize petitions as likely made by working people when the following words occur: "inhabit","merchant","trade","cloth","art","make","osier","manuf" "silk", "glove", "woollen", "linen", "flax", "worsted", "cotton", "weaver", "spin", "wage", "calico", "wool", "card", "labour", "tanner", "skin", "burgess", "mayor", "alderman", "alderman", "work", "protest", "poor", "coachinen". These words were selected among the petition corpus because associated with working men. We obtained 1,040 petitions likely made by working people among those matched to a city, a town, or a borough. Finally, we compute the total number of uncategorized petitions per geographic unit between 1688 and 1834, the total number of petitions after eliminating those likely made by nobles or clergymen, and the total number of petitions likely made by working men.

A.6 Common aggregated geographical level: Quasi-parish

As it has been described in Appendixes A.1 and A.2 we attempted to merge data on industrial mills and medieval boroughs and their institutional characteristics with precise parishes. However, this was not always possible leading to some units to be matched with higher geographical units, such as hundreds or registration districts and substricts.

This was not a problem for population and occupational structure data in the 19th century, as it was precisely matched with parishes as this data was produced using the map from Satchell et al. (2016). Similarly, data for the 11th and 16th century comes from the Domesday Book (Hodgson et al., 2007) and the Gazetteer (Letters, 2021), respectively. This data comes with precise latitude and longitude for each entry, so it was possible to match it to a place in the Satchell et al. (2016)'s map. If many entries from the Domesday Book or the Gazetteer were matched to a single geographical unit in Satchell et al. (2016)'s map, we aggregate data at that geographical unit. Food riots data also come geolocalised. In addition, we also overlap the Satchell et al. (2016)'s map with the datasets about natural and geographic conditions (bedrocks, wheat suitability, location of Roman toads and medieval navigable rivers) to obtain information at place level.

To summarize these are the level of geographical analysis for each data:

- Industrial mills and Arkwright-type mills: mainly at parish level, some observations at registration districts or subdistricts level, few at hundred level.
- Medieval boroughs, grants, medieval guilds, parliamentary constituencies, self-governance in 1835, swing riots, and historical occupation: mainly at parish level, some observations at hundred level, few at registration districts or subdistricts level.
- Population and occupational structure in the 19th century: parish level.
- Data about the 11th, 14th and 16th centuries, about natural and geographical characteristics and food riots: place level.

Hence, to homogeneize the different data sources we construct two final datasets, one where all the observations are at place level, and one where all the observations are aggregated at the minimum common geographic unit (quasi-parish). We further detail the two procedures.

Observations at place level: To convert the industrial mills and boroughs information at place level we do several steps separately for each dataset.

First, for every geographical unit in a dataset we find the centroid of its polygon. For example, if one observation with a mill has been matched to a parish, we find the centroid of that parish. Otherwise, if one observation with a mill has been matched to a registration subdistrict, we find the centroid of that subdistrict. We do this both for geographical units that have at least one borough or mill, but also for the one that do not have one.

Second, for each place in the Satchell et al. (2016)'s map we calculate the distance between the centroid that place and the centroid of the closest five geographical units that have at least one mill or borough. Similarly, we compute the distance to the five geographical units in the mill or borough database, irrespective of the presence or not of a mill or borough.

Third, for each place we compute the information on mills and boroughs, for the five closest geographical units. For example, for a place we compute the number of mills in the closest geographical unit with a mill to that place, but also whether the closest geographical units had a mill or not. Similarly, for a place we compute the type of borough (royal or mesne) in the closest geographical unit with a borough to that place, but also whether the closest geographical units had a borough or not. We do the same for all the information on mills and boroughs. We compute both information for the five closest geographical units and the five closest geographical units with a mill or a borough.

Fourth, for some peripheral places inside a parish, the centroid of a neighboring parish might be closer to the centroid of the place than the centroid of the parish to which it belongs. Hence, for the first closest geographical units that are not the same parish, we substitute the values with the ones of the centroid of the same parish (or higher aggregations).

Observations at the minimum common geographic unit: The main dataset we created instead of using data at place level use it a homogeneized aggregated geographical levels. This database has the advantage to reduce biases from local spillover effects. Still, the main difficulty is that some observations in the mills dataset have been matched to a different geographical unit than the match performed with the borough data. There are four possible scenarios about the relationship between mills and borough data:

1), observations for the mills data match exactly observations of borough data.

The most common case is when one observation with a mill and a borough have been matched to a specific parish. This is also the case for the observations without a mill and a borough. In this case, we aggregate all information at the specific level of geography at which the match is formed.

2), multiple observations from a mill geographical unit form one borough observation. For example, two parishes have one mill each and they both belong to a hundred which has been matched to a medieval borough. In this case, we aggregate all information at the specific level of geography taken by the borough.

3), multiple observations from a borough geographical unit form one mill observation. For example, two parishes have one borough each and they both belong to a registration district which has been matched to a city with a mill. In this case, we aggregate all information at the specific level of geography taken by the observation with a mill.

4), multiple observations forming a borough partially intersect multiple observations forming a mill observation. This is a common situation when the same city has been matched to a hundred in the borough data but, for example, a registration district in the mill data. In fact, hundred and registration districts or subdistrict often do not coincide. In this case, we first create a higher and new geographical unit consisting in the sum of all the places belonging to the geographical unit for the mill observation and for the borough observation. Then, we aggregate all information at this new specific level of geography.

Depending on the nature of the variable under interest, we could compute several statistics for the aggregated territories. We calculate dummies for whether a situation is present. For example, whether at least one parish inside a geographical unit was a borough. We calculate the sum of the values inside the territory. For example, the sum of all mills present in the parishes inside the geographical unit. Similarly, we calculate also the average, minimum and maximum values inside a territory.

As different final geographical units are not all at the same level of geographical aggregation we always use frequency weights–based on the number of places inside that geographical unit–to make more reliable comparisons.

Merging of different data sources and creating a common homogeneous geographical unit led to the reduction of the number of distinct observations that were boroughs due to the possible aggregation of different units in a single one. For each geographical unit, we consider the unit to be a borough, a royal borough, a borough with a Charter of Liberties, a borough with a constituency, or a borough with 19^th century self-governance if any of the parishes inside was part of one of them. The final number

of observations according to the different institutional variables are reported in Table A.2.

We have information about 591 medieval boroughs. Our main definition of royal borough consists of all boroughs that were either royal or a mixed form of royal with any other category (ecclesiastic, lay seignorial) and were first mentioned before 1334. Out of the 591 medieval boroughs, 163 were boroughs that we consider in the paper royal. Table A.2 shows that out of these 164 boroughs, 148 were purely royal, and 15 were a mixed form. Moreover, 5 additional boroughs were royal but first mentioned after the black pest. Finally, out of the 591 geographical observations that had a medieval borough, 181 obtained any grant from the Charter of Liberties, 199 became a parliamentary constituency, and 208 had some form of urban autonomy by 1835.

Table A.2: Number of Observations According to Institutional Variables

	Boroughs						
	All	Royal			W/ Medieval Self-Gov.	W/ Parliamentary Representation	W/ 19th Centu Self-Gov.
		Pre-1334	Pure Pre-1334	All years			
s.	591	163	148	169	181	199	208

table reports the number of observations that had a medieval borough (All Boroughs), had a medieval borough that was purely royal o but mixed with another category and was first mentioned before 1334 (Pre-1334 Royal Boroughs), had a medieval borough that was p and was first mentioned before 1334 (Pre-1334 Pure Royal Boroughs), had a medieval borough that was purely royal or was royal but n another category and was first mentioned in any year (All years Royal Boroughs), had a medieval borough that received any grant b ter of Liberties before 1307 (Boroughs W/ Medieval Self-Gov.), had a medieval borough that had a parliamentary constituency (Borough amentary Representation), and had a medieval borough that was a Corporate Town before 1835 (Boroughs W/ 19th Century Self-Gov.).

A.7 Summary statistics

Tables A.3, A.4, and A.5 reports the summary statistics for economic variables, institutional variables, and mechanism and control variables, respectively. Mechanism variables include variables about popular politics that we consider as important channels behind our results, i.e., protests, riots, and petitions. We report each variable's average and standard deviation for all harmonized geographical units in England, all units that had a medieval borough, and all units that had a royal borough.

Table A.3: Summary statistics: economic development variables

Variable	All England		Boroughs		Royal boroughs	
	Mean	**s.d.**	**Mean**	**s.d.**	**Mean**	**s.d.**
DEVELOPMENT: MEDIEVAL	.	.	.	.	.	.
Value of Holdings 1066	11.91	18.09	20.85	26.20	27.84	31.93
Value of Holdings 1070	8.65	12.09	11.63	15.94	11.40	15.13
Population 1086	21.25	41.12	32.29	62.79	37.45	73.57
DEVELOPMENT: PRE-INDUSTRIAL	.	.	.	.	.	.
Lay Subsidy Value 1334	95.31	287.22	147.17	535.27	192.92	289.09
Dummy Guilds 1450	0.01	0.10	0.17	0.38	0.37	0.49
Lay Subsidy per Capita 1527	29.38	54.59	38.08	63.10	46.15	74.99
Dummy Market Presence 1600	0.86	0.35	0.74	0.44	0.85	0.36
DEVELOPMENT: INDUSTRIAL	.	.	.	.	.	.
N. Factories 1838	0.46	8.61	3.99	25.49	3.06	11.73
N. Factories Cotton 1838	0.22	6.04	1.63	14.41	1.25	7.24
N. Factories Worsted 1838	0.04	1.75	0.42	6.02	0.21	1.88
N. Factories Woollen 1838	0.11	2.14	0.68	5.46	0.34	1.77
N. Factories Flax 1838	0.03	0.76	0.28	3.02	0.52	4.52
N. Factories Silk 1838	0.07	3.93	0.97	15.84	0.75	5.48
Factories per 1,000 In. 1830s	0.03	0.55	0.07	0.28	0.06	0.18
N. Workers 1838	47.81	959.46	482.82	3325.17	424.15	1809.28
N. Female Workers 1838	27.19	533.11	276.83	1849.83	262.49	1091.97
N. Child Workers 1838	4.42	98.67	46.78	369.37	48.15	269.97
N. Steam-Engines 1838	0.35	6.86	3.46	23.08	3.07	12.69
Horse Power per Worker 1838	0.16	0.41	0.20	0.63	0.13	0.15
N. Arkwright-type Factories 1868-1888	0.02	0.44	0.25	1.64	0.42	2.54
DEVELOPMENT: OCCUPATIONAL STRUCTURE	.	.	.	.	.	.
Share Textile 1675-1699	0.02	0.08	0.03	0.07	0.04	0.08
Share Textile 1700-1724	0.02	0.09	0.03	0.06	0.03	0.05
Share Textile 1725-1749	0.02	0.07	0.03	0.07	0.02	0.05
Share Textile 1750-1774	0.02	0.07	0.02	0.06	0.02	0.04
Share Textile 1775-1799	0.01	0.06	0.02	0.06	0.01	0.04
Share Textile 1800-1824	0.01	0.06	0.02	0.05	0.02	0.04
Share Textile 1825-1831	0.01	0.05	0.02	0.07	0.01	0.03
Share Handicraft 1831	0.18	0.11	0.33	0.13	0.38	0.14
Share Capitalists 1831	0.03	0.04	0.05	0.04	0.06	0.03
Share Manufacture 1831	0.02	0.07	0.05	0.11	0.04	0.09
Share Servants 1831	0.02	0.04	0.02	0.02	0.03	0.02
Share Agriculture Laborers 1831	0.50	0.20	0.27	0.19	0.22	0.18
Share Non Agriculture Laborers 1831	0.06	0.10	0.14	0.11	0.15	0.09

Table A.4: Summary statistics: institutional variables

ariable	All England		Boroughs		Royal borough	
	Mean	**s.d.**	**Mean**	**s.d.**	**Mean**	**s.d.**
STITUTIONAL: MEDIEVAL SELF-GOVERNANCE	.	.	.	.	.	.
ummy Any Charter of Liberty 1307	0.02	0.14	0.31	0.46	0.52	0.50
ummy Property Rights 1307	0.02	0.12	0.25	0.43	0.42	0.49
ummy Mercantile Priviliges 1307	0.01	0.11	0.19	0.39	0.34	0.48
ummy Fiscal Privileges 1307	0.01	0.09	0.13	0.33	0.29	0.45
ummy Judicial Independence 1307	0.01	0.11	0.20	0.40	0.37	0.49
ummy Political Independence 1307	0.01	0.07	0.08	0.28	0.15	0.36
STITUTIONAL: CONSTITUENCIES	.	.	.	.	.	.
ummy Parliamentary Representation Pre-1832	0.02	0.14	0.34	0.47	0.62	0.49
ummy Rotten Constituency Pre-1832	0.01	0.07	0.09	0.29	0.11	0.31
ummy Large Electorate Pre-1832	0.00	0.05	0.04	0.20	0.12	0.33
ummy Corporation Franchise Pre-1832	0.01	0.07	0.09	0.29	0.12	0.33
STITUTIONAL: 19th CENTURY SELF-GOVERNANCE	.	.	.	.	.	.
ummy Corporate Town 1835	0.02	0.15	0.35	0.48	0.63	0.49
ummy Major Presence 1835	0.02	0.13	0.26	0.44	0.47	0.50
ummy Self-Election Common Council 1835	0.01	0.12	0.21	0.41	0.36	0.48
Councillors 1835	62.20	170.89	64.38	175.95	88.00	226.84
ummy Admission Freemen by Gift 1835	0.01	0.10	0.15	0.36	0.23	0.42
ummy Any Type Criminal Jurisdiction 1835	0.02	0.14	0.32	0.47	0.60	0.49
Magistrates 1835	5.77	4.14	5.92	4.22	6.74	4.71
ummy Any Type Civil Jurisdiction 1835	0.01	0.11	0.17	0.38	0.37	0.48

Table A.5: Summary statistics: mechanism and control variables

Variable	All England		Boroughs		Royal boroughs	
	Mean	**s.d.**	**Mean**	**s.d.**	**Mean**	**s.d.**
MECHANISM: POPULAR POLITICS	.	.	.	.	.	.
Riots 1700-1829	0.65	12.39	7.70	46.96	19.14	76.29
Food Riots 1347-1800	0.04	0.37	0.50	1.26	0.97	1.81
Food Riots 1347-1700	0.01	0.14	0.12	0.50	0.33	0.82
Food Riots 1700-1800	0.04	0.37	0.50	1.26	0.97	1.81
Swing Riots 1830-1832	0.96	7.56	6.85	25.28	14.01	42.68
Attacks on Machines and Arsons 1758-1829	0.60	12.31	7.16	46.72	18.12	76.08
Industrial Protests	0.01	0.11	0.04	0.35	0.06	0.45
Petitions 1688-1834	7.22	385.08	93.93	1553.52	85.64	290.20
New Petitions 1688-1834	2.63	135.49	34.30	546.20	33.21	115.50
New Petitions Workers 1688-1834	2.32	123.07	30.58	496.19	27.91	98.59
CONTROLS: POPULATION	.	.	.	.	.	.
Population 1801	5274.89	89912.98	56178.95	351096.82	46698.47	118802.83
Population 1831	8205.42	130620.73	88482.82	504070.15	75958.34	193843.26
CONTROLS: GEOGRAPHIC	.	.	.	.	.	.
Coaldfield Distance	78627.56	60847.89	66240.73	57127.49	75423.26	61727.45
Roman Road Distance	8922.07	13540.18	12091.74	18752.25	9723.52	16101.00
Medieval Navigable River Distance	14324.71	15413.18	19601.35	21571.59	16821.00	19076.71
Coast Distance	24373.40	20832.27	23446.49	22103.48	21597.68	21405.82
Wheat Suitability	37.67	13.66	34.06	12.98	34.33	13.21

B Stylised Fact: Robustness and Additional Results

Table B.6: Early Development and Industrial Location: Alternative Measures of Industrialization

	N. Factories	Factories per 1000 In.	N. Workers	N. Steam-engines	Horse Power per Worker
	(1)	(2)	(3)	(4)	(5)
Lay Subsidy Value in 1334	-5.084***	-0.0172***	-504.4***	-3.171***	-0.00913
	(0.521)	(0.00385)	(63.99)	(0.408)	(0.00915)
Observations	3071	3066	3071	3071	1513
Mean DV	3.511	0.0788	411.4	2.926	0.146
Controls	Yes	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes	Yes
R^2	0.773	0.0892	0.819	0.819	0.952

Note: Independent variable is the log value of lay subsidies (taxable wealth) in 1334. Dependent variables are the number of textile mills (1), the number of textile mills per 1,000 inhabitants (2), the number of workers in textile mills (3), the total number of steam-engines in textile mills (4), and the horsepower per worker (5). Observations are at the minimum common geographic unit (quasi-parish). We use frequency weights given by the number of places inside a geographical unit. Mean DV means average of the dependent variable. We include geographical and population in 1801 and 1831 controls. County fixed effect is included. Sample of cities that had a medieval borough. Robust standard errors in parenthesis. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table B.7: Early Development and Industrial Location: Alternative Measures of Early Development over Time

	N. Factories (1838)			
	(1)	(2)	(3)	(4)
Lay Subsidy Value in 1334	-5.084***			
	(0.521)			
Lay Subsidy Per Capita in 1527		-0.601		
		(0.378)		
Market Presence in 1600			-6.136***	
			(1.386)	
Share Handicrafts in 1831				-42.06***
				(5.948)
Observations	3071	4096	4221	4214
Mean DV	3.511	4.066	3.986	4.026
Controls	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes
R^2	0.773	0.775	0.722	0.724

Note: Dependent variable is the number of textile mills in 1838. Independent variables are the log value of lay subsidies (taxable wealth) in 1334 (1), the log value of lay subsidies per capita paid in 1527 (2), a dummy equal 1 if the borough had a market and a fair in 1600 (3), the share of male above 20 years of age employed as handicrafts in 1831 (4). Observations are at the minimum common geographic unit (quasi-parish). We use frequency weights given by the number of places inside a geographical unit. Mean DV means average of the dependent variable. We include geographical and population in 1801 and 1831 controls. County fixed effect is included. Sample of cities that had a medieval borough. Robust standard errors in parenthesis. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table B.8: Early Development and Industrial Location: No County Fixed Effects

	Ln Lay Subsidy per Capita (1527)	Market Presence (1600)	Share Handicrafts (1831)	N. Factories (1838)
	(1)	(2)	(3)	(4)
Lay Subsidy Value in 1334	0.450***	0.0879***	0.0446***	-5.295***
	(0.0269)	(0.00520)	(0.00162)	(0.535)
Observations	2951	3071	3065	3071
Mean DV	2.762	0.749	0.337	3.511
Geo. Controls	Yes	Yes	Yes	Yes
Pop Controls	No	No	Yes	Yes
County FE	No	No	No	No
R^2	0.293	0.150	0.383	0.739

Note: Dependent variable is the log value of lay subsidies (taxable wealth) in 1334. Independent variables are the log value of lay subsidies per capita paid in 1527 (1), a dummy equal 1 if the borough had a market and a fair in 1600 (2), the share of male above 20 years of age employed as handicrafts in 1831 (3) and the number of textile mills in 1838 (4). Observations are at the minimum common geographic unit (quasi-parish). We use frequency weights given by the number of places inside a geographical unit. Mean DV means average of the dependent variable. We include geographical and population in 1801 and 1831 controls. County fixed effect are not included. Sample of cities that had a medieval borough. Robust standard errors in parenthesis. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table B.9: Early Development and Industrial Location: Robustness to Different Geographical Variations

	N. Factories 1838			
	(1)	(2)	(3)	(4)
Lay Subsidy Value in 1334	-5.084***	-1.676***	-5.715***	-7.183***
	(0.521)	(0.516)	(0.342)	(0.573)
Observations	3071	2573	2750	2966
Mean DV	3.511	2.661	2.143	3.524
Controls	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes
Excluded County	None	Yorkshire	Lancashire	Middlesex
R^2	0.773	0.817	0.786	0.790

Note: Dependent variable is the number of textile mills in 1838. Independent variable is the log value of lay subsidies (taxable wealth) in 1334. Observations are at the minimum common geographic unit (quasi-parish). We use frequency weights given by the number of places inside a geographical unit. Mean DV means average of the dependent variable. We include geographical and population in 1801 and 1831 controls. County fixed effect is included. Sample of cities that had a medieval borough. Excluded County reports the county that have been excluded in each estimation, where Yorkshire corresponds to the East, North and West Riding of Yorkshire and Middlesex includes London City Registration District. Robust standard errors in parenthesis. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table B.10: Early Development and Industrial Location: Alternative Estimators

	N. Factories 1838
	(1)
Lay Subsidy Value in 1334	-0.479***
	(0.0342)
Observations	3071
Controls	Infl
County FE	No
Estimation	ZINB
Vuong Test	17.05
LR Test	93627.1

The outcome variable is the number of factories. Independent variable is the log value of lay subsidies (taxable wealth) in 1334. We use frequency weights given by the number of places inside any geographical unit. Observations are at the minimum common geographic unit (quasi-parish). Sample of cities that had a medieval borough. Estimations method is Zero-Inflated Negative Binomial (ZINB). Geographical and population in 1801 and 1831 controls are used to model the zero-inflation (Infl). Vuong Test is a test with the null hypothesis of the equivalence between ZINB negative binomial models. Large positive values of the Vuong test favors the ZINB model over the negative binomial model. LR test is a likelihood-ratio test with the null hypothesis of the equivalence between the ZINB and the zero-inflated Poisson models. Robust standard errors in parenthesis. *Note*: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

C The Origins of Economic and Institutional Divergence: Additional Results

Table C.11: Royal Boroughs and Medieval Self-Governance

Panel A:

	Property Rights	Mercantile Privileges	Fiscal Privileges
	(1)	(2)	(3)
Royal Borough	0.3553***	0.2119***	0.3263***
	(0.017)	(0.017)	(0.015)
Observations	4221	4221	4221
Mean DV	0.2521	0.1878	0.1269
Controls	Yes	Yes	Yes
County FE	Yes	Yes	Yes
R^2	0.3837	0.3484	0.4552

Panel B:

	Judicial Independence	Political Independence	Any Charter
	(4)	(5)	(6)
Royal Borough	0.2930***	0.0741***	0.3643***
	(0.016)	(0.013)	(0.016)
Observations	4221	4221	4221
Mean DV	0.1997	0.0812	0.3063
Controls	Yes	Yes	Yes
County FE	Yes	Yes	Yes
R^2	0.4575	0.4742	0.4068

Note: Independent variable is a dummy equal to one if the city had a medieval royal borough. Outcome variables are dummies equal to one if the borough was granted a Charter of Liberty by 1307. Categories are from Ballard and Tait (1923) and reflect the rights to own and transfer property (1), the right to regulate and establish markets and guilds (2), the right to regulate taxes (3), the right to form a borough court, have specific methods of trials, have rules of procedure, freedom to avoid some punishments, and permitting to take distresses from debtors (4), power to elect sheriffs, justiciars, reeves, coroners, and mayors (5), and if the borough obtained any Charter at all (6). Observations are at the minimum common geographic unit (quasi-parish). We use frequency weights given by the number of places inside any geographical unit. Mean DV means average of the dependent variable. We include geographical controls. County fixed effect is included. Sample of cities that had a medieval borough. Robust standard errors in parenthesis. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table C.12: Royal Boroughs and Parliamentary Representation

	Parliamentary Representation	Large Parl. Electorate	Rotten Borough	Franchise in Corporation
	(1)	(2)	(3)	(4)
Royal Borough	0.541***	0.187***	-0.0524***	-0.00374
	(0.0154)	(0.0118)	(0.00971)	(0.00929)
Parliamentary Representation		0.294***	0.0786***	0.0762***
		(0.0105)	(0.00824)	(0.00781)
Observations	4221	4221	4221	4221
Mean DV	0.337	0.0406	0.0914	0.0423
Controls	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes
R^2	0.434	0.650	0.248	0.410

Note: Independent variable is a dummy equal to one if the city had a medieval royal borough. Outcome variables are a dummy equal to one if the city was a parliamentary constituency before the Great Reform Act of 1832 (1), and dummies equal to one if the constituency had a large electorate (2), or was a constituency identified as rotten (3), or the electorate was based on corporations (4) as defined by Bogart (2016) and Sedgwick (1970), respectively. Observations are at the minimum common geographic unit (quasi-parish). We use frequency weights given by the number of places inside any geographical unit. Mean DV means average of the dependent variable. We include geographical controls. County fixed effect is included. Sample of cities that had a medieval borough. Robust standard errors in parenthesis. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table C.13: Royal Boroughs and 19^{th} Century Self-Governance

			Common Council			Criminal Jurisdiction		
	Corporate Town	Major	Self-elected	N. Councillors	Freemen by Gift	Any Type	N. Magistrates	Civ. Jur.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Royal Borough	0.557***	0.0690***	-0.0115	31.60***	-0.141***	0.110***	1.651***	0.0827***
	(0.0147)	(0.0134)	(0.0159)	(9.802)	(0.0145)	(0.0108)	(0.273)	(0.0165)
Corporate Town		0.718***	0.505***		0.291***	0.886***		0.587***
		(0.0134)	(0.0142)		(0.0142)	(0.0106)		(0.0147)
Observations	4221	4221	4221	2016	4221	4221	1918	4221
Mean DV	0.352	0.255	0.210	64.38	0.152	0.316	5.919	0.174
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.477	0.787	0.531	0.526	0.380	0.922	0.640	0.649

Notes: Independent variable is a dummy equal to one if the city had a medieval royal borough. Outcome variables are a dummy equal to one if the borough was a Corporate town in 1835 (1), or could elect a major (2), or the Common Council was self-elected (3), the number of Councillors (4), a dummy equal to one if the admission to freemen was by gift (5), or if the borough had any type of autonomous criminal jurisdiction (6), the number of local magistrates (7), and a dummy equal to one if the the borough had any type of autonomous civil jurisdiction (8). Observations are at the minimum common geographic unit (quasi-parish). We use frequency weights given by the number of places inside any geographical unit. Mean DV means average of the dependent variable. We include geographical controls. County fixed effect is included. Sample of cities that had a medieval borough. Robust standard errors in parenthesis. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

D Anecdotal Evidence: Political Organizations, Technology Adoption, and Manufacturing Decline

While Norwich was the most ancient manufacturing town in England, the development of the factory system had fully bypassed the city by 1840. The Norwich woollen industry, at its height, commanded 12,000 looms and 72,000 weavers. The industry grew until the 1770s, after which it went through periods of strength and activity until its collapse in the early nineteenth century. According to Berg (2005), Yorkshire's rise meant Norfolk's demise.

The manufacture of cotton, for example, was introduced in Norwich in the year 1784 and shortly employed 2000 laborers. In the following 10 or 12 years, Manchester's manufacturers made an effort to attract the cotton trade and, according to Mr. Stark,[50] managed to capture the whole cotton business by paying lower wages to their weavers. However, when Norwich manufacturers, led by Mr. Robert Blake, advised the weavers to work for lower wages, they resisted all attempts at reduction, supported by the local magistrates, leading the Norwich cotton trade to extinction.

The following conversation between the commissioner and Mr. Stark upon a visit to the Yorkshire manufacturing districts of Leeds, Halifax, and Bradford, capture the essence of the competition that the power loom imposed on the Norwich products.

[50]These are extract from the Reports on the Conditions of the Hand Loom Weaver in (Symons et al., 1839). Mr. Stark is the witness interviewed by the commissioner.

While the manufacture of products such as Camlets and bombazines was exclusive of Norwich these are now made by steam power in the new districts, resulting in lower quality and price.

As for the reasons of the difference in the products prices, Mr. Stark respond that these are entirely due to "the adoption of machinery for their production, against the use of which there it a very foolish and erroneous feeling in Norwich. Had we kept pace with the improvements of the age, we might stall have retained our business, and been in a flourishing condition at this moment; but we have constantly been embroiled in petty, paltry, local political contentions; and certain parties, who ought to have devoted their talents and property to the improvement of the trade of the city, have given up their time to these virulent and useless broils, and suffered its main supports to be dragged away, bit by bit, till now scarcely anything remains." (Symons et al., 1839, p. 308)

D.1 Wages

J. Mitchell, Esq. reports a series of wages for Norwich weavers in 1839. The sheriff of the city, John Francis, on April 1838, report an average wage of 7 shillings and the fraction of a penny per waver and eight hours as the average number of daily hours worked by a weaver. [51]

[51] This measure is the effective rate, once we include the unemployed weeks in the computation.

Figure D.1: Handloom Wages

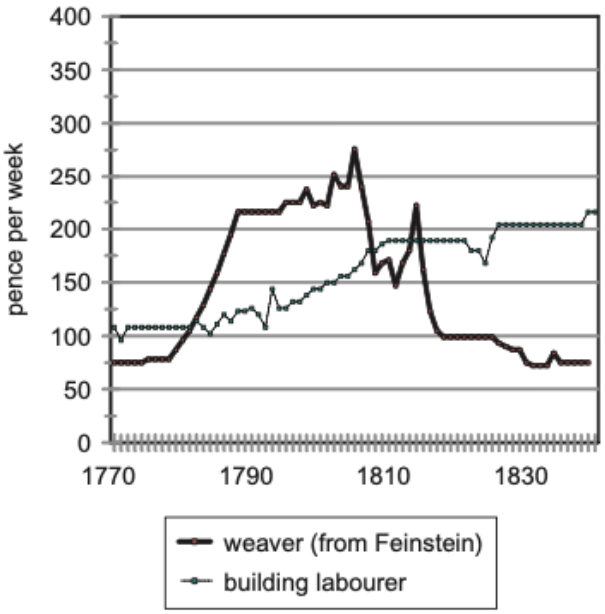


Figure 1. *Weekly earnings (pence) of a hand loom weaver and a building labourer.*
Sources: *hand loom weaver–Feinstein's index based on Bowley, Palgrave, and Wood as described in Feinstein (1998, p. 189).*
building labourer—1700–94: Gilboy, Wages, *pp. 280–2. 1810–25:* Tables of the revenue *(1833, p. 165).*
1839–1900 Bowley (1900, pp. 310–11).

Notes: Source: Allen (2018).

D.2 Collective Action in Norwich

Contrary to the case of the Spitafileds weavers who secured their wages by petitioning Parliament, in Norwich, weavers maintained high wages by direct political action, entering in agreement with the manufacturers and enforcing the wages by the "force of their union". The report concludes that result of the "violent conduct of the union" has been the prevention of the introduction of machinery into the city (Symons et al., 1839, p. 341).

The *Report* is not alone in pointing out the high level of political participation of the working people of Norwich, since the 17th century. Phillips (1982, p. 39) claims that in Norwich, 'issues and party consideration reigned sovereign", in a political environment where since the 1690s some 30 percent of the adult male population possessed the right to vote.

E Main Results: Identification Diagnostics and Robustness

E.1 Selection on Observable Variables

Table E.14: Geographic and Economic Characteristics of Royal Boroughs

	Roman Road Distance	Medieval Navigable River Distance	Coast Distance	Coalfield Distance	Wheat Suitability	Value of Holding to the Lord 1066-1086		Population in 1086
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Royal Borough	-2491.9***	-628.5	-1945.5***	1060.3**	-1.136***	1.775*	-0.567	1.013
	(251.6)	(420.2)	(408.5)	(514.9)	(0.358)	(1.034)	(0.392)	(1.702)
Observations	4221	4221	4221	4221	4221	3148	2673	4221
Mean DV	12091.7	19601.4	23446.5	66240.7	66240.7	19.36	10.81	32.29
County FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample	All	All	All	All	All	All	0-95 pctl	All
R^2	0.704	0.533	0.778	0.941	0.481	0.657	0.509	0.562

Note: Independent variable is a dummy equal to one if the city had a medieval royal borough. Dependent variables are the average distance of the observation to a Roman road (1), average distance to a Medieval navigable river (2), the average distance to the coast (3), the average distance to a coalfield (4), the average wheat suitability (5), the average value of holdings to the lord between 1066, 1070 and 1086 (6 and 7), and the population in 1086 (8). The average value of holdings to the lord between 1066, 1070 and 1086 takes value identical to the average value of holdings to the lord in 1066, around 1070 or in 1086 if only one of these variables is present, if more values are present we compute the average across time. We use frequency weights given by the number of places inside any geographical unit. Mean DV means average of the dependent variable. County FE are county dummies. Sample of cities that had a medieval borough in all columns, except column (7) where the observations in the top fifth percentile in the average value of holdings to the lord between 1066, 1070 and 1086 are excluded. Robust standard errors in parenthesis. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table E.15: Royal Boroughs, Industrial Development, Pre-Industrial: Robustness to Unconditional Regression

	N. Factories in 1838	Ln Lay Subsidy Value in 1334	Ln Lay Subsidy per Capita in 1527	Any Market or Fair in 1600	Share of Handicraft in 1831
	(1)	(2)	(3)	(4)	(5)
Royal Borough	-16.57***	0.839***	0.368***	0.123***	0.104***
	(1.874)	(0.0379)	(0.0480)	(0.0111)	(0.00401)
Observations	4221	3071	4096	4221	4214
Mean DV	3.986	4.319	2.434	0.741	0.328
Controls	No	No	No	No	No
County FE	Yes	Yes	Yes	Yes	Yes
R^2	0.353	0.682	0.606	0.278	0.406

Note: Dependent variables are the number of textile mills in 1838 (1), the log value of lay subsidies (taxable wealth) in 1334 (2), the log value of lay subsidies per capita paid in 1527 (3), a dummy equal 1 if the borough had a market and a fair in 1600 (4), the share of male above 20 years of age employed as handicrafts in 1831 (5). Royal Borough is a dummy equal to one if the city had a medieval royal borough. Observations are at the minimum common geographic unit (quasi-parish). We use frequency weights given by the number of places inside any geographical unit. County FE are county dummies. Sample of cities that had a medieval borough. Robust standard errors in parenthesis. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table E.16: Royal Boroughs and Industrial Development: Robustness to Inclusion of Population of 1831

	N. Factories in 1838	Share of Handicraft in 1831
	(1)	(2)
Royal Borough	-7.716***	0.0990***
	(1.153)	(0.00399)
Observations	4221	4214
Mean DV	3.986	0.328
Usual Controls	Yes	Yes
Population 1831	Yes	Yes
County FE	Yes	Yes
R^2	0.723	0.436

Note: Dependent variables are the number of textile mills in 1838 (1), the log value of lay subsidies (taxable wealth) in 1334 (2), the log value of lay subsidies per capita paid in 1527 (3), a dummy equal 1 if the borough had a market and a fair in 1600 (4), the share of male above 20 years of age employed as handicrafts in 1831 (5). Royal Borough is a dummy equal to one if the city had a medieval royal borough. Observations are at the minimum common geographic unit (quasi-parish). We use frequency weights given by the number of places inside any geographical unit. We include geographical and population in 1801 (Usual Controls) and population in 1831 controls. County FE are county dummies. Sample of cities that had a medieval borough. Robust standard errors in parenthesis. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

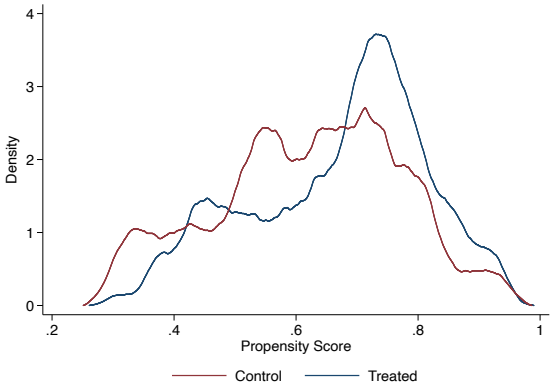
Table E.17: Measurement of the Bias from Unobservables Variables: Royal Borough on Industrial and Pre-Industrial Development

	Panel A: N. Factories in 1838 on Royal Borough			
	Uncontrolled	**Controlled**	**Identified set**	**δ for $\beta = 0$**
Treatment effect	-22.196	-8.406	[-8.406;-4.686]	2.214
s.e.	(1.728)	(1.123)		
R-squared	0.020	0.722		
	Panel B: Ln Lay Subsidy Value in 1334 on Royal Borough			
Treatment effect	0.765	0.755	[0.755;0.752]	-80.506
s.e.	(0.050)	(0.038)		
R-squared	0.065	0.699		
	Panel C: Ln Lay Subsidy per Capita in 1527 on Royal Borough			
Treatment effect	0.841	0.412	[0.412;0.279]	3.069
s.e.	(0.058)	(0.048)		
R-squared	0.053	0.618		
	Panel D: Any Market of Fair in 1600 on Royal Borough			
Treatment effect	0.096	0.121	[0.121;0.129]	-11.945
s.e.	(0.011)	(0.011)		
R-squared	0.016	0.303		
	Panel E: Sh. Handicrafts in 1831 on Royal Borough			
Treatment effect	0.103	0.098	[0.098;0.096]	41.845
s.e.	(0.004)	(0.004)		
R-squared	0.165	0.439		

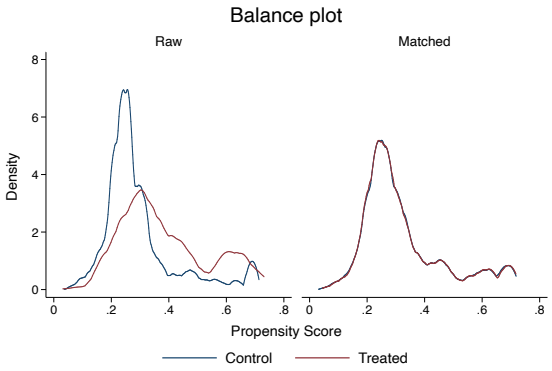
Note: Dependent variables are the number of textile mills in 1838 (Panel A), the log value of lay subsidies (taxable wealth) in 1334 (B), the log value of lay subsidies per capita paid in 1527 (C), a dummy equal 1 if the borough had a market and a fair in 1600 (D), the share of male above 20 years of age employed as handicrafts in 1831 (E). *Uncontrolled*: treatment effect, standard errors (s.e.) and R-squared from a OLS estimation of the regression of the variable under consideration on the dummy equal to one if the city had a medieval royal borough. *Controlled*: treatment effect ($\tilde{\beta}$), standard errors (s.e.) and R-squared ($\tilde{R}$) from a OLS estimation of the regression of the variable under consideration, geographical controls, population in 1801 controls (only for the share of handicrafts in 1831 and the number of factories in 1838), and County dummies. *Identified set*: bounds for the treatment effect, between the controlled effect ($\tilde{\beta}$) and the bias-adjusted treatment effect when the maximum R-squared is $R_{max} = 1.3\tilde{R}$ and $\delta = 1$, that is and equal selection on unobservables as observables ($\beta^*(R_{max}, 1)$). *δ for $\beta = 0$*: estimate of the degree of selection on unobservables as a proportion of selection on observables that is needed to obtain a bias-adjusted treatment effect of 0. Observations are at the minimum common geographic unit (quasi-parish). We use frequency weights given by the number of places inside any geographical unit. Sample of cities that had a medieval borough.

Figure E.2: Matching Estimations Diagnostics

A. Overlap Test



B. Balance Plot Test



Notes: Panel A shows that the overlapping assumption is satisfied when predicting Royal using a model of covariates determined by the algorithm proposed in Imbens, 2015. Panel B show balance in the raw and matched sample.

E.2 Model Specification

Table E.18: Royal Boroughs and Industrial Development: Robustness to Alternative Estimators

	N. Factories 1838		
	(1)	(2)	(3)
Royal Borough	-1.271***		
	(0.0726)		
Pred. Royal Borough		-15.28***	-5.542***
		(1.233)	(1.154)
Observations	4221	4221	4221
Controls	Infl	PS	NN
County FE	No	No	No
Estimation	ZINB	PS Match	NN Match
Vuong Test	19.47	.	.
LR Test	228477.4	.	.

The outcome variable is the number of factories. Royal Borough is a dummy equal to one if the city had a medieval royal borough. Pred. Royal Borough is the predicted value of royal borough after performing the corresponding matching first stage. We use frequency weights given by the number of places inside any geographical unit. County FE are county dummies and are not included in the estimations. Estimations methods are Ordinarly Least Square (OLS, column 1), Zero-Inflated Negative Binomial (ZINB, column 2), Propensity-Score Matching (PS match, column 3), and Nearest-Neighbor Matching (NN Match, column 4). Geographical and population in 1801 controls are included in column (1), are used to model the zero-inflation (Infl) in column (2), are used to estimate the Propensity-Score (PS) in column (3), and are used to compute the Nearest-Neighbors (NN) in column (4). Observations are at the minimum common geographic unit (quasi-parish). Sample of cities that had a medieval borough. Vuong Test is a test with the null hypothesis of the equivalence between ZINB negative binomial models. Large positive values of the Vuong test favors the ZINB model over the negative binomial model. LR test is a likelihood-ratio test with the null hypothesis of the equivalence between the ZINB and the zero-inflated Poisson models. Robust standard errors in parenthesis. *Note*: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table E.19: Royal Boroughs and Pre-Industrial Development: Robustness to Alternative Estimators

	Ln Lay Subsidy Value in 1334	Ln Lay Subsidy per Capita in 1527	Any Market or Fair in 1600	Share of Handicraft in 1831
	(1)	(2)	(3)	(4)
Pred. Royal Borough	0.467***	0.786***	0.122***	0.0576***
	(0.0394)	(0.0668)	(0.0172)	(0.00713)
Observations	3071	4096	4221	4214
Controls	PS	PS	PS	PS
County FE	No	No	No	No
Estimation	PS Match	PS Match	PS Match	PS Match

Dependent variables are the log value of lay subsidies (taxable wealth) in 1334 (1), the log value of lay subsidies per capita paid in 1527 (2), a dummy equal 1 if the borough had a market and a fair in 1600 (3), the share of male above 20 years of age employed as handicrafts in 1831 (4). Royal Borough is a dummy equal to one if the city had a medieval royal borough. Pred. Royal Borough is the predicted value of royal borough after performing the corresponding matching first stage. We use frequency weights given by the number of places inside any geographical unit. County FE are county dummies and are not included in the estimations. Estimations method is Propensity-Score Matching (PS match) in all columns. To estimate the Propensity-Score (PS) we use geographical controls in all columns and we also use the population in 1801 in column (4). Observations are at the minimum common geographic unit (quasi-parish). Sample of cities that had a medieval borough. Robust standard errors in parenthesis. *Note*: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

E.3 Geographical Variation

Table E.20: Royal Boroughs and Industrial Development: Robustness to Different Geographical Variations

	N. Factories in 1838		
	(1)	(2)	(3)
Royal Borough	-8.545***	-10.32***	-7.673***
	(1.247)	(1.116)	(1.017)
Observations	3661	3813	4116
Controls	Yes	Yes	Yes
County FE	Yes	Yes	Yes
Excluded County	Yorkshire	Lancashire	Middlesex
R^2	0.730	0.702	0.768

Note: Independent variable is a dummy equal to one if the city had a medieval royal borough. Outcome variable is the number of textile mills. Observations are at the minimum common geographic unit (quasi-parish). We use frequency weights given by the number of places inside any geographical unit. We include geographical and population in 1801 controls. County FE are county dummies. Sample of cities that had a medieval borough. Excluded County reports the county that have been excluded in each estimation, where Yorkshire corresponds to the East, North and West Riding of Yorkshire and Middlesex includes London City Registration District. Robust standard errors in parenthesis. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table E.21: Royal Boroughs and Pre-Industrial Development: Robustness to Different Geographical Variations

Panel A: *Ln Lay Subsidy Value in 1334*

	(1)	(2)	(3)
Royal Borough	0.6590***	0.8684***	0.7622***
	(0.040)	(0.041)	(0.038)
Observations	2573	2750	2966
Excluded County	Yorkshire	Lancashire	Middlesex
R^2	0.7255	0.6912	0.5514

Panel B: *Ln Lay Subsidy per Capita in 1527*

	(1)	(2)	(3)
Royal Borough	0.3452***	0.4260***	0.4118***
	(0.050)	(0.053)	(0.048)
Observations	3536	3688	4092
Excluded County	Yorkshire	Lancashire	Middlesex
R^2	0.6550	0.6336	0.6137

Panel C: *Any Market or Fairs in 1600*

	(1)	(2)	(3)
Royal Borough	0.1179***	0.1258***	0.1214***
	(0.012)	(0.013)	(0.011)
Observations	3661	3813	4116
Excluded County	Yorkshire	Lancashire	Middlesex
R^2	0.3323	0.3214	0.2925

Panel D: *Share of Handicrafts in 1831*

	(1)	(2)	(3)
Royal Borough	0.0883***	0.0994***	0.0979***
	(0.004)	(0.004)	(0.004)
Observations	3654	3806	4109
Excluded County	Yorkshire	Lancashire	Middlesex
R^2	0.4508	0.4116	0.4222

Independent variable is a dummy equal to one if the city had a medieval royal borough. Dependent variables are the log value of lay subsidies (taxable wealth) in 1334 (Panel A), the log value of lay subsidies per capita paid in 1527 (B), a dummy equal 1 if the borough had a market and a fair in 1600 (C), the share of male above 20 years of age employed as handicrafts in 1831 (D). Observations are at the minimum common geographic unit (quasi-parish). We

E.4 Data Aggregation

We here show that our results do not depend on the geographical aggregations we conduct in the construction of the database.

To do this, we first construct a database that overlaps information about the division of England in places and the map of our aggregated geographical units. For each place and aggregated geographical unit, we find their centroid. For each place centroid, we compute the centroid of which aggregated geographical unit was the first, second, third, fourth, and fifth closest. We then create a dummy for whether or not the closest aggregated geographical unit to a place was royal. We also created a dummy for whether the closest aggregated geographical unit to a place that was a borough was royal or not. Similarly, we compute the number of factories in the closest aggregated geographical unit to a place and the number of factories in the closest aggregated geographical unit that had any textile mill to a place.

We then show that if a place was closer to a royal borough, then it was more likely to be farther from a location of textile mills in several ways. First, in Panel A of Table E.22 we show that if the aggregated geographical unit closest to a place that was a borough was also royal, then that closest aggregated geographical unit had a lower number of factories (1). Similarly, this is true when we use whether the aggregated geographical unit closest to a place was royal, irrespective of the fact that it was a borough or not (columns 2 and 4). Columns (3) and (4) show that this is also true for the number of factories in the closest aggregated geographical unit with a non-zero number of textile mills.

Second, results in Panel A uniquely exploit information on the closest boroughs and mills. In Panel B of Table E.22, we replicate the results of column (1) of Panel A, using the average presence of a borough and mills using the second, third, fourth, and fifth closest units.

Third, we also estimate the effect of a place being close to a royal borough exploiting the distance between the place and the borough. In Panel C, we estimate the effect of having a royal borough close for the observations at a distance from the borough that is up to the 10th percentile (1), 25th percentile (2), 50th percentile (3), and 75th percentile (4). The farther away the borough is from the place, the weakest the negative effect of having a royal borough close to the number of factories in the closest aggregated geographical unit.

Table E.22: Royal Boroughs and Industrial Development: Robustness Using Data at Place Level

Panel A: *Using Different Reference Points*

	N. Factories in Closest Geo Unit		N. Factories in Closest Unit with Factories	
	(1)	(2)	(3)	(4)
Closest Borough is Royal	-1.3517***		-1.3112***	
	(0.148)		(0.165)	
Closest Geo Unit is Royal		-5.7642***		-5.9284***
		(1.210)		(1.204)
Observations	18426	2049	18426	2049
Controls	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes
R^2	0.2231	0.3709	0.2606	0.3737

Panel B: *Using Average of Observations at Different Distances*

	Mean N. Factories in Closest Geo Units			
	1st to 2nd	1st to 3rd	1st to 4th	1st to 5th
	(1)	(2)	(3)	(4)
Mean Royal 1st to 2nd Closest Borough	-1.5291***			
	(0.140)			
Mean Royal 1st to 3rd Closest Borough		-1.9747***		
		(0.164)		
Mean Royal 1st to 4th Closest Borough			-2.4882***	
			(0.197)	
Mean Royal 1st to 5th Closest Borough				-3.0136***
				(0.258)
Observations	20509	21075	21161	21175
Controls	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes
R^2	0.2332	0.2391	0.2552	0.2658

Panel C: *Using Treatment at Different Distances*

	N. Factories in Closest Geo Unit			
	(1)	(2)	(3)	(4)
Closest Borough is Royal	-2.8829***	-1.3788***	-0.9010***	-0.9605***
	(0.911)	(0.429)	(0.247)	(0.175)
Observations	1752	4571	9184	13809
Controls	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes
Sample	1st-10th pctl	1st-25th pctl	1st-50th pctl	1st-75th pctl
R^2	0.2662	0.2631	0.2207	0.1929

Note: Outcome variables are the number of textile mills in the aggregated geographical unit whose centroid is the closest to the place (panel A columns 1 and 2 and panel C), number of textile mills in the aggregated geographical unit with a positive number of mills whose centroid is the closest to the place (panel A columns 3 and 4), or the average number of textile mills in the aggregated geographical units whose centroid are the first and second closest to the place (panel B column 1), first, second and third (panel B column 2), first, second, third and fourth (panel B column 2), first, second, third, fourth and fifth (panel B column 2). In panels A and C independent variables are a dummy equal to one if the closest aggregated geographical unit whose centroid is the closest to the place is a royal borough (Closest Geo Unit is Royal), dummy equal to one if the closest aggregated geographical unit that is a medieval borough whose centroid is the closest to the place is a royal borough (Closest Borough is Royal). In panel B independent variables are the average of the dummies equal to one if the aggregated geographical units that are a medieval borough whose centroids are the first and second closest to the place are royal boroughs (Mean Royal 1st to 2nd Closest Borough), or computed for the first, second, and third closest (Mean Royal 1st to 3rd Closest Borough), or for the first, second, third and fourth (Mean Royal 1st to 4th Closest Borough), or first, second, third, fourth, and fifth (Mean Royal 1st to 5th Closest Borough). We include geographical measured at place level and population in 1801 controls at parish level. County FE are county dummies. In panels A and B sample of all the places in England. In panel C observations are only considered for places whose distance from a geographical unit that is a borough is inferior to the percentile (pctl) under consideration. Robust standard errors in parenthesis. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table E.23: Royal Boroughs and Industrial Development: Robustness to Different Weights

	N. Factories in 1838		
	(1)	(2)	(3)
Royal Borough	-8.406***	-5.176***	-45.90***
	(1.123)	(0.000411)	(0.0387)
Controls	Yes	Yes	Yes
County FE	Yes	Yes	Yes
Weights	Number Places	Area Geo Unit	Pop Geo Unit
R^2	0.719	0.781	0.816

Note: Independent variable is a dummy equal to one if the city had a medieval royal borough. Outcome variable is the number of textile mills. Observations are at the minimum common geographic unit (quasi-parish). We use frequency weights at the level reported: number of places inside any geographical unit (1), area of the geographical unit (2) and population of the geographical unit (3). We include geographical controls in all panels and population in 1801 in panel D. County FE are county dummies. Sample of cities that had a medieval borough. Robust standard errors in parenthesis. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table E.24: Royal Boroughs and Pre-Industrial Development: Robustness to Different Weights

Panel A: *Ln Lay Subsidy Value in 1334*

	(1)	(2)	(3)
Royal Borough	0.7548***	0.3330***	0.3073***
	(0.038)	(0.000)	(0.001)
Observations	3071	15268528058	40837071
Weights	Number Places	Area Geo Unit	Pop Geo Unit
R^2	0.6943	0.4040	0.9254

Panel B: *Ln Lay Subsidy per Capita in 1527*

	(1)	(2)	(3)
Royal Borough	0.4118***	0.1768***	0.3009***
	(0.048)	(0.000)	(0.001)
Observations	4096	19704263999	46619388
Weights	Number Places	Area Geo Unit	Pop Geo Unit
R^2	0.6138	0.5871	0.7284

Panel C: *Any Market or Fairs in 1600*

	(1)	(2)	(3)
Royal Borough	0.1214***	0.0463***	0.0254***
	(0.011)	(0.000)	(0.000)
Observations	4221	19941827635	52293345
Weights	Number Places	Area Geo Unit	Pop Geo Unit
R^2	0.2958	0.1903	0.2014

Panel D: *Share of Handicrafts in 1831*

	(1)	(2)	(3)
Royal Borough	0.0980***	0.0441***	0.0895***
	(0.004)	(0.000)	(0.000)
Observations	4214	19769192526	52292964
Weights	Number Places	Area Geo Unit	Pop Geo Unit
R^2	0.4331	0.2397	0.7836

Note: Independent variable is a dummy equal to one if the city had a medieval royal borough. Dependent variables are the log value of lay subsidies (taxable wealth) in 1334 (Panel A), the log value of lay subsidies per capita paid in 1527 (B), a dummy equal 1 if the borough had a market and a fair in 1600 (C), the share of male above 20 years of age employed as handicrafts in 1831 (D). Observations are at the minimum common geographic unit (quasi-parish). We use frequency weights at the level reported: number of places inside any geographi-

E.5 Inference

Table E.25: Royal Boroughs and Industrial Development: Inference Robustness

Panel A: *Place Level*

	N. Factories in 1838			
	(1)	(2)	(3)	(4)
Closest Borough is Royal	-1.4252**	-1.4252***	-1.4252***	-1.4252***
	(0.683)	(0.342)	(0.543)	(0.539)
Observations	18426	18426	18426	18426
Controls	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes
Aggregation FE	No	No	No	No
Cluster se	Hundred	Reg. subdistr.	Reg. distr.	Parish
R^2	0.2294	0.2294	0.2294	0.2294

Panel B: *Quasi-parish Level*

	N. Factories in 1838			
	(1)	(2)	(3)	(4)
Royal Borough	-17.9600***	-17.9790*	-17.9790*	-17.9790*
	(2.063)	(9.903)	(9.711)	(9.780)
Observations	4221	4215	4215	4215
Controls	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes
Aggregation FE	Yes	Yes	Yes	Yes
Cluster se	Rob.	Hundred	Reg. subdistr.	Reg. distr.
R^2	0.7409	0.7409	0.7409	0.7409

Note: Observations are at the place level in panel A and the minimum common geographic unit (quasi-parish) in panel B. Outcome variables are the number of textile mills in the closest aggregated geographical unit (panel A) or the number of textile mills in the same aggregated geographical unit (panel B). Independent variable is a dummy equal to one if the closest borough to the place is a royal borough (panel A) or if the aggregated geographical unit had a medieval royal borough (panel B). In panel B we use frequency weights given by the number of places inside any geographical unit. We include geographical and population in 1801 controls. County FE are county dummies. Aggregation FE are dummies reflecting the level of aggregation of the geographical units (place, parish, hundred, registration subdistrict, registration district, or a different artificial aggregated). Sample of all the places in England in panel A and cities that had a medieval borough in panel B. Cluster se refers to the level of clustering of the standard errors or alternatively whether robust (rob) standard errors have been used. *** $p < 0.01$, ** $p < 0.05$, * p

Table E.26: Royal Boroughs and Pre-Industrial Development: Inference Robustness

Panel A: *Ln Lay Subsidy Value in 1334*

	(1)	(2)	(3)	(4)
Royal Borough	0.3786***	0.3799**	0.3799**	0.3799**
	(0.043)	(0.161)	(0.165)	(0.165)
Observations	3071	3066	3066	3066
Cluster se	Rob.	Hundred	Reg. subdistr.	Reg. distr.
R^2	0.7679	0.7680	0.7680	0.7680

Panel B: *Ln Lay Subsidy per Capita in 1527*

	(1)	(2)	(3)	(4)
Royal Borough	0.4390***	0.4460***	0.4460***	0.4460***
	(0.051)	(0.157)	(0.154)	(0.152)
Observations	4096	4092	4092	4092
Cluster se	Rob.	Hundred	Reg. subdistr.	Reg. distr.
R^2	0.6185	0.6195	0.6195	0.6195

Panel C: *Any Market or Fairs in 1600*

	(1)	(2)	(3)	(4)
Royal Borough	0.0663***	0.0664**	0.0664**	0.0664**
	(0.012)	(0.031)	(0.033)	(0.031)
Observations	4221	4215	4215	4215
Cluster se	Rob.	Hundred	Reg. subdistr.	Reg. distr.
R^2	0.3265	0.3273	0.3273	0.3273

Panel D: *Share of Handicrafts in 1831*

	(1)	(2)	(3)	(4)
Royal Borough	0.0740***	0.0740***	0.0740***	0.0740***
	(0.005)	(0.015)	(0.014)	(0.014)
Observations	4214	4214	4214	4214
Cluster se	Rob.	Hundred	Reg. subdistr.	Reg. distr.
R^2	0.4722	0.4722	0.4722	0.4722

Note: Independent variable is a dummy equal to one if the city had a medieval royal borough. Dependent variables are the log value of lay subsidies (taxable wealth) in 1334 (Panel A), the log value of lay subsidies per capita paid in 1527 (B), a dummy equal 1 if the borough had a market and a fair in 1600 (C), the share of male above 20 years of age employed as handicrafts in 1831 (D). Observations are at the minimum common geographic unit (quasi-parish). We use frequency weights given by the number of places inside any geographical unit. We include

F Mechanisms: Robustness and Additional Results

F.1 The Mediating Role of Parliamentary Representation: Robustness

Table F.27: Parliamentary Representation and Economic Conditions: Robustness to Alternative Measures

	N. Factories 1838					
	(1)	(2)	(3)	(4)	(5)	(6)
Royal Borough	2.944*	1.035	2.826*	5.599***	11.18***	5.320***
	(1.619)	(1.802)	(1.513)	(0.798)	(3.087)	(1.427)
Parliamentary Representation	-48.06***	-51.15***	-44.54***	-16.37***	-49.67***	-48.16***
	(2.264)	(2.485)	(2.236)	(1.539)	(2.238)	(2.272)
19th Century Self-Governance	25.16***	21.95***	23.30***	11.33***	21.62***	25.69***
	(2.425)	(2.115)	(2.201)	(1.618)	(3.652)	(2.475)
Medieval Self-Governance	4.615**	1.031				
	(1.825)	(1.628)				
Guild 1450		14.81***				
		(2.739)				
Annual Value of Real Property 1815 (1000 £)					-0.00326***	
					(0.000885)	
Annual Value of Real Property 1815 per sqm						-61.91***
						(23.20)
Observations	4214	4214	4214	2946	4214	4213
Mean DV	4.026	4.026	4.026	3.607	4.026	4.033
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Occup. 1831 Controls	Handicrafts	Handicrafts	All	Handicrafts	Handicrafts	Handicrafts
Pre-Ind. Controls	No	No	No	All	No	No
County FE	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.752	0.756	0.771	0.802	0.764	0.755

Notes: The outcome variable is the number of factories in 1838. Royal Borough is a dummy equal to one if the city had a medieval royal borough. Parliamentary Representation is a dummy equal to one if the city was a parliamentary constituency before the Great Reform Act of 1832. 19th Century Self-Governance is a dummy equal to one if the city was a Corporate Town before the Municipal Corporation Act of 1835. Medieval Self-Governance is a dummy equal to one if the city received any Charter of Liberties by 1307. Guild 1450 is a dummy equal to one if the city had any medieval guilt in 1450. Annual Value of Real Property 1815 is the local property tax paid in the borough and is either measured in 1000 pounds (1000 £) or divided by the squared meters of the parish (per sqm). Occup. 1831 Controls either include the share of male above 20 years of age employed as handicrafts in the 1831 Census (Handicrafts) or also the share employed as capitalists, bankers and professionals, in the manufacture of machine making, servants, agricultural laborers, and non-agricultural laborers (All). Observations are at the common minimum common geographic unit (quasi-parish). Pre-Ind. Controls include a log value of lay subsidies (taxable wealth) in 1334, the average lay subsidies per capita paid in 1527, and a dummy equal to one if the city had any market or fair in 1600. We use frequency weights given by the number of places inside any geographical unit. Mean DV means average of the dependent variable. We include geographical and population controls. County FE are county dummies. Sample of cities that had a medieval borough. Robust standard errors in parenthesis. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table F.28: Occupational Structure in 1831

	Capitalists, Bankers and Professionals	Employed in Munufacture or Machine Making	Trade and Handicraft	Servants	Agriculture Laborers	Non Agriculture Laborers
	(1)	(2)	(3)	(4)	(5)	(6)
Royal Borough	0.0158***	-0.00210	0.0980***	0.00281***	-0.103***	0.0244***
	(0.00102)	(0.00398)	(0.00398)	(0.000550)	(0.00546)	(0.00325)
Observations	4214	4214	4214	4214	4214	4214
Mean DV	0.0502	0.0458	0.328	0.0220	0.272	0.272
Controls	Yes	Yes	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.678	0.518	0.433	0.387	0.401	0.300

The dependent variables are the share of male above 20 years of age employed in the 1831 census as capitalists, bankers and professionals (1), employed in manufacture of machine making (2), employed in trade and handcraft (3), servants (4), agricultural laborers (5), and non-agricultural laboreres (6). Royal Borough is a dummy equal to one if the city had a medieval royal borough. Observations are at the minimum common geographic unit (quasi-parish). We use frequency weights given by the number of places inside any geographical unit. Mean DV means average of the dependent variable. We include geographical and population in 1801 controls. County FE are county dummies. Sample of cities that had a medieval borough. Robust standard errors in parenthesis. *Note*: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table F.29: Local Taxation in Nineteenth-Century England

Year	Aggregate taxes wrt national income (%)	Poor rate receipts wrt total tax revenue by the central govt (%)	Local taxation wrt total tax revenue by the central govt (%)	Local taxation wrt national income (%)
1750	12.9	10	11	1.4
1780	12.9	17	18.7	2.4
1800	13.4	17	18.7	2.5
1811	24.3	12	13.2	3.2
1821	20.6	14	15.4	3.2
1831	16	15	16.5	2.6
1851	19	12	13.2	1.4

Notes: Aggregate taxes as shares of national income comes from (Hartwell, 1981, p. 136). Poor rate receipts as percent of total tax revenue by the central government comes from (Hartwell, 1981, p. 138) where the value in 1750 is measured between 1748 and 1750, the value in 1780 is measured between 1783 and 1785, the value in 1800 is measured in 1803, and the value in 1810 is measured in 1813. Total local taxation receipts as percent of total tax revenue by the central government is computed adding using the estimate in (Hartwell, 1981, p. 138) that other local taxation accounts to 10% of the poor relief receipts. Local taxation as shares of national income is calculated as ratio between tge otal local taxation receipts as percent of total tax revenue by the central government and the aggregate taxes as shares of national income.

F.2 The Mediating Role of Parliamentary Representation: Mediation Analysis

Table F.30: Measurement of the Bias from Unobservables Variables: Mediating Regressions

	Panel A: Parliamentary Reprepresentation on Royal Borough			
	Panel A1: Not controlling for 19th C Self-Gov. and Sh. Handicrafts			
	Uncontrolled	**Controlled**	**Identified set**	**δ for $\beta = 0$**
Treatment effect	0.475	0.565	[0.565;0.607]	-2.417
s.e.	(0.014)	(0.015)		
R-squared	0.197	0.481		
	Panel A2: Controlling for 19th C Self-Gov. and Sh. Handicrafts			
Treatment effect	0.475	0.172	[0.172;0.057]	1.463
s.e.	(0.014)	(0.016)		
R-squared	0.197	0.696		
	Panel B: N. Factories on Parliamentary Representation			
	Panel B1: Not controlling for 19th C Self-Gov. and Sh. Handicrafts			
Treatment effect	-22.304	-31.301	[-31.301;-34.490]	-6.487
s.e.	(2.163)	(1.618)		
R-squared	0.022	0.745		
	Panel B2: Controlling for 19th C Self-Gov. and Sh. Handicrafts			
Treatment effect	-22.304	-48.143	[-48.143;-58.809]	-2.565
s.e.	(2.163)	(2.270)		
R-squared	0.022	0.755		

Notes: Panel A considers regressions where Parliamentary Representation is the dependent variable and Royal Boroughs the independent variable. Panel B consider regressions where the number of factories in 1838 is the dependent variable and Parliamentary Representation the independent variable. Royal Borough is a dummy equal to one if the city had a medieval royal borough. Parliamentary Representation is a dummy equal to one if the city was a parliamentary constituency before the Great Reform Act of 1832. *Uncontrolled*: treatment effect, standard errors (s.e.) and R-squared from a OLS estimation of a regression without additional controls. *Controlled*: treatment effect ($\tilde{\beta}$), standard errors (s.e.) and R-squared ($\tilde{R}$) from a OLS estimation of a regression including geographical and population controls, additional mediating controls, and County dummies. Additional mediating variables include the share of people employed as handicraft

Table F.31: Determinants of Parliamentary Representation for Mediation Analysis

	Parliamentary Representation	
	(1)	(2)
Royal Borough	0.565***	0.172***
	(0.0154)	(0.0165)
19th Century Self-Governance		0.596***
		(0.0159)
Share of Handicrafts 1831		0.632***
		(0.0587)
Observations	4214	4214
Mean DV	0.337	0.337
Controls	Yes	Yes
County FE	Yes	Yes
R^2	0.475	0.693

Notes: Outcome variable is a dummy equal to one if the city had parliamentary representation before the Great Reform Act of 1832. Royal Borough is a dummy equal to one if the city had a medieval royal borough. 19th Century Self-Governance is a dummy equal to one if the city was a Corporate Town before the Municipal Corporation Act of 1835. Share of Handicrafts 1831 is the share of male above 20 years of age employed as handicrafts. Observations are at the minimum common geographic unit (quasi-parish). We use frequency weights given by the number of places inside any geographical unit. Mean DV means average of the dependent variable. We include geographical and population in 1801 controls. Sample of cities that had a medieval borough. Robust standard errors in parenthesis. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

F.3 Local Institutions and Resistance to Technology Adoption

Table F.32: Institutional Heterogeneity, Riots, and Factories: Rotten Boroughs and Franchise in Corporation

	N. Factories 1838		Ln Petitions 1688-1834		Ln Riots 1700-1829	
	(1)	(2)	(3)	(4)	(5)	(6)
Royal Borough	10.02***	9.362***	0.967***	1.033***	0.804***	0.879***
	(1.497)	(1.444)	(0.0616)	(0.0614)	(0.0774)	(0.0771)
Parliamentary Representation	-32.37***	-32.25***	0.699***	0.672***	1.957***	1.851***
	(1.704)	(1.684)	(0.0553)	(0.0543)	(0.0756)	(0.0750)
Rotten Borough	12.42***		-1.219***		-1.207***	
	(1.847)		(0.114)		(0.164)	
Franchise in Corporation		11.98***		-1.002***		-0.0280
		(1.793)		(0.0949)		(0.167)
Observations	4221	4221	4221	4221	4221	4221
Mean DV	3.986	3.986	0.609	0.609	1.110	1.110
Controls	Yes	Yes	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.742	0.742	0.603	0.601	0.659	0.655

Notes: The outcome variables are the number of factories (columns 1 to 3), the number of petitions to the Parliament (columns 4 to 6), and the number of riots (column 7 to 9). Parliamentary Representation is a dummy equal to one if the city was a parliamentary constituency before the Great Reform Act of 1832. Royal Borough is a dummy equal to one if the city had a medieval royal borough. Rotten Borough, and Corporation are dummies equal to one if the city was a constituency identified as rotten, or the electorate was based on corporations as defined by Bogart (2016) and Sedgwick (1970), respectively. Observations are at the minimum common geographic unit (quasi-parish). We use frequency weights given by the number of places inside any geographical unit. Mean DV means average of the dependent variable. We include geographical and population in 1801 controls. County FE are county dummies. Sample of cities that had a medieval borough. Robust standard errors in parenthesis. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table F.33: Royal Boroughs and Riots

Panel A: Riots before Industrialization

	Ln Food Riots (1347-1800)	Ln Food Riots (1347-1700)	Ln Food Riots (1700-1800)
	(1)	(2)	(3)
Royal Borough	0.4386***	0.1919***	0.3316***
	(0.020)	(0.013)	(0.018)
Observations	4221	4221	4221
Mean DV	0.2378	0.0688	0.1910
Controls	Yes	Yes	Yes
County FE	Yes	Yes	Yes
R^2	0.5377	0.4932	0.5183

Panel B: Riots during Industrialization

	Ln Swing Riots (1830-1832)	Ln Attacks on Machines and Arsons (1758-1829)	Ln Industrial Protests (1756-1826)
	(4)	(5)	(6)
Royal Borough	1.0921***	1.0970***	0.0559***
	(0.058)	(0.063)	(0.013)
Observations	4221	4221	4221
Mean DV	0.7911	0.4289	0.0214
Controls	Yes	Yes	Yes
County FE	Yes	Yes	Yes
R^2	0.4963	0.5262	0.3476

Notes: Independent variable is a dummy equal to one if the city had a medieval royal borough. The dependent variables in columns (1), (2), and (3) of panel A are food riots that happened between 1347 and 1800, between 1347 and 1700, and between 1700 and 1800, respectively. The dependent variables in columns (4), (5), and (6) of panel B are agricultural riots during the 1830-1832 Swing Riot crises, more attacks on machines (including agricultural machines) between 1758 and 1829, and industrial protest between 1756 and 1826, respectively. Observations are at the minimum common geographic unit (quasi-parish). We use frequency weights given by the number of places inside any geographical unit. Mean DV means average of the dependent variable. We include geographical and population in 1801 controls. County FE are county dummies. Sample of cities that had a medieval borough. Robust standard errors in parenthesis. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table F.34: Royal Boroughs and Petitions

	Ln Petitions	Ln New Petitions	Ln New Petitions - Workers
	(1)	(2)	(3)
Royal Borough	1.923***	1.925***	1.770***
	(0.0732)	(0.0602)	(0.0566)
Observations	4221	4221	4221
Mean DV	1.110	0.708	0.653
Controls	Yes	Yes	Yes
County FE	Yes	Yes	Yes
R^2	0.595	0.629	0.638

Notes: Independent variable is a dummy equal to one if the city had a medieval royal borough. Dependent variables are the log number of matched petitions between 1688 and 1834 (1). Log number of new matched petitions between 1688 and 1834 (2). Log number of new matched petitions between 1688 and 1834 that refer to workers (3). The dependent variable in (1) refers to whether a paragraph in the Journal of the House of Commons mentioned in any form the word "petition", while in columns (2) and (3) we restrict to cases in which a paragraph in the Journal of the House of Commons began with the formula "A Petition of X ... setting forth that ..." that most likely identify a new petition. Observations are at the minimum common geographic unit (quasi-parish). We use frequency weights given by the number of places inside any geographical unit. Mean DV means average of the dependent variable. We include geographical and population in 1801 controls. County FE are county dummies. Sample of cities that had a medieval borough. Robust standard errors in parenthesis. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table F.35: Royal Boroughs and Industrial Development: Child and Female Labor

	Child Workers	Female Workers
	(1)	(2)
Royal Borough	-90.56	-570.8***
	(61.11)	(197.2)
Observations	2116	2116
Mean DV	196.1	1160.3
Controls	Yes	Yes
County FE	Yes	Yes
Sample	Factories	Factories
R^2	0.820	0.830

Notes: Independent variable is a dummy equal to one if the city had a medieval royal borough. Dependent variables are the number of workers in textile mills that are below 13 years old (1) or women (2). Observations are at the minimum common geographic unit (quasi-parish). We use frequency weights given by the number of places inside any geographical unit. Mean DV means average of the dependent variable. We include geographical and population controls. County FE are county dummies. Sample of cities that had a medieval borough and at least one factory. Robust standard errors in parenthesis. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.