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The Effect of Mechanisation on Labour: Evidence from the Diffusion of Steam

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The effect of mechanisation on labour: Evidence from the diffusion of steam power

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Abstract

We use the two earliest industrial censuses from 19th-century France to investigate the impact on industrial labour of one of the largest waves of mechanisation in history, the diffusion of steam power. We establish using OLS and IV analyses that wages and employment both grew significantly more among steam-adopting industries compared to their non-adopting peers. Growth in total revenue was also significantly higher among steam adopters while labour's share did not change significantly compared to non-adopters. These findings dispute the common view that the historical modernisation of industry set labour back in absolute terms or relative to capitalists.

Keywords: Capitalists, industrialisation, inequality, labour, mechanisation, productivity, technological progress, wages.

JEL Classifications: I15, J42, J31, L92, O14, O33

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1 Introduction

Policymakers widely agree that technological progress is necessary in order to thrive in an increasingly competitive world. This view is however accompanied by scepticism about whether new technology will harm workers through wage cuts and job losses (e.g. Aghion et al., 2021; Johnson and Acemoglu, 2023). Part of the skepticism is grounded in history. Workers during the industrial revolution feared that mechanisation would render their skills redundant, dreading they either had to battle joblessness or buckle down and perform unskilled work for lower wages (e.g. Caprettini and Voth, 2020). Previous studies have indicated that these concerns applied in connection with specific historical innovations or areas of production (e.g. Mokyr et al., 2015). We move beyond earlier works by exploring one of the largest and most widespread waves of mechanisation in history, the diffusion of steam power. The empirical setting is mid-19th-century France, a time and place where steam technology boomed (e.g. Franck and Galor, 2021, 2022), and where rich historical statistics allow an investigation of its effect on labour. We perform OLS and IV regression analyses using data from the two earliest national industrial censuses in France recorded in the 1840s and the 1860s. These data enable a comparison of industries that did and did not install steam power between the two censuses, showing that wages, employment, and total revenue all grew relatively faster among steam adopters while the change in labour's share was not significantly different from that of non-adopters.

Our findings thus dispute the common narrative that industrial modernisation disfavoured labour both in absolute terms and relative to capitalists. Indeed, earlier works on the topic are overwhelmed with 'technological anxiety' (Mokyr et al., 2015, see title). For example, Karl Marx and John Maynard Keynes both famously regarded technical unemployment as a serious consequence of mechanisation (Marx, 1844, pp. 25-30; Keynes, 1931, p. 364). Simon Kuznets further argued that the profits of early industrial capitalists grew faster than the wages of the workers they employed (Kuznets, 1955, p.18) and Friedrich Engels even that early industrial workers encountered poorer payments and living conditions than their pre-industrial peers (Engels, 1943, p. 3). Equally, the shift from artisan to factory production that went hand-in-hand with the spread of steam power has been perceived as skill- and

therefore wage-saving (e.g. Berg and Hudson, 1994; Goldin and Katz, 1996; Atack et al., 2004, 2008, 2019, 2023). These views align with John Habakkuk and Robert Allen's contention that industrial modernisation was an attempt to save on labour costs (e.g. Habakkuk, 1962; Allen, 2009). Chronicles about machine-breaking riots sparked by workers' fear that mechanisation would render their skills obsolete (e.g. Nuvolari et al., 2002; Caprettini and Voth, 2020; Jarrige and Hilaire-Perez, 2021) have helped cement the impression that earlier waves of mechanisation deteriorated labour conditions.

Our OLS analysis contrastingly documents a robust positive relationship between the adoption of steam power and growth in the use of labour and its compensation – also after accounting for an extensive list of probable confounding factors. Because the OLS relationship is not necessarily causal, we re-estimate the effects in a dual instrumental-variable setup using plausibly exogenous cross-district variation in steam adoption based on the districts' proximity to coal deposits (with coal fuelling the steam engines) and to Fresnes-sur-Escaut in the north of France from where French steam knowledge first diffused (e.g. Franck and Galor, 2021, 2022). Our IV analysis establishes that total employment increased 122% more and male wages 20% more on average among steam adopters compared to their non-steam-adopting peers. Since steam power could have emerged at any time between the 1840s and the 1860s, our estimates combine short- and medium-term effects. By using variation in steam adoption prior to the first industrial census registration however we show that pre-1840s steam adopters also experienced significantly more growth between the 1840s and the 1860s – both in total employment (123%) and in male wages (17%) – compared to non-adopters. These numbers suggest that the positive effects on wages and employment of adopting steam power applied both in the shorter and longer runs.

The observed positive effect of mechanisation on wages suggests that technical change widened the wage structure already at the earliest stages of industrial modernisation, i.e. with the adoption of steam power, something previously believed to have emerged only with the later spread of electric motors (Goldin and Katz, 1996, 1998, p. 697). The finding that industrial modernisation was labour biased moreover confronts the Habakkuk thesis that labour shortage historically prompted labour-saving innovations. Many of the labour-saving examples presented in Habakkuk (1962) concerning North America's industrialisation

and later in Allen (2009) concerning England's industrial revolution have however centred on specific appliances implemented in textiles such as the spinning jenny (e.g. Jarrige and Hilaire-Perez, 2021). Steam engines on the other hand had much wider industrial application and thus concerned much broader sections of the industrial workforce. But even when we restrict our analysis to wool milling – a textile sector well-suited to mechanisation – we observe that steam adopters increased male wages by a staggering 38% and total employment by 203% more than their non-steam adopting wool-milling peers. We do not observe significant improvements in labour productivity resulting from steam adoption neither in the wool-milling industry nor in French manufacturing as a whole. Steam power typically did not involve major changes to internal factory designs (e.g. Devine, 1983), and so did not contribute to the reorganisations and productivity growth that Juhász et al. (2023) observes ensued from specific machines installed in textiles at the time.

Our baseline analysis further shows that the total revenue of steam adopters grew 147% more among early and late steam adopters alike compared to non-adopters. We do not observe any significant difference in the evolution of labour's share between the two, with labour's share defined as the total cost of labour over the total revenue. We also do not detect significant growth in the share of women and children workers among steam adopters compared to their non-adopting peers, thus rejecting the idea that mechanisation replaced expensive male workers with cheaper labour options. Our findings this way jointly dispute the common understanding that industrial modernisation worsened labour's position in absolute terms or relative to capitalists (e.g. Engels, 1943; Piketty, 2014; Bartels et al., 2023).

We also consider the interface between the use of traditional water power and the new steam-powered technology. The censuses indicate that steam power regularly supplemented water in order for producers to expand production beyond what local water resources allowed (e.g. Benoit, 2020). But there were also cases in the censuses where steam replaced water power entirely or was adopted in its absence. Our estimates imply that employment increased relatively less and wages relatively more compared to non-adopters when steam was integrated alongside water power whereas employment oppositely grew more and wages less when steam was used on its own. The effects of the two technological scenarios were however generally not statistically different from the baseline results.

2 Background

Steam power is one of the earliest examples of a general-purpose technology (e.g. Crafts, 2004; Bresnahan, 2010; Benoit, 2020). It was used historically to both mechanise and stabilise production. The first-ever steam engine was erected and put to use in England in 1702, after which steam power spread worldwide over the course of the next two centuries. The industrial statistics needed to conduct our analysis for England instead of France are only available after 1900 (see Smith and Penneck, 2009). By this time, the next large wave of general-purpose technology (i.e. electric motors) had already started to replace steam power (Devine, 1983; Goldin and Katz, 1998). The census data for France used below instead starts several decades before electricity found its industrial use, thus freeing our analysis from any confounding interactions between the two huge waves of general-purpose technology.

France is often portrayed as a technological laggard compared to England. While this has no bearing for the importance of our conclusions below, France's slowpoke certainly applied to its historical employment of steam (e.g. Nuvolari, 2010). The first commercial steam engine in France dates back to 1732 and served to pump water out of mines in Fresnes-sur-Escaut in the north of France (Franck and Galor, 2021). The archives of Boulton and Watt, a leading British steam manufacturer at the time, reveal numerous inquiries from France concerning the Watt steam engine in the late 18th- and early 19th-century (see Tann and Breckin, 1978). Barely any of these inquiries however translated into actual orders. Boulton and Watt delivered a total of 110 steam engines to overseas customers between 1776 and 1825. Only six of these were sent to France for a total of 314 horsepower, a far cry from the more than 200,000 steam-generated horsepower used in Britain at the time (Van Neck, 1982).

Large-scale steam adoption in France occurred only after the 1820s. The Continental Blockade was part of the reason for this delay (Payen, 1969). The successful diffusion of steam power in France thereafter is largely ascribed to improved steam technology. The low-fuel consumption engine developed by Trevithick and Woolf allegedly made it profitable to install steam also in areas where coal was relatively costly (Nuvolari, 2010). The Woolf steam engine gradually spread from Fresnes-sur-Escaut in the late 1830s to most of the rest

of France during the subsequent decades (Diebolt et al., 2021; Franck and Galor, 2021, 2022).

Coal was certainly vital to the historical modernisation of industry (e.g. Allen, 2009; Fernihough and O'Rourke, 2021; De Pleijt et al., 2020). In particular, Allen (2009) has argued that low-priced coal was a key reason why England industrialised before France. Allen's view contrasts earlier studies holding that cheap coal could always be imported into France if needed, and that it was heavy investments in water-power technology that caused France's slow adoption of steam power (Crouzet, 1974, 2003). France was much better endowed with water than England and relied heavier on this for manufacturing than Britain (Benoit, 2020). The lack of French railroads up until the mid-19th-century (see the maps in Appendix D) meant however that coal outside of coal-rich regions and away from coal-importing ports was pricey and made hydraulic power a rational choice where water was abundant. Steam according to Dubuc (1952) and Benoit (2020) would therefore only occur where water was absent or insufficient to satisfy local energy needs.

An example of this is captured in two letters uncovered from the Departmental Archive of Besançon reported in Appendix A (Beuchot, 2023). The letters concern a production plant – *Usine de la Gouille* – owned by Mr. Bouchot and located a few kilometres outside of Besançon. The plant – an iron casting foundry – originally drew its water energy from the Doubs river. One of the letters, dated 23 February 1835, informs that Mr. Bouchot had made an inquiry to the chief engineer of the Doubs river about the possibility to build a new water intake at the level of a double lock to be able to continue his production all year round. The letter discloses that Mr. Bouchot's proposal was rejected because his double lock would have reduced the level of the Doubs river below its navigable capacity. In a second letter, it states that Mr. Bouchot had decided to install two steam engines for a total of 40 horsepower instead despite the cost of this being higher than the double lock. The letter also reveals that the new steam equipment involved the hiring of eight additional blacksmiths alongside a foreman and a supervising mechanic for all of who it was necessary to build up several additional housing units.

The letters emphasise several important aspects linked to steam adoption at the time. One was that hydraulic power had capacity constraints. Steam power offered a solution, even if its adoption was costly on numerous levels. For example, the sheer price of installing

the steam engine was considerable and required access to investment funding (see Van Neck, 1982; Nuvolari and Verspagen, 2009). Steam further demanded an increased workforce entailing a higher total costs of labour. The additional costs in the example above comprise not just the extra labour wages of ten additional workers. It also included a foreman whose wage contained an added payment for overseeing activities, as well as a mechanic whose wage entailed a skill premium. The letter thus suggests that steam would not only expand employment – it would also raise average wages. Though not explicated in the letters, the production plant was located in the vicinity of the coal deposits of Épinac, Gémoval, and Creusot et Blanzy, helping to keep the costs of steam-engine fuel down at *Usine de la Gouille* while coal in other areas of France had to be imported from other regions or abroad (Benoit, 2020).

The advantages for production plants like *Usine de la Gouille* of raising expenditures were that total production and hence total revenues were likely to increase as a result. These factors and more are quantified below and considered for their role in steam adoption in 19th-century French manufacturing, alongside the effect that the new technology had on labour.

3 Data

The statistics used in the analysis below consist of two parts. One concerns industry-specific data and comes from the two earliest French industrial surveys carried out by the French Bureau of Statistics during the mid-19th century (see Chanut et al., 2000). The second part concerns district-specific information. These district-specific details - drawn from a variety of sources listed in Appendix B – serve to account for observable conditions potentially important for local producers' decision to adopt steam power including water availability and easy access to coal.

3.1 Industry-specific data

The first ever industrial census in France was carried out in the 1840s and the second in the 1860s. The censuses are all-encompassing in terms of active industries at the time and

include four key economic indicators, i.e. the motive powers deployed (water, wind, animal, and steam); the number of employees; their average wages; and the value of production. The two censuses differ with respect to their unit of observation. The first census reports its statistics at the firm level and the second at the district sub-industry level. The latter prevents a tracking of local firms across time. We resolve this issue by grouping firms together at the district sub-industry level also in the case of the first census while controlling in the analysis for the number of local sub-industry establishments. This conveniently also solves the issue that firms with less than ten employees were bundled together at the district-sub-industry level already in the first census (Doraszelski, 2004, pp. 259-260; Chanut et al., 2000, p. 15-21). The second census further differs from the first one by reporting not just the type but also the number of motive horsepower installed – an information we use to test the robustness of our baseline results.

The two censuses jointly mention 82 sub-industries across 356 districts totalling 3,839 operating local sub-industries in the 1840s and 6,460 in the 1860s. Out of these, 2,614 local sub-industries were active across both censuses, making up our baseline sample. Not all districts hosted all 82 sub-industries (Panel A of Figure 1). On the busy end, Lille in Hauts-de-France had a total of 32 operating sub-industries in the 1840s, whereas five percent of the sampled districts had only a single active one. The most common sub-industries included flour milling (active in 68% of all districts), breweries (63%), and brick production (50%). Among the least common sub-industries was the production of acid, arms, and musical instruments (<1%). The summary statistics of the baseline sample are reported in Appendix C and concern 76 of the 82 sub-sectors mentioned in the censuses.

Our main explanatory variable – whether or not steam power was adopted – proxies for industrial mechanisation. Steam power in the 1840s was used intensively in textiles (41%), iron and steel production (44%), and the production of rotating wooden objects (100%). Steam was not used at all in shoe-making, watchmaking, and the production of musical instruments. Some of the sampled sub-industries used one or several motive powers, others none (see Table 1). Eight percent of the sampled sub-industries used steam exclusively in the 1840s. A further ten percent used steam in combination with other motive powers, mainly water. The share of local steam-using sub-industries roughly doubled between the 1840s

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and the 1860s, capturing the speed of diffusion of steam power in France between the two censuses. The use of traditional motive powers in the 1840s and 1860s is controlled for in the analysis.

Table 1: The use of motive powers in the baseline sample

Type of power	1840s	1860s
No power	43.4%	32.2%
Only steam	7.4%	15.4%
Only water	20.8%	12.8%
Only animal	7.1%	7.1%
Only wind	0.7%	0.4%
Steam and water	7.3%	15.1%
Steam and animal	2.6%	4.8%
Steam and wind	0.2%	0.2%
Other	10.4%	12.0%
Total %	100%	100%
Total N	2,614	2,614

The fact that we can identify local steam-using sub-industries already at the time of the first census enable us to crudely assess both the shorter- and longer-term impact of steam adoption on labour. We obtain the two measures by separating local steam-using sub-industries in two groups: early steam adopters with steam employed for more than 20 years in the 1860s and late steam adopters with steam used for less than 20 years. Panel B of Figure 1 shows the district-level variation in steam adoption in textiles represented by the wool-milling industry. Medium-blue districts signify late steam adopters and dark-blue districts early ones. Light-blue districts had an active but non-steam using wool-milling industry both in the 1840s and 1860s. Wool milling in the white districts either did not exist or did not persist across the two censuses.

Turning to our main outcome variables – wages, employment, and total revenue – these varied considerably both within and across sub-industries. For example, male workers employed in acid-making were paid twice as much on average as male workers in shoe-making. Inter-industrial differences were due in part to regional wage variation. Male wages in flour

Figure 1: Sub-industries by district and steam adoption in wool milling

A) Sub-industries by district   B) Steam in wool milling
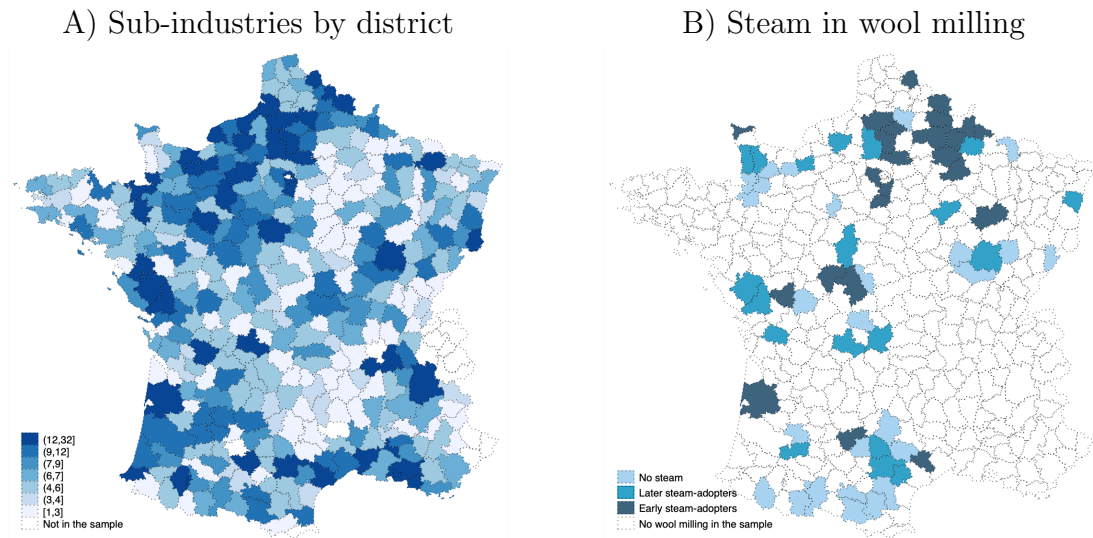
Notes: Early steam adopters had installed steam power prior to the 1840s. Late steam adopters adopted it between the 1840s and the 1860s. No wool milling means that the sub-industry either did not exist or did not persist across the two censuses. *Source*: Chanut et al. (2000)

milling in the industrial regions of northern France for example were three times higher than those paid in the less industrialised and less densely populated southern regions. Employment varied in similar fashions. Steel and textile production occupied large shares of the industrial workforce while brewing, saw-milling, and acid-making employed much smaller portions. The shares of women and children employed varied too. The production of musical instruments had no women and children employed at all, whereas the workforce in lace-embroidery consisted of 98% women and children. Total revenues also varied greatly, with the average value of output created in flour-milling for example some 75 times larger than that created in acid production.

3.2 District-specific data

Recent scholarship has pointed to a host of plausible stimuli behind the mechanical modernisation of industry. These divide into three main hypotheses helping to account for local variation in factors that were potentially associated with steam adoption. The summary

statistics of the district-specific variables are reported in Appendix C, while maps showing their geographical distribution are displayed in Appendix D.

The first hypothesis is the so-called *high-wage theory*. In particular, Allen (2009) has argued that England was the first country worldwide to industrialise because labour there was costlier than elsewhere while coal and capital was cheaper. We account for Allen's propositions below by controlling for local sub-industry-specific wages as well as for proximity to coal deposit and coal-importing ports. Indeed, our IV analysis uses proximity to coal deposits as an instrumental variable for steam adoption.

Furthermore, Allen's notion of cheap capital aligns with the idea of finance-led growth. For example, Rousseau and Sylla (2005) found that financial structures predated important technical developments in early 19th-century North America. Van Neck (1982) concurrently highlighted the crucial role played by banks in steam adoption in North-East France, the costs of which were considerable (e.g. Nuvolari and Verspagen, 2009). Here, we account for variation in local access to finance by controlling for the number of banks by district.

The second hypothesis concerns the role of market potential. We account for two types of market forces. One regards the size of local markets, captured by district-level population densities alongside access to transport infrastructure proxied by the geodesic distances from the centroid of each district to coasts, rivers, and railroads. Equally, because local purchasing power was not just a matter of the number of people but also of their wealth, we further control for a set of geographical variables related to the historical affluence of local communities including aspects such as soil quality and climate (rainfall and temperature).

The their and final hypothesis asserts that human capital was critical to the adoption of early industrial technologies. Kelly et al. (2014, 2023) have suggested that the knowledge necessary to introduce new technologies ranged from the training required in order to understand the principles of advanced machines to the practical knowledge needed to design, build, and maintain them. We concurrently account for local variation in four different types of human capital: basic, academic, scientific, and practical knowledge.

More specifically, basic human capital is captured by the district-level literacy rates, and academic knowledge by the distance from the centroid of the district to the nearest university. Scientific knowledge falls into two categories: general and specific. General

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scientific knowledge is estimated by the local rate of subscription to scientific encyclopaedias (Squicciarini and Voigtländer, 2015). Specific scientific knowledge instead is captured by whether or not steam power was installed in another local sub-industry at the time. Practical knowledge is captured by whether or not the district had a metal sector, which Kelly et al. (2023) deems necessary to build, install, and maintain the local steam engines.

4 Analysis

This section explores the effect of steam adoption on labour. In particular, the census information enable us to consider a total of eight outcome variables including the total value of output; the value of output per worker; total employment; the share of women and children to total employment; male, female, and child wages; and labour's share defined as the total cost of labour to the total value of output.

We first use an OLS model to estimate effects. However, because the relationship between steam adoption and the outcome variables could be subject to reverse causality or governed by unobserved factors, we also deploy an IV strategy in order to mitigate any potential problems of endogeneity. To both ends, we use a linear regression model of the following form:

$$Outcome_{ijt} = \alpha_0 + \alpha_t + \alpha_{ij} + \alpha_1 Steam_{ijt} + \sigma \mathbf{X}'_{ijt} + \epsilon_{ijt} \tag{1}$$

where $Outcome_{ijt}$ represent each of our eight outcome variables in sub-industry j of district i at time t; $Steam_{ijt}$ is a dummy taking the value one if sub-industry j in district i used steam power at time t and zero otherwise; α_t and α_{ij} are time and local-sub-industry fixed effects; $\mathbf{X}$ is a matrix including both the lagged and non-lagged local sub-industry statistics and the time-invariant district-specific controls (multiplied by a dummy equal to one in the 1860s); and ϵ_{ijt} is an i.i.d. error term for sub-industry j of district i at time t. The parameter α_1 is the key coefficient of interest, expressing the impact on each of the outcome variables of adopting steam at time t.

While the OLS model controlled for numerous plausibly confounding factors, its coef-

ficients might still be biased. In order to mitigate any biases, we exploit exogenous vari-
ation in steam adoption across districts based on their proximity to a coal deposit and to
Fresnes-sur-Escaut in the north of France. Closeness to coal helped keep the price of fuel
for the steam engines down in the presence of high-cost overland transportation. Closeness
to Fresnes meant being located close to the region where the first-ever French steam engine
was adopted, which helped local producers access knowledge about how to install the engine
(Franck and Galor, 2021, 2022). Table E.1 in Appendix E shows that the two instrumental
variables are not statistically correlated with important pre-steam development indicators
including finance, human capital formation, and urbanisation.

The first stage of our IV analysis thus predicts the dummy $Steam_{ijt}$ of equation (1) by
the distance between the centroid of district i and the centroid of Fresnes-sur-Escaut on the
one hand and the nearest coal deposit on the other, as described in the following equation:

$$Steam_{ijt} = \beta_0 + \beta_t + \beta_{ij} + \beta_1 Dist.\ Fresney_i + \beta_2 Dist.\ coal_i + \mu \mathbf{X}'_{ijt} + \omega_{ijt} \qquad (2)$$

where β_t and β_{ij} are time and local-sub-industry fixed effects; $\mathbf{X}$ is the same matrix of
controls as in equation (1), and ω_{ij} is an error term for sub-industry j in district i at time t.

4.1 The baseline results

Tables F.1-F.8 in Appendix F reports the effects of steam adoption on our eight outcome
variables for the OLS models (Columns 1-2) and IV models (Columns 3-4), respectively.
All variables are in logs except dummies, and all specifications include time- and local-
sub-industry fixed effects. Conley standard errors are clustered within 100 km from the
centroid of each district. Columns (1) and (3) account for the lagged and non-lagged local
sub-industry specific variables, while Columns (2) and (4) further account for the time-
invariant district-specific factors. The estimated coefficients of the OLS and IV models are
qualitatively identical, though the IV coefficients are typically larger. The OLS and IV
coefficients in our steam horsepower sensitivity check (see Appendix G) are however closer
in terms of magnitude.

The first stages of the IV analysis (Columns 3 and 4) inform that closeness to coal and

Fresnes both had a positive impact on the likelihood of adopting steam. Further stimuli of steam adoption included many and expensive workers (Tables F.3 and F.6). These observations align with Allen's hypothesis that labour scarcity and inexpensive coal prompted mechanisation, even if mechanisation in our analysis below ultimately turns out not to save on labour in the way that Allen envisioned it. The first stages also unveil that use of water power in the 1840s, or its installation between the 1840s and 1860s, was an impetus to steam adoption. This finding conflicts with Crouzet's assertion that use of water obstructed the adoption of steam power (e.g. Crouzet, 1974, 1996).

Figure 2 reports the effects of steam adoption on our eight outcome variables using the IV model and the full set of controls (Columns 4 in Appendix F). The observed coefficients – plotted by their order of magnitude – reveal that growth in the total value of output between the two censuses attributable to steam adoption was 147% higher for both early and late adopters. The growth of total employment was 122% higher for late adopters and 123% higher for early adopters compared to non-adopters. The growth of wages among late adopters was 31% higher for females, 24% for children, and 20% for males between the 1840s and the 1860s relative to non-adopters. The comparable growth of wages for early steam adopters was 27% higher for females, 23% for children, and 17% for males.

The growth in labour productivity, measured as the total value of output per worker, was 20% higher for late adopters and 6% higher for early adopters compared to non-adopters, though the coefficients were not statistically significant. The lack of statistical significance also applied to labour's share, defined as the total cost of workers divided by the total value of output, which was 1% higher for late adopters and 2% higher for early adopters relative to non-adopters. Lastly, the change in the share of women and children relative to total employment was also not statistically significant compared to non-adopters, with the share being 12% higher for late adopters and 16% for early adopters.

The observations above are robust to using steam horsepower instead of steam yes/no as the main explanatory variable (see Appendix G). Note that, because horsepower use was only reported in the second census, the sampled sub-industries in the horsepower analysis are restricted to sub-industries without steam power in the 1840s.

Figure 2: The effect of steam adoption on labour
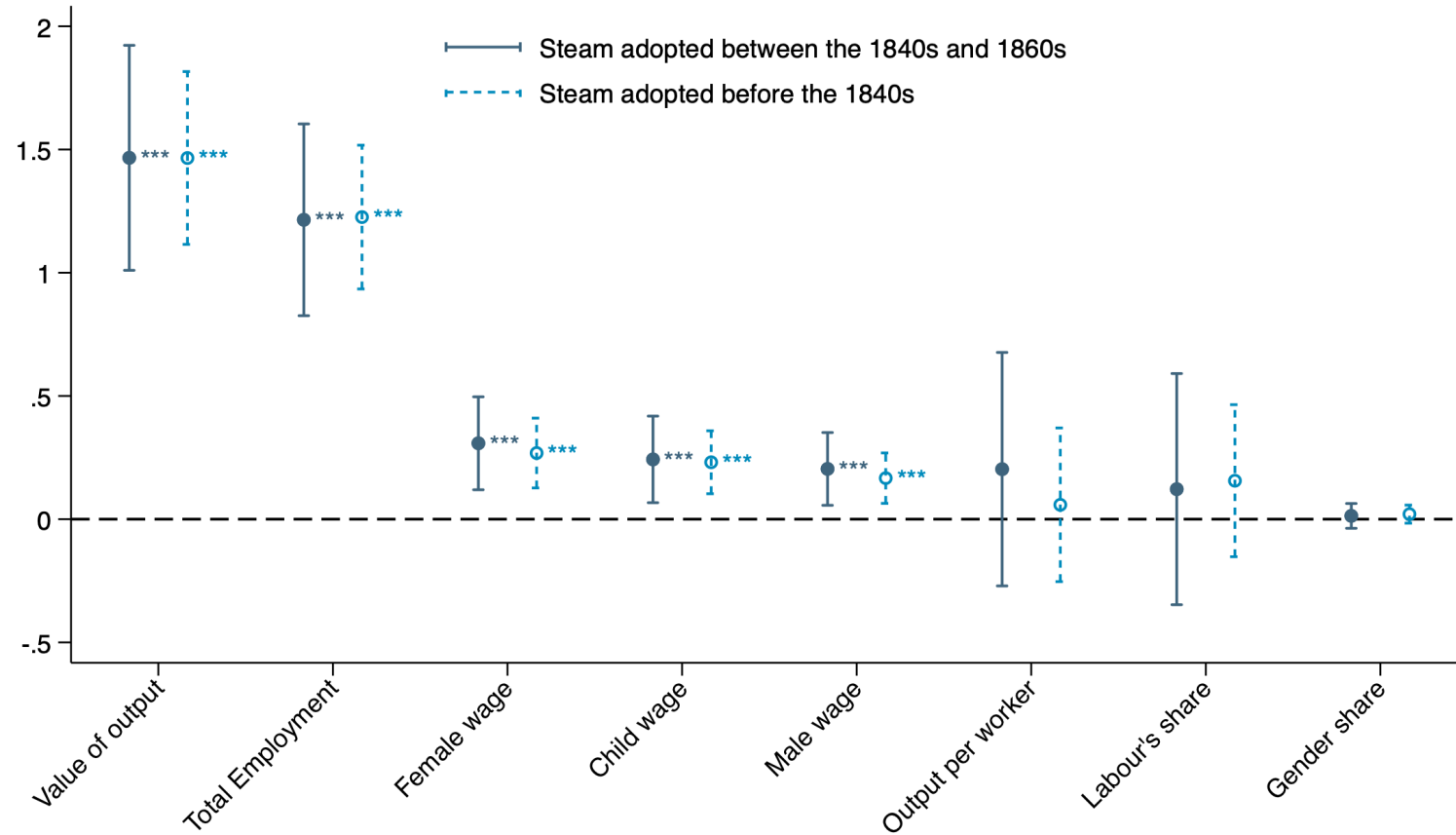
Notes: The coefficient plot is based on Appendix F, estimating the effects of adopting steam power before the 1840s or between the 1840s and 1860s. The coefficients and their confidence intervals are all based on Columns (4), reporting the results of the IV model jointly described by equations (1) and (2) in the text. The asterisks in the graph refer to statistical significance: * $p<0.10$. ** $p<0.05$. *** $p<0.01$. The models account for both time-varying sub-industry-specific and district-specific variables, alongside sub-industry, district, and time fixed effects, with Conley standard errors clustered within 100 km away from the centroid of each district. Time-varying sub-industry specific-variables include dummies for the use of traditional motive powers (water, wind, animal), the number of establishments in each local sub-industry, and the lagged outcome variable. District specific variables include longitude, rainfall, temperature, land suitability for agriculture, literacy rates, encyclopaedia subscription rates, number of banks, population density, whether the district had a metal sector and a steam engine installed in another local sub-industry in the 1840s, as well as distances to the nearest coast, river, railroad, and university. All variables are in log except dummies.

Figure 3: The effect of steam adoption with and without water power on labour
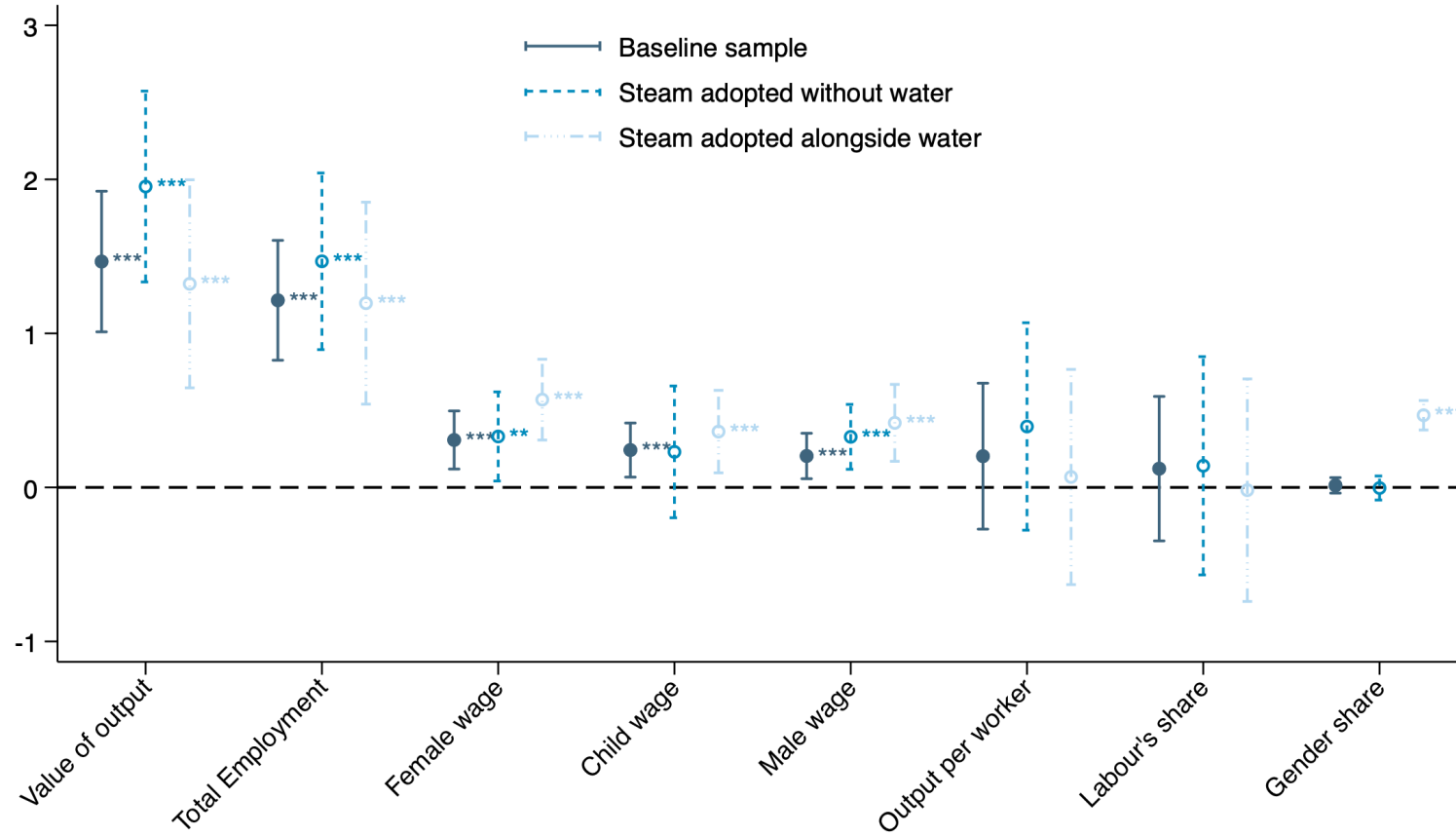
Notes: The coefficient plot is based on Appendices F and H, estimating the effects of adopting steam power before the 1840s or between the 1840s and 1860s. The coefficients and their confidence intervals are based on Column (4), reporting the results of the IV model jointly described by equations (1) and (2) in the text. The asterisks in the graph refer to statistical significance: * p<0.10. ** p<0.05. *** p<0.01. The models account for both time-varying sub-industry-specific and district-specific variables, time, alongside sub-industry and district fixed effects, and the Conley standard errors are clustered within 100 km away from the centroid of the district in question. Time-varying sub-industry specific-variables include dummies for the use of traditional motive powers (water and animal, but not wind), the number of establishments in each local sub-industry, and the lagged outcome variable. District specific variables include longitude, rainfall, temperature, land suitability for agriculture, literacy rates, encyclopaedia subscription rates, number of banks, population density, whether the district had a metal sector and a steam engine installed in another local sub-industry in the 1840s, as well as distances to the nearest coast, river, railroad, and university. All variables are in log except dummies.

Figure 4: The effect of steam adoption in wool milling on labour
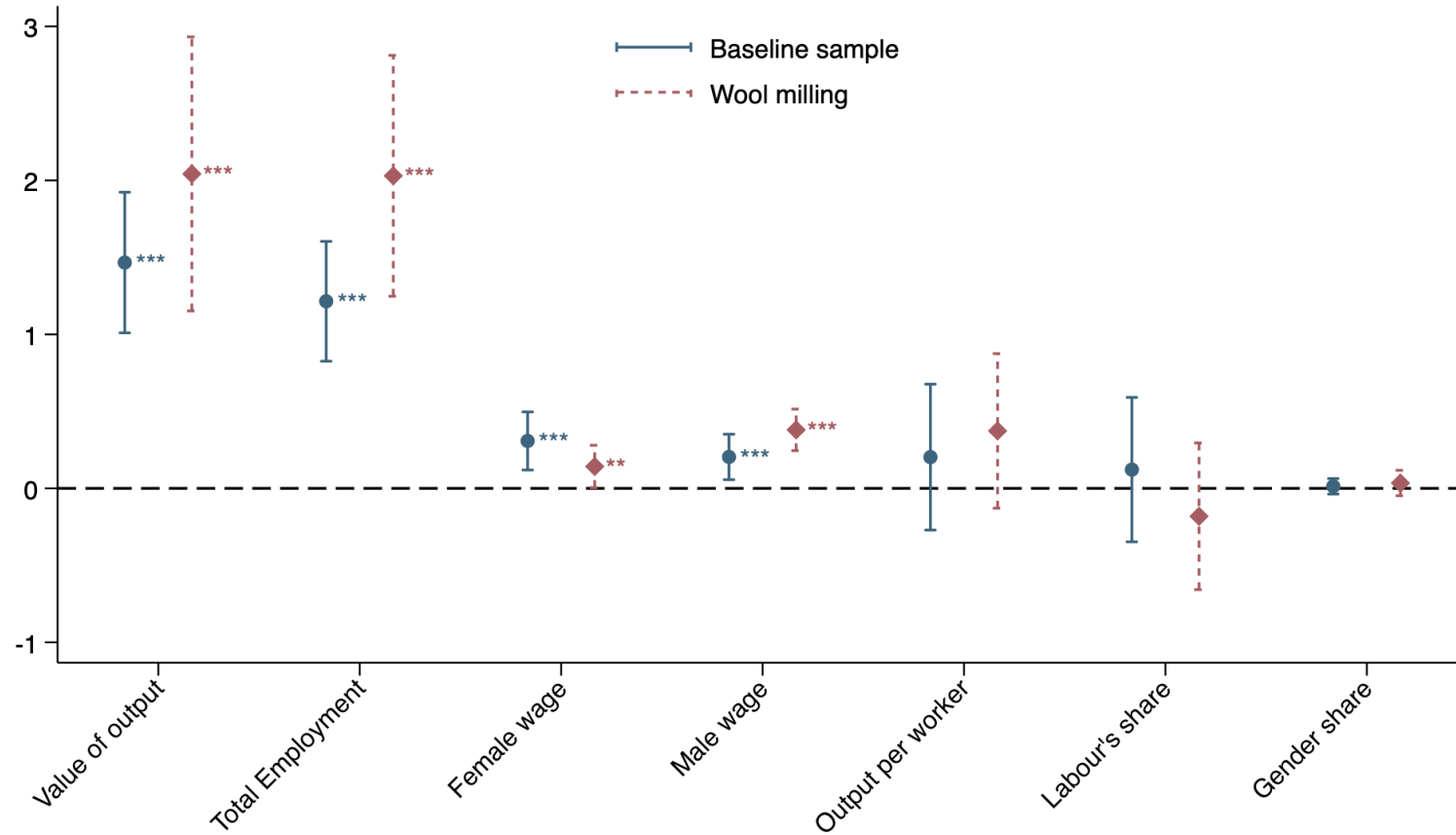
Notes: The coefficient plot is based on Appendices F and I, estimating the effects of adopting steam power before the 1840s or between the 1840s and 1860s. The coefficients and their confidence intervals are based on Column (4), reporting the results of the IV model jointly described by equations (1) and (2) in the text. The asterisks in the graph refer to statistical significance: * p<0.10. ** p<0.05. *** p<0.01. The models account for both time-varying sub-industry-specific and district-specific variables, time, and district fixed effects, and the Conley standard errors are clustered within 100 km away from the centroid of the district in question. Time-varying sub-industry specific-variables include dummies for the use of traditional motive powers (water and animal, but not wind) and the lagged outcome variable. District specific variables include longitude, rainfall, temperature, land suitability for agriculture, literacy rates, encyclopaedia subscription rates, number of banks, population density, whether the district had a metal sector and a steam engine installed in another local sub-industry in the 1840s, as well as distances to the nearest coast, river, railroad, and university. All variables are in log except dummies.

4.2 Different motive-power combinations

Roughly half of the sampled local sub-industries that had adopted steam power by the 1860s had combined it with water power (see Table 1). Are the observed effects of steam adoption on the outcome variables sensitive to whether or not steam was conjoined with water? Figure 3 reports the IV impact of steam adoption in two scenarios: one where steam was deployed in combination with water power and one where steam was used in its absence. The coefficients and confidence intervals are based on the regression models reported in Appendix H using the same control variables as in the baseline specification above. The coefficient plot shows that the effects of steam in the two scenarios are generally not statistically different from the baseline results. The numbers nevertheless imply that employment grew relatively less and wages relatively more among steam adopters when steam was integrated alongside water whereas wages grew relatively more and employment relatively less when steam was used on its own.

4.3 The mechanisation of textile

The textile sector is often considered in the context of industrial modernisation. Juhász et al. (2023) for example observes that the mechanisation of cotton spinning in France was associated with productivity growth through a reorganisation of the production process. The machines introduced into cotton spinning at the time – including the spinning jenny, the water-frame, and the spinning mule – where all installed on the factory shop floor. Steam engines in contrast were usually positioned outside of the factories and thus did not influence the interior designs of factories (e.g. Devine, 1983, p.371). It is not obvious therefore that steam would result in the same reorganisation of production – and hence have the same positive effects on productivity – as the machines installed inside of the factory had.

Wool and cotton milling are both examples of textile sectors that were well-suited to mechanisation. The first stage of our IV analysis works poorly in the case of cotton milling but reasonably well in the case of wool milling. Appendix G reports the results of running the baseline model when restricting the sample to wool milling (see Panel B of Figure 1). Figure 3 reports the coefficients and confidence intervals obtained from the IV regression model

specified in Columns (4) of Tables I.1 to I.7 in Appendix I. The graph reveals that steam adoption in wool milling had the same qualitative impact on the eight outcome variables as was the case for the whole of French manufacturing using the baseline sample.

In particular, total employment and male wages among steam adopters in the wool-milling industry both increased somewhat more – 203% and 38%, respectively – than the comparable numbers of the baseline sample – 122% and 20%, respectively. Labour productivity in the steam-adopting wool-milling industries also increased more than in the baseline model – 37% versus 20% – even if the increase was not statistically significant. It should be noted that the size of the wool-milling sub-sample is relatively modest (N=140); that the Kleibergen-Paap test statistics sometimes drop slightly below the desired minimum of 10, indicating that instrumentation in the case of wool milling does not function as well as with the baseline sample; and that the less restrictive OLS regression specification (Column 1 of Table I.2) does indeed generate a statistically significant and positive effect of steam adoption on labour productivity, consistent with the observed impact of mechanisation in textile reported in Juhász et al. (2023).

5 Conclusion

Our findings suggest that one of the most prominent waves of mechanisation in history – the diffusion of steam power – augmented both the use of labour and its compensation. The narrative presented in the background section indicated that steam engines were a supplement to water power, and that this entailed not just an expansion of the local workforce but also an increase in the share of local workers entitled to a wage premium. Total labour costs grew in tandem with total revenue both among steam and non-steam adopters, meaning that labour's share was unaffected by the adoption of steam power. These findings jointly contest earlier pessimistic views that major technological breakthroughs – captured here by the introduction of steam engines – set labour back in absolute terms or relative to capitalists.

Future studies could take several routes towards a deeper understanding of the historical impacts on labour of mechanisation. One route would be to shed further light on the so-called *deskilling hypothesis* (e.g. Atack et al., 2023). This would involve uncovering historical data

that enable an investigation of the shift in skill-use at the sub-industry (or even firm) level in response to technical change. Data that would allow a more exact tracking of the effects of mechanisation on labour over time would further inform whether the idea of technical anxiety is applicable to more narrowly-defined time horizons than those possible to consider here. This could be combined with occupational statistics that would allow a test of Acemoglu and Restrepo (2018)'s *replacement-versus-reinstatement* hypothesis that technical change caused new job types to substitute outdated ones.

References

Acemoglu, D. and P. Restrepo (2018). The race between man and machine: Implications of technology for growth, factor shares, and employment. *American Economic Review 108*(6), 1488–1542.

Aghion, P., C. Antonin, and S. Bunel (2021). *The power of creative destruction: economic upheaval and the wealth of nations*. Harvard University Press.

Allen, R. C. (2009). *The British industrial revolution in global perspective*. Cambridge University Press.

Atack, J., F. Bateman, and R. A. Margo (2004). Skill intensity and rising wage dispersion in nineteenth-century american manufacturing. *The Journal of Economic History 64*(1), 172–192.

Atack, J., F. Bateman, and R. A. Margo (2008). Steam power, establishment size, and labor productivity growth in nineteenth century american manufacturing. *Explorations in Economic History 45*(2), 185–198.

Atack, J., R. A. Margo, and P. Rhode (2023). De-skilling: Evidence from late nineteenth century american manufacturing. *National Bureau of Economic Research Working Paper 31334*.

Atack, J., R. A. Margo, and P. W. Rhode (2019). Automation of manufacturing in the late nineteenth century: The hand and machine labor study. *Journal of Economic Perspectives 33*(2), 51–70.

Bartels, C., F. Kersting, and N. Wolf (2023). Testing marx: Capital accumulation, income inequality, and socialism in late nineteenth-century germany. *The Review of Economics and Statistics*, 1–44.

Benoit, S. (2020). *D'eau et de feu : forges et énergie hydraulique. XVIIIe-XXe siècles, une histoire singulière de l'industrialisation française.* Collection "Histoire". Presses universitaires de Rennes.

Berg, M. and P. Hudson (1994). Growth and change: a comment on the crafts-harley view of the industrial revolution. *The Economic History Review 47*(1), 147–149.

Beuchot, G. (2023). Du moulin à la machine à vapeur 1835: Passage de l'énergie hydraulique à l'énergie thermique.

Bresnahan, T. (2010). General purpose technologies. *Handbook of the Economics of Innovation 2*, 761–791.

Caprettini, B. and H.-J. Voth (2020). Rage against the machines: Labor-saving technology and unrest in industrializing england. *American Economic Review: Insights 2*(3), 305–20.

Chanut, J.-M., J. Heffer, J. Mairesse, G. Postel-Vinay, F. Boccara, P. Sicsic, A. Strauß, and P. Verley (2000). *L'industrie française au milieu du 19e siècle: les enquêtes de la statistique générale de la France.* Ed. de l'EHESS.

Crafts, N. (2004). Steam as a general purpose technology: a growth accounting perspective. *The Economic Journal 114*(495), 338–351.

Crouzet, F. (1974). French economic growth in the nineteenth century reconsidered. *History 59*(196), 167–179.

Crouzet, F. (1996). *The industrial revolution in national context: Europe and the USA.* In M. Teich and R. Porter (editors). Cambridge University Press.

Crouzet, F. (2003). The historiography of french economic growth in the nineteenth century. *The Economic History Review 56*(2), 215–242.

De Pleijt, A., A. Nuvolari, and J. Weisdorf (2020). Human capital formation during the first industrial revolution: evidence from the use of steam engines. *Journal of the European Economic Association 18*(2), 829–889.

Devine, W. D. (1983). From shafts to wires: Historical perspective on electrification. *The Journal of Economic History 43*(2), 347–372.

Diebolt, C., C. Le Chapelain, and A. R. Menard (2021). Neither the elite, nor the mass. the rise of intermediate human capital during the french industrialization process. *Cliometrica 15*, 167–202.

Doraszelski, U. (2004). Measuring returns to scale in nineteenth-century french industry. *Explorations in Economic History 41*(3), 256–281.

Dubuc, A. (1952). Les premières machines à vapeur à rouen. *Annales de Normandie 2*(3), 280–280.

Engels, F. (1943). *The Condition of the Working Class in England in 1844.* London: George Allen and Unwin.

Fernihough, A. and K. H. O'Rourke (2021). Coal and the european industrial revolution. *The Economic Journal 131*(635), 1135–1149.

Franck, R. and O. Galor (2021). Flowers of evil? industrialization and long run development. *Journal of Monetary Economics 117*, 108–128.

Franck, R. and O. Galor (2022). Technology-skill complementarity in early phases of industrialisation. *The Economic Journal 132*(642), 618–643.

Gay, V. (2021). Mapping the third republic: a geographic information system of france (1870–1940). *Historical Methods: A Journal of Quantitative and Interdisciplinary History 54*(4), 189–207.

Goldin, C. and L. F. Katz (1996). Technology, skill, and the wage structure: insights from the past. *The American Economic Review 86*(2), 252–257.

Goldin, C. and L. F. Katz (1998). The origins of technology-skill complementarity. *The Quarterly journal of economics 113*(3), 693–732.

Habakkuk, H. J. (1962). *American and British technology in the nineteenth century: the search for labour saving inventions.* Cambridge University Press.

Jarrige, F. and L. Hilaire-Perez (2021). La machine à vapeur démythifiée. *L'Histoire. Les collections* (91), 24–31.

Johnson, S. and D. Acemoglu (2023). *Power and Progress: Our Thousand-Year Struggle Over Technology and Prosperity.* Hachette UK.

Juhász, R., M. P. Squicciarini, and N. Voigtländer (2023). Technology adoption and productivity growth: Evidence from industrialization in france. *Unpublished manuscript*.

Kelly, M., J. Mokyr, and C. Ó. Gráda (2014). Precocious albion: a new interpretation of the british industrial revolution. *Annu. Rev. Econ. 6*(1), 363–389.

Kelly, M., J. Mokyr, and C. Ó Gráda (2023). The mechanics of the industrial revolution. *Journal of Political Economy 131*(1), 59–94.

Keynes, J. (1931). Economic possibility for our grandchildren. *Essays in Persuasion. Macmillan, London*.

Kuznets, S. (1955). Economic growth and income inequality. *The American economic review 45*(1), 1–28.

Marx, K. (1844). Contribution to the critique of hegel's philosophy of right. *Deutsch-Französische Jahrbücher 7*(10), 261–271.

Mokyr, J., C. Vickers, and N. L. Ziebarth (2015). The history of technological anxiety and the future of economic growth: Is this time different? *Journal of Economic Perspectives 29*(3), 31–50.

Nuvolari, A. (2010). The theory and practice of steam engineering in britain and france, 1800-1850. *Documents pour l'histoire des techniques. Nouvelle série* (19), 189–197.

Nuvolari, A. et al. (2002). The 'machine breakers' and the industrial revolution. *Journal of European Economic History 31*(2), 393–426.

Nuvolari, A. and B. Verspagen (2009). Technical choice, innovation, and british steam engineering, 1800–50 1. *The economic history review 62*(3), 685–710.

Payen, J. (1969). *Capital et machine à vapeur au XVIIIe siècle.* Berlin, Boston: De Gruyter Mouton.

Piketty, T. (2014). *Capital in the twenty-first century.* Harvard University Press.

Rousseau, P. L. and R. Sylla (2005). Emerging financial markets and early us growth. *Explorations in Economic History 42*(1), 1–26.

Smith, P. and S. Penneck (2009). *100 years of the Census of Production in the UK*, Volume 38. Office for National Statistics.

Squicciarini, M. P. and N. Voigtländer (2015). Human capital and industrialization: Evidence from the age of enlightenment. *The Quarterly Journal of Economics 130*(4), 1825–1883.

Tann, J. and M. J. Breckin (1978). The international diffusion of the watt engine, 1775-1825. *The Economic History Review 31*(4), 541–564.

Van Neck, A. (1982). Les débuts de la machine à vapeur dans l'industrie belge: 1800-1850. *Bulletins de l'Académie Royale de Belgique 68*(1), 245–265.

A   Letters concerning *Usine de la Gouille* (Beuchot, 2023)

Letter dated 23 January 1835
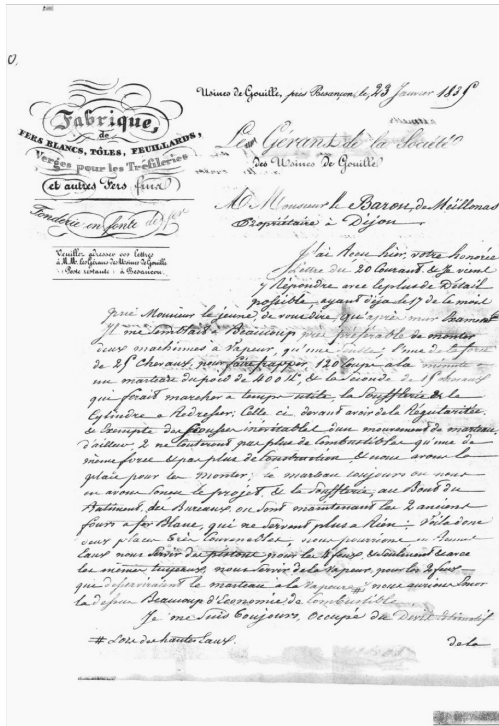
Letter dated 23 February 1835

Fabrique,
de
FERS BLANCS, TÔLES, FEUILLARDS,
Verges pour les Tréfileries
et autres Fers fins

Usines de Gouille, près Besançon, le 23 février 1835

Les Gérant de la Société
des Usines de Gouille.

M. Monsieur Winckler à Dijon.

B List of sources

Table B.1: Sources used

Variables	Sources
Industry specific:	Statistique de la France: Industrie (Chanut et al., 2000)
District specific:	
District borders	Shapefiles of France: historical borders (Gay, 2021)
Longitude	https://www.mapsofworld.com/lat_long/france-lat-long
Rainfall	https://www.fao.org/
Temperature	https://www.fao.org/
Land suitability	https://www.fao.org/
Literacy rates in the 1830s	Ministere de la Guerre, Compte-rendu sur le recrutement de l'armee (Paris, 1836–1900)
Encyclopaedia subscription in 1750	Squicciarini and Voigtländer (2015)
Population in the 1830s	https://www.insee.fr/
Urban population in 1700	Franck and Galor (2021)
Banks in the 1840s	Annuaire-almanach du commerce, de l'industrie, de la magistrature et de l'administration
Steam engine and metal-sector in district in the 1840s	Statistique de la France: Industrie (Chanut et al., 2000)
Coal ports and deposits	Ministère des Travaux Publiques, de l'Agriculture e du Commerce 1839
Distance from Fresnes	Own calculations using the shapefile of France (see above)
Coastlines and navigable rivers	https://www.french-waterways.com/waterways/canals-rivers-france/
Railroads in the 1840s	Carte du réseau ferroviaire d'intérêt général en France métropolitaine en 1840
Distance to university in the 1840s	https://en.wikipedia.org/wiki/List_of_modern_universities_in_Europe_(1801–1945)

C   Summary statistics

Table C.1: Descriptive statistics of the subindustry-specific variables of the baseline sample

Variables	Mean 1840s	Mean 1860s	Std. Dev 1840s	Std. Dev 1860s	Min 1840s	Min 1860s	Max 1840s	Max 1860s	N 1840s	N 1860s
Total value of output	1,272	2,061	3,758	5,428	0.4	0.3	63,800	69,500	2,614	2,614
Total value of output per worker	7,480	9,259	31,564	17,534	50	109	1,340,571	348,000	2,614	2,614
Total employment	318	407	1,253	1,398	1	1	32,500	39,835	2,614	2,614
Women and children's share	0.2	0.2	0.3	0.2	0.0	0.0	1	1	2,614	2,614
Male wages	200	231	66	62	70	47	650	500	2,614	2,614
Female wages	95	114	30	30	30	40	350	250	1,324	1,653
Child wages	70	86	27	26	5	20	250	225	1,402	1,390
Labour's share	0.1	0.1	0.1	0.1	0.0	0.0	4.0	1.8	2,614	2,614
Local subindustry establishments	23	23	65	59	1	1	1,023	1,240	2,614	2,614
Steam power (yes/no)	0.2	0.4	0.4	0.5	0.0	0.0	1	1	2,614	2,614
Water power (yes/no)	0.4	0.4	0.5	0.5	0.0	0.0	1	1	2,614	2,614
Wind power (yes/no)	0.1	0.1	0.3	0.3	0.0	0.0	1	1	2,614	2,614
Animal power (yes/no)	0.2	0.2	0.4	0.4	0.0	0.0	1	1	2,614	2,614
Steam horsepower in use	0.0	11	0.0	49	0.0	0.0	0.0	928	2,068	2,068

Notes: The total value of production is measured in 1,000 *franc*. The wages are measured in *centimes*.

Labour's share is defined as the total costs of labour divided by the total value of output. Source: Chanut et al. (2000).

Table C.2: Descriptive statistics of the district-specific variables

District variables	Mean	Std. Dev.	Min	Max	N
Longitude	2.1	2.6	-4.5	8	5,228
Rainfall (mm)	841	153	597	1,425	5,228
Temperature (Celsius)	11	1.5	1.8	14	5,228
Land suitability (index)	3.6	1.0	1.3	7.9	5,228
Literacy rate	0.4	0.2	0.1	0.9	5,228
Encyclopaedia subscriptions	1.3	2.7	0.0	16	5,228
Population density	0.9	0.7	0.2	5.4	5,228
Urban population in 1700	7,498	15,472	0.0	90,000	5,228
Number of banks	2.9	3.5	0.0	18	5,228
Metal sector in the district	0.3	0.5	0.0	1.0	5,228
Steam engine in the district	0.4	0.5	0.0	1.0	5,228
Distance to Fresnes (km)	446	232	10	881	5,228
Distance to coal deposits (km)	68	50	1.7	284	5,228
Distance to coal ports (km)	136	116	2.4	488	5,228
Distance to rivers (km)	8.5	7.5	0.0	38	5,228
Distance to coast (km)	135	111	0.7	416	5,228
Distance to railroads (km)	167	110	2.5	484	5,228
Distance to university (km)	83	51	0.0	255	5,228

Note: Geodesic distances from the centroid of the districts to the events mentioned. *Sources*: See Table B.1 in Appendix B.

D   Maps of district specific variables
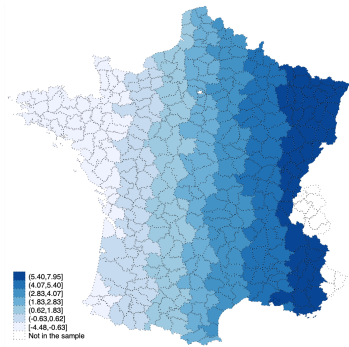
Longitude
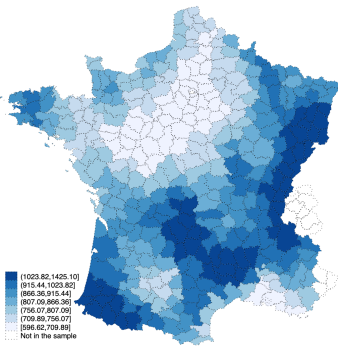
Rainfall
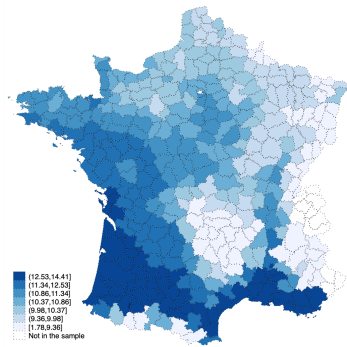
Temperature
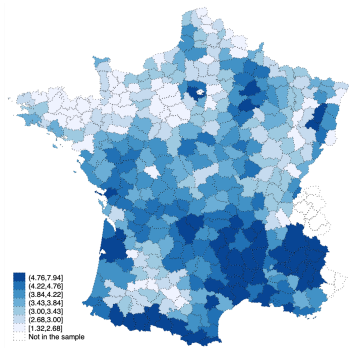
Land suitability
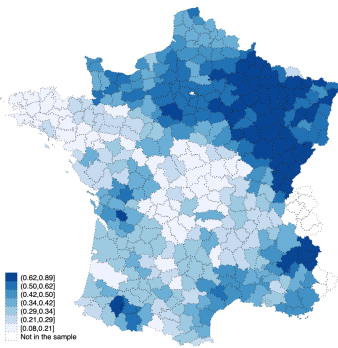
Literacy rates
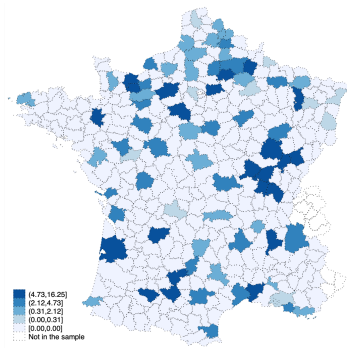
Encyclopaedia
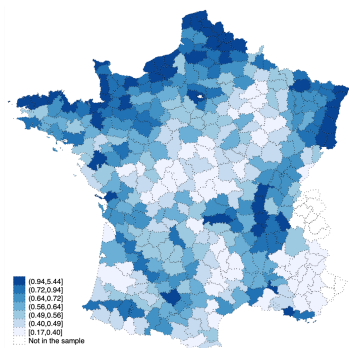
Population density
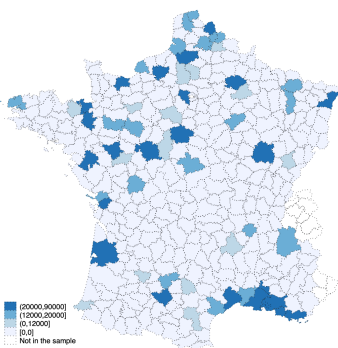
Urban population
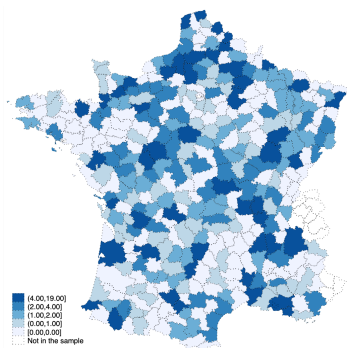
Number of banks
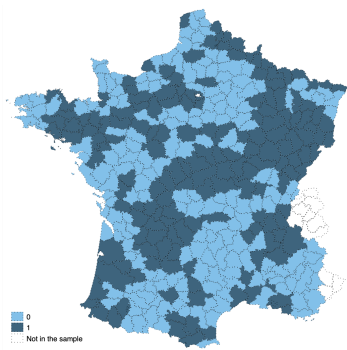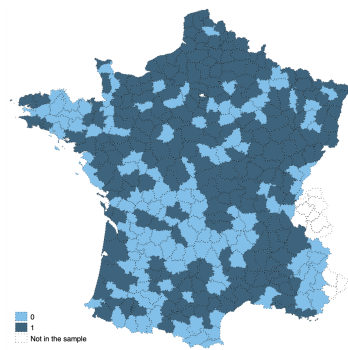
Metal in district   Steam in district   Distance to Fresnes
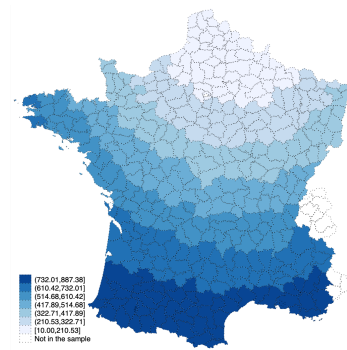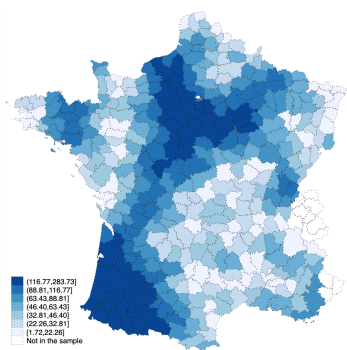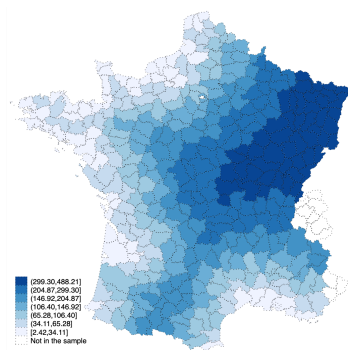
Distance to coal deposit   Distance to coal port   Distance to river
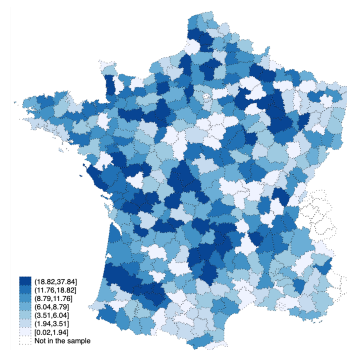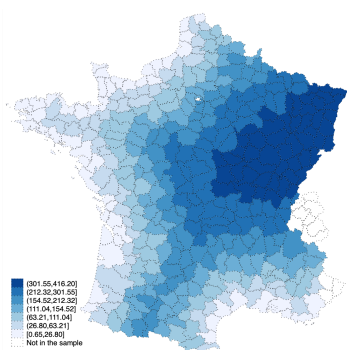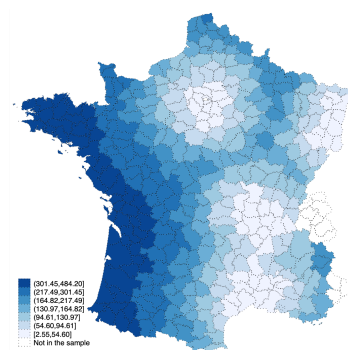
Distance to coast   Distance to rails   Distance to university
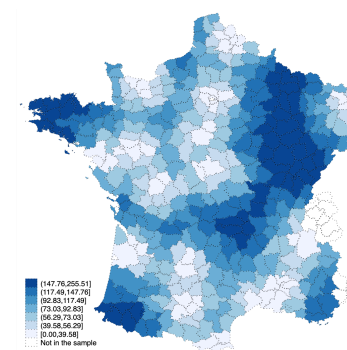
E   Orthogonality test: IV and pre-steam developments

Table E.1: Pre-steam developments explained by the two instruments

	(1)	(2)	(3)	(4)	(5)
	Distance to university	Literacy rate in the 1820s	Encyclopedia subscription in 1750s	Urban population in the 1700	Banks in the 1840s
Distance to Fresnes	0.330	0.061	-0.184	-1.041	-0.01
	(0.280)	(0.049)	(0.199)	(1.056)	(0.230)
Distance to coal	-0.018	0.012	-0.011	0.107	-0.064
	(0.087)	(0.022)	(0.060)	(0.422)	(0.088)
Longitude	-0.888	0.710	-0.320	-2.909	-1.023
	(1.672)	(0.486)	(1.046)	(6.953)	(1.388)
Rainfall	1.958***	-0.271	-1.866***	-9.488***	-1.558***
	(0.705)	(0.215)	(0.670)	(2.726)	(0.538)
Land suitability	-0.590*	0.000	0.363	3.546***	-0.017
	(0.322)	(0.068)	(0.222)	(1.124)	(0.253)
Temperature	-0.770**	-0.357***	0.688**	2.273**	0.260
	(0.353)	(0.116)	(0.322)	(1.128)	(0.321)
Distance to coast	-0.016	-0.102***	0.074	-0.674	-0.116
	(0.082)	(0.031)	(0.075)	(0.489)	(0.108)
Distance to rivers	0.132***	-0.031***	-0.092***	-0.744***	-0.039
	(0.038)	(0.012)	(0.034)	(0.177)	(0.038)
Department FE	Yes	Yes	Yes	Yes	Yes
R2	0.081	0.092	0.074	0.120	0.040
N	356	356	356	356	356

Notes: The model has department fixed effects, and the Conley standard errors are clustered within 100 km from the centroid of the district in question. All variables are in log except dummies. * $p<0.10$. ** $p<0.05$. *** $p<0.01$.

F   Baseline regression results

Notes for the tables presented in Appendix F: eColumns (1) and (2) report the results of the OLS model described by equation (1), while Columns (3) and (4) report the results of the IV model jointly described by equations (1) and (2). Columns (1) and (3) include time-varying sub-industry specific variables while Columns (2) and (4) also include district specific variables. Both models account for time and sub-industry and district fixed effects, with Conley standard error clustered within 100 km away from the centroid of the district in question. Time-varying sub-industry specific variables include dummies for the use of traditional motive powers (water, wind, animal), the number of establishments in each local sub-industry, and the lagged outcome variable. District-specific variables include longitude, rainfall, temperature, land suitability for agriculture, literacy rates, encyclopaedias subscription rates, number of banks, population density, whether the district had a metal sector and a steam engine installed in another local sub-industry in the 1840s, as well as distances to the nearest coast, river, railroad, and university. All variables are in log except dummies. * $p<0.10$. ** $p<0.05$. *** $p<0.01$.

Table F.1: Effect of steam adoption on the total value of output

	OLS		IV	
	(1)	(2)	(3)	(4)
Steam adopted between the 1840s and 1860s	0.962***	0.890***	1.913***	1.466***
	(0.040)	(0.038)	(0.184)	(0.233)
Steam adopted before the 1840s	1.158***	1.037***	1.810***	1.466***
	(0.050)	(0.050)	(0.134)	(0.179)
Water adopted between the 1840s and 1860s	0.451***	0.497***	0.377***	0.441***
	(0.051)	(0.045)	(0.057)	(0.056)
Water adopted before the 1840s	0.342***	0.436***	0.277***	0.365***
	(0.057)	(0.049)	(0.053)	(0.062)
Wind adopted between the 1840s and 1860s	0.125*	0.096	0.116	0.096
	(0.065)	(0.068)	(0.081)	(0.076)
Wind adopted before the 1840s	0.337***	0.318***	0.352***	0.320***
	(0.068)	(0.071)	(0.082)	(0.077)
Animal adopted between the 1840s and 1860s	-0.061	-0.072*	-0.136***	-0.106**
	(0.042)	(0.043)	(0.049)	(0.048)
Animal adopted before the 1840s	-0.214***	-0.247***	-0.351***	-0.312***
	(0.048)	(0.046)	(0.063)	(0.059)
Outcome in the 1840s	-0.438***	-0.454***	-0.520***	-0.492***
	(0.015)	(0.016)	(0.021)	(0.019)
Controls	No	Yes	No	Yes
R2	0.542	0.552	0.476	0.529
N	5228	5228	5228	5228
Kleibergen-Paap F stat			61	27

	IV: 1st stage Steam adopted between the 1840s and 1860s	
Distance from Fresnes	-0.107***	-0.092***
	(0.011)	(0.015)
Distance from Coal	-0.048***	-0.052***
	(0.009)	(0.012)
Steam adopted before the 1840s	-0.717***	-0.756***
	(0.017)	(0.018)
Water adopted between the 1840s and 1860s	0.100***	0.109***
	(0.018)	(0.018)
Water adopted before the 1840s	0.100***	0.137***
	(0.019)	(0.017)
Wind adopted between the 1840s and 1860s	-0.008	-0.014
	(0.028)	(0.026)
Wind adopted before the 1840s	-0.014	-0.015
	(0.036)	(0.033)
Animal adopted between the 1840s and 1860s	0.074***	0.061***
	(0.018)	(0.017)
Animal adopted before the 1840s	0.136***	0.111***
	(0.022)	(0.020)
Outcome in the 1840s	0.074***	0.064***
	(0.004)	(0.005)
Controls	No	Yes

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

Table F.2: Effect of steam adoption on output per worker

	OLS		IV	
	(1)	(2)	(3)	(4)
Steam adopted between the 1840s and 1860s	0.101***	0.061**	0.338***	0.203
	(0.029)	(0.029)	(0.129)	(0.242)
Steam adopted before the 1840s	0.035	-0.036	0.166**	0.058
	(0.029)	(0.033)	(0.073)	(0.159)
Water adopted between the 1840s and 1860s	0.291***	0.306***	0.265***	0.288***
	(0.037)	(0.037)	(0.041)	(0.050)
Water adopted before the 1840s	0.204***	0.256***	0.162***	0.226***
	(0.036)	(0.035)	(0.038)	(0.064)
Wind adopted between the 1840s and 1860s	0.438***	0.427***	0.438***	0.426***
	(0.054)	(0.051)	(0.055)	(0.052)
Wind adopted before the 1840s	0.693***	0.679***	0.697***	0.675***
	(0.064)	(0.061)	(0.064)	(0.062)
Animal adopted between the 1840s and 1860s	-0.027	-0.027	-0.041	-0.033
	(0.035)	(0.035)	(0.038)	(0.039)
Animal adopted before the 1840s	-0.091**	-0.111***	-0.126**	-0.126**
	(0.042)	(0.042)	(0.051)	(0.054)
Outcome in the 1840s	-0.354***	-0.366***	-0.358***	-0.366***
	(0.011)	(0.011)	(0.012)	(0.011)
Controls	No	Yes	No	Yes
R2	0.237	0.247	0.226	0.244
N	5228	5228	5228	5228
Kleibergen-Paap F stat			66	24

	IV: 1st stage Steam adopted between the 1840s and 1860s	
Distance from Fresnes	-0.131***	-0.104***
	(0.012)	(0.016)
Distance from Coal	-0.050***	-0.049***
	(0.010)	(0.012)
Steam adopted before the 1840s	-0.612***	-0.678***
	(0.017)	(0.018)
Water adopted between the 1840s and 1860s	0.130***	0.136***
	(0.019)	(0.018)
Water adopted before the 1840s	0.198***	0.227***
	(0.019)	(0.017)
Wind adopted between the 1840s and 1860s	-0.018	-0.004
	(0.028)	(0.026)
Wind adopted before the 1840s	-0.016	0.009
	(0.037)	(0.034)
Animal adopted between the 1840s and 1860s	0.058***	0.046***
	(0.018)	(0.018)
Animal adopted before the 1840s	0.137***	0.106***
	(0.024)	(0.021)
Outcome in the 1840s	0.012**	-0.001
	(0.006)	(0.005)
Controls	No	Yes

* p<0.10. ** p<0.05. *** p<0.01.

Table F.3: Effect of steam adoption on total employment

	OLS		IV	
	(1)	(2)	(3)	(4)
Steam adopted between the 1840s and 1860s	0.784***	0.761***	1.270***	1.215***
	(0.031)	(0.033)	(0.154)	(0.198)
Steam adopted before the 1840s	0.927***	0.883***	1.254***	1.226***
	(0.048)	(0.049)	(0.105)	(0.149)
Water adopted between the 1840s and 1860s	0.132***	0.157***	0.086*	0.108**
	(0.042)	(0.040)	(0.045)	(0.044)
Water adopted before the 1840s	0.024	0.051	-0.035	-0.022
	(0.035)	(0.034)	(0.038)	(0.045)
Wind adopted between the 1840s and 1860s	-0.309***	-0.325***	-0.350***	-0.353***
	(0.061)	(0.063)	(0.072)	(0.071)
Wind adopted before the 1840s	-0.361***	-0.372***	-0.399***	-0.407***
	(0.058)	(0.059)	(0.068)	(0.068)
Animal adopted between the 1840s and 1860s	-0.009	-0.009	-0.056	-0.043
	(0.039)	(0.040)	(0.046)	(0.045)
Animal adopted before the 1840s	-0.116***	-0.123***	-0.186***	-0.172***
	(0.036)	(0.037)	(0.045)	(0.045)
Outcome in the 1840s	-0.341***	-0.340***	-0.382***	-0.372***
	(0.015)	(0.015)	(0.021)	(0.022)
Controls	No	Yes	No	Yes
R2	0.578	0.583	0.557	0.566
N	5228	5228	5228	5228
Kleibergen-Paap F stat			60	24

	IV: 1st stage Steam adopted between the 1840s and 1860s	
Distance from Fresnes	-0.116***	-0.092***
	(0.011)	(0.015)
Distance from Coal	-0.046***	-0.049***
	(0.010)	(0.012)
Steam adopted before the 1840s	-0.711***	-0.766***
	(0.017)	(0.017)
Water adopted between the 1840s and 1860s	0.114***	0.120***
	(0.019)	(0.018)
Water adopted before the 1840s	0.145***	0.174***
	(0.018)	(0.016)
Wind adopted between the 1840s and 1860s	0.055*	0.047*
	(0.028)	(0.027)
Wind adopted before the 1840s	0.065*	0.062*
	(0.037)	(0.035)
Animal adopted between the 1840s and 1860s	0.091***	0.076***
	(0.018)	(0.017)
Animal adopted before the 1840s	0.136***	0.107***
	(0.023)	(0.021)
Outcome in the 1840s	0.072***	0.068***
	(0.005)	(0.005)
Controls	No	Yes

* p<0.10. ** p<0.05. *** p<0.01.

Table F.4: Effect of steam adoption on the share of women and children

	OLS		IV	
	(1)	(2)	(3)	(4)
Steam adopted between the 1840s and 1860s	0.019***	0.019***	0.009	0.013
	(0.004)	(0.004)	(0.018)	(0.026)
Steam adopted before the 1840s	0.027***	0.024***	0.021*	0.020
	(0.007)	(0.008)	(0.011)	(0.019)
Water adopted between the 1840s and 1860s	0.018***	0.020***	0.019***	0.021***
	(0.005)	(0.005)	(0.006)	(0.006)
Water adopted before the 1840s	0.010**	0.013***	0.012**	0.014*
	(0.005)	(0.005)	(0.006)	(0.008)
Wind adopted between the 1840s and 1860s	-0.006	-0.007	-0.006	-0.007
	(0.008)	(0.008)	(0.008)	(0.008)
Wind adopted before the 1840s	-0.032***	-0.034***	-0.032***	-0.034***
	(0.007)	(0.008)	(0.007)	(0.008)
Animal adopted between the 1840s and 1860s	0.003	0.004	0.004	0.004
	(0.005)	(0.005)	(0.005)	(0.005)
Animal adopted before the 1840s	-0.006	-0.005	-0.005	-0.005
	(0.006)	(0.006)	(0.007)	(0.007)
Outcome in the 1840s	-0.341***	-0.340***	-0.340***	-0.339***
	(0.014)	(0.014)	(0.015)	(0.014)
Controls	No	Yes	No	Yes
R2	0.201	0.210	0.200	0.209
N	5228	5228	5228	5228
Kleibergen-Paap F stat			69	24

	IV: 1st stage Steam adopted between the 1840s and 1860s	
Distance from Fresnes	-0.132***	-0.103***
	(0.012)	(0.017)
Distance from coal	-0.050***	-0.050***
	(0.010)	(0.012)
Steam adopted before the 1840s	-0.621***	-0.689***
	(0.017)	(0.018)
Water adopted between the 1840s and 1860s	0.128***	0.131***
	(0.019)	(0.018)
Water adopted before the 1840s	0.191***	0.211***
	(0.018)	(0.016)
Wind adopted between the 1840s and 1860s	0.005	0.008
	(0.028)	(0.026)
Wind adopted before the 1840s	0.015	0.026
	(0.035)	(0.033)
Animal adopted between the 1840s and 1860s	0.066***	0.052***
	(0.019)	(0.018)
Animal adopted before the 1840s	0.140***	0.109***
	(0.024)	(0.021)
Outcome in the 1840s	0.125***	0.134***
	(0.035)	(0.037)
Controls	No	Yes

* p<0.10. ** p<0.05. *** p<0.01.

Table F.5: Effect of steam adoption on labour's share

	OLS		IV	
	(1)	(2)	(3)	(4)
Steam adopted between the 1840s and 1860s	-0.031	-0.015	0.028	0.122
	(0.030)	(0.030)	(0.149)	(0.239)
Steam adopted before the 1840s	0.029	0.066*	0.062	0.156
	(0.032)	(0.035)	(0.084)	(0.157)
Water adopted between the 1840s and 1860s	-0.313***	-0.322***	-0.319***	-0.339***
	(0.035)	(0.034)	(0.039)	(0.047)
Water adopted before the 1840s	-0.239***	-0.276***	-0.250***	-0.306***
	(0.038)	(0.038)	(0.046)	(0.065)
Wind adopted between the 1840s and 1860s	-0.464***	-0.457***	-0.465***	-0.458***
	(0.053)	(0.052)	(0.053)	(0.052)
Wind adopted before the 1840s	-0.701***	-0.689***	-0.701***	-0.692***
	(0.061)	(0.061)	(0.061)	(0.063)
Animal adopted between the 1840s and 1860s	-0.009	-0.006	-0.013	-0.012
	(0.033)	(0.033)	(0.036)	(0.037)
Animal adopted before the 1840s	0.066*	0.081**	0.057	0.067
	(0.039)	(0.039)	(0.050)	(0.051)
Outcome in the 1840s	-0.374***	-0.379***	-0.373***	-0.380***
	(0.014)	(0.014)	(0.014)	(0.014)
Controls	No	Yes	No	Yes
R2	0.185	0.192	0.184	0.188
N	5228	5228	5228	5228
Kleibergen-Paap F stat			67	24

	IV: 1st stage Steam adopted between the 1840s and 1860s	
Distance to Fresnes	-0.132***	-0.104***
	(0.012)	(0.016)
Distance to coal	-0.049***	-0.049***
	(0.010)	(0.012)
Steam adopted before the 1840s	-0.611***	-0.678***
	(0.017)	(0.018)
Water adopted between the 1840s and 1860s	0.132***	0.137***
	(0.019)	(0.018)
Water adopted before the 1840s	0.203***	0.230***
	(0.019)	(0.017)
Wind adopted between the 1840s and 1860s	-0.009	-0.001
	(0.027)	(0.026)
Wind adopted before the 1840s	-0.005	0.012
	(0.037)	(0.034)
Animal adopted between the 1840s and 1860s	0.060***	0.046***
	(0.018)	(0.018)
Animal adopted before the 1840s	0.137***	0.106***
	(0.024)	(0.021)
Outcome in the 1840s	-0.003	0.004
	(0.006)	(0.005)
Controls	No	Yes

* p<0.10. ** p<0.05. *** p<0.01.

Table F.6: Effect of steam adoption on male wages

	OLS		IV	
	(1)	(2)	(3)	(4)
Steam adopted between the 1840s and 1860s	0.101***	0.072***	0.337***	0.204***
	(0.010)	(0.008)	(0.065)	(0.075)
Steam in the 1840s	0.127***	0.078***	0.262***	0.166***
	(0.012)	(0.011)	(0.043)	(0.052)
Water adopted between the 1840s and 1860s	-0.011	-0.005	-0.039***	-0.022*
	(0.011)	(0.009)	(0.013)	(0.013)
Water in the 1840s	-0.028***	-0.015*	-0.074***	-0.043**
	(0.009)	(0.008)	(0.016)	(0.018)
Wind adopted between the 1840s and 1860s	-0.016	-0.020	-0.020	-0.021
	(0.018)	(0.013)	(0.019)	(0.013)
Wind in the 1840s	-0.019	-0.029*	-0.021	-0.032*
	(0.019)	(0.015)	(0.021)	(0.017)
Animal adopted between the 1840s and 1860s	-0.020**	-0.017**	-0.034***	-0.022***
	(0.008)	(0.008)	(0.009)	(0.009)
Animal in the 1840s	-0.015	-0.026***	-0.048***	-0.040***
	(0.010)	(0.009)	(0.013)	(0.012)
Outcome in the 1840s	-0.574***	-0.675***	-0.613***	-0.685***
	(0.018)	(0.013)	(0.018)	(0.013)
Controls	No	Yes	No	Yes
R2	0.540	0.600	0.438	0.570
N	5228	5228	5228	5228
Kleibergen-Paap F stat			92	27

			IV: 1st stage	
			Steam adopted between the 1840s and 1860s	
Distance from Fresnes			-0.133***	-0.108***
			(0.010)	(0.016)
Distance from Coal			-0.050***	-0.049***
			(0.010)	(0.012)
Steam in the 1840s			-0.635***	-0.685***
			(0.018)	(0.018)
Water adopted between the 1840s and 1860s			0.138***	0.139***
			(0.018)	(0.018)
Water in the 1840s			0.213***	0.231***
			(0.018)	(0.016)
Wind adopted between the 1840s and 1860s			-0.006	-0.007
			(0.027)	(0.026)
Wind in the 1840s			0.004	0.008
			(0.035)	(0.033)
Animal adopted between the 1840s and 1860s			0.054***	0.043**
			(0.018)	(0.018)
Animal in the 1840s			0.132***	0.107***
			(0.023)	(0.021)
Outcome in the 1840s			0.170***	0.095***
			(0.024)	(0.022)
Controls			No	Yes

* p<0.10. ** p<0.05. *** p<0.01.

Table F.7: Effect of steam adoption on female wages

	OLS		IV	
	(1)	(2)	(3)	(4)
Steam adopted between the 1840s and 1860s	0.109***	0.079***	0.473***	0.308***
	(0.012)	(0.010)	(0.078)	(0.096)
Steam adopted before the 1840s	0.146***	0.102***	0.371***	0.268***
	(0.016)	(0.014)	(0.050)	(0.072)
Water adopted between the 1840s and 1860s	-0.010	-0.004	-0.053**	-0.035
	(0.016)	(0.014)	(0.021)	(0.022)
Water adopted before the 1840s	-0.020*	-0.004	-0.094***	-0.058**
	(0.012)	(0.012)	(0.023)	(0.028)
Wind adopted between the 1840s and 1860s	-0.027	-0.023	-0.028	-0.025
	(0.022)	(0.019)	(0.026)	(0.022)
Wind adopted before the 1840s	0.011	0.001	0.027	0.008
	(0.026)	(0.023)	(0.030)	(0.025)
Animal adopted between the 1840s and 1860s	0.018	0.018	0.019	0.022
	(0.015)	(0.015)	(0.017)	(0.016)
Animal adopted before the 1840s	-0.019	-0.022	-0.066***	-0.041**
	(0.017)	(0.017)	(0.020)	(0.017)
Outcome in the 1840s	-0.629***	-0.722***	-0.696***	-0.734***
	(0.026)	(0.021)	(0.029)	(0.022)
Controls	No	Yes	No	Yes
R2	0.590	0.637	0.382	0.563
N	2212	2212	2212	2212
Kleibergen-Paap F stat			61	25

	IV: 1st stage Steam adopted between the 1840s and 1860s	
Distance from Fresnes	-0.134***	-0.125***
	(0.013)	(0.018)
Distance from Coal	-0.050***	-0.034**
	(0.011)	(0.015)
Steam adopted before the 1840s	-0.669***	-0.737***
	(0.022)	(0.023)
Water adopted between the 1840s and 1860s	0.140***	0.155***
	(0.028)	(0.027)
Water adopted before the 1840s	0.222***	0.249***
	(0.023)	(0.022)
Wind adopted between the 1840s and 1860s	0.005	0.005
	(0.039)	(0.039)
Wind adopted before the 1840s	-0.023	-0.036
	(0.051)	(0.049)
Animal adopted between the 1840s and 1860s	0.001	-0.012
	(0.028)	(0.026)
Animal adopted before the 1840s	0.100***	0.072**
	(0.032)	(0.030)
Outcome in the 1840s	0.164***	0.064**
	(0.033)	(0.031)
Controls	No	Yes

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

Table F.8: Effect of steam adoption on child wages

	OLS		IV	
	(1)	(2)	(3)	(4)
Steam adopted between the 1840s and 1860s	0.102***	0.090***	0.327***	0.242***
	(0.016)	(0.015)	(0.050)	(0.090)
Steam adopted before the 1840s	0.145***	0.123***	0.281***	0.231***
	(0.017)	(0.016)	(0.031)	(0.065)
Water adopted between the 1840s and 1860s	0.022	0.027**	-0.004	0.004
	(0.014)	(0.013)	(0.016)	(0.020)
Water adopted before the 1840s	-0.009	0.001	-0.057***	-0.038
	(0.013)	(0.013)	(0.016)	(0.027)
Wind adopted between the 1840s and 1860s	0.047	0.035	0.061*	0.038
	(0.030)	(0.028)	(0.034)	(0.032)
Wind adopted before the 1840s	0.066**	0.050*	0.089**	0.056*
	(0.032)	(0.030)	(0.036)	(0.033)
Animal adopted between the 1840s and 1860s	-0.024	-0.017	-0.033*	-0.019
	(0.016)	(0.015)	(0.017)	(0.016)
Animal adopted before the 1840s	-0.028	-0.019	-0.054***	-0.031
	(0.018)	(0.017)	(0.020)	(0.021)
Outcome in the 1840s	-0.665***	-0.727***	-0.702***	-0.741***
	(0.018)	(0.015)	(0.018)	(0.017)
Controls	No	Yes	No	Yes
R2	0.611	0.650	0.557	0.628
N	1968	1968	1968	1968
Kleibergen-Paap F stat			42	17

			IV: 1st stage Steam adopted between the 1840s and 1860s	
Distance from Fresnes			-0.107***	-0.089***
			(0.014)	(0.017)
Distance from Coal			-0.058***	-0.037**
			(0.012)	(0.016)
Steam adopted before the 1840s			-0.665***	-0.728***
			(0.020)	(0.021)
Water adopted between the 1840s and 1860s			0.143***	0.161***
			(0.027)	(0.027)
Water adopted before the 1840s			0.242***	0.276***
			(0.023)	(0.022)
Wind adopted between the 1840s and 1860s			-0.038	-0.021
			(0.048)	(0.052)
Wind adopted before the 1840s			-0.069	-0.038
			(0.050)	(0.052)
Animal adopted between the 1840s and 1860s			0.048*	0.025
			(0.026)	(0.024)
Animal adopted before the 1840s			0.116***	0.085***
			(0.031)	(0.030)
Outcome in the 1840s			0.169***	0.099***
			(0.031)	(0.027)
Controls			No	Yes

* p<0.10. ** p<0.05. *** p<0.01.

G   Regression results using horsepower

Notes for the tables presented in Appendix G: Columns (1) and (2) report the results of the OLS model described by equation (1), while Columns (3) and (4) report the results of the IV model jointly described by equations (1) and (2). Columns (1) and (3) include time-varying sub-industry specific variables while Columns (2) and (4) also include district specific variables. Both models account for time and sub-industry and district fixed effects, with Conley standard error clustered within 100 km away from the centroid of the district in question. Time-varying sub-industry-specific dummies include the use of traditional motive powers (water, wind, animal), the number of establishments in each local sub-industry, and the lagged outcome variable. District-specific variables include longitude, rainfall, temperature, land suitability for agriculture, literacy rates, encyclopaedias subscription rates, number of banks, population density, whether the district had a metal sector and a steam engine installed in another local sub-industry in the 1840s, as well as distances to the nearest coast, river, railroad, and university. All variables are in log except dummies. The data used are restricted to local sub-industries not using steam power in the 1840s. * $p<0.10$. ** $p<0.05$. *** $p<0.01$.

Table G.1: Effect of steam horsepower on the total value of output

	OLS		IV	
	(1)	(2)	(3)	(4)
Steam horsepower in 1860s	0.346***	0.328***	0.500***	0.411***
	(0.012)	(0.011)	(0.055)	(0.070)
Water adopted between the 1840s and 1860s	0.508***	0.542***	0.448***	0.505***
	(0.049)	(0.047)	(0.053)	(0.059)
Water adopted before the 1840s	0.346***	0.411***	0.303***	0.375***
	(0.059)	(0.055)	(0.056)	(0.067)
Wind adopted between the 1840s and 1860s	0.313***	0.275***	0.324***	0.284***
	(0.068)	(0.070)	(0.075)	(0.074)
Wind adopted before the 1840s	0.518***	0.499***	0.540***	0.505***
	(0.077)	(0.080)	(0.085)	(0.083)
Animal adopted between the 1840s and 1860s	-0.006	-0.011	-0.041	-0.025
	(0.043)	(0.045)	(0.045)	(0.048)
Animal adopted before the 1840s	-0.144***	-0.179***	-0.211***	-0.206***
	(0.054)	(0.054)	(0.063)	(0.062)
Outcome in the 1840s	-0.463***	-0.470***	-0.507***	-0.488***
	(0.018)	(0.018)	(0.026)	(0.023)
Controls	No	Yes	No	Yes
R2	0.567	0.576	0.550	0.572
N	4136	4136	4136	4136
Kleibergen-Paap F stat			52	31

	IV: 1st stage Steam horsepower in the 1860s	
Distance from Fresnes	-0.421***	-0.374***
	(0.045)	(0.054)
Distance from Coal	-0.161***	-0.146***
	(0.032)	(0.040)
Water adopted between the 1840s and 1860s	0.442***	0.464***
	(0.072)	(0.073)
Water adopted before the 1840s	0.378***	0.476***
	(0.078)	(0.072)
Wind adopted between the 1840s and 1860s	-0.124	-0.130
	(0.110)	(0.105)
Wind adopted before the 1840s	-0.122	-0.103
	(0.138)	(0.130)
Animal adopted between the 1840s and 1860s	0.178***	0.142**
	(0.067)	(0.060)
Animal adopted before the 1840s	0.384***	0.295***
	(0.091)	(0.075)
Outcome in the 1840s	0.240***	0.208***
	(0.017)	(0.015)
Controls	No	Yes

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

Table G.2: Effect of steam horsepower on output per worker

	OLS		IV	
	(1)	(2)	(3)	(4)
Steam horsepower in 1860s	0.035***	0.023**	0.136***	0.130
	(0.010)	(0.010)	(0.040)	(0.081)
Water adopted between the 1840s and 1860s	0.320***	0.336***	0.267***	0.278***
	(0.046)	(0.045)	(0.052)	(0.066)
Water adopted before the 1840s	0.226***	0.267***	0.154***	0.184**
	(0.042)	(0.041)	(0.046)	(0.077)
Wind adopted between the 1840s and 1860s	0.427***	0.411***	0.434***	0.416***
	(0.064)	(0.061)	(0.064)	(0.062)
Wind adopted before the 1840s	0.767***	0.761***	0.778***	0.756***
	(0.077)	(0.074)	(0.078)	(0.076)
Animal adopted between the 1840s and 1860s	-0.013	-0.017	-0.032	-0.031
	(0.042)	(0.042)	(0.044)	(0.045)
Animal adopted before the 1840s	-0.042	-0.066	-0.091	-0.101
	(0.052)	(0.052)	(0.060)	(0.063)
Outcome in the 1840s	-0.353***	-0.364***	-0.357***	-0.362***
	(0.013)	(0.013)	(0.013)	(0.014)
Controls	No	Yes	No	Yes
R2	0.238	0.247	0.219	0.229
N	4136	4136	4136	4136
Kleibergen-Paap F stat			64	30

	IV: 1st stage Steam horsepower in the 1860s	
Distance from Fresnes	-0.521***	-0.429***
	(0.049)	(0.060)
Distance from Coal	-0.170***	-0.138***
	(0.036)	(0.042)
Water adopted between the 1840s and 1860s	0.561***	0.568***
	(0.077)	(0.079)
Water adopted before the 1840s	0.761***	0.821***
	(0.085)	(0.079)
Wind adopted between the 1840s and 1860s	-0.116	-0.066
	(0.110)	(0.104)
Wind adopted before the 1840s	-0.080	0.010
	(0.144)	(0.133)
Animal adopted between the 1840s and 1860s	0.143**	0.114*
	(0.068)	(0.061)
Animal adopted before the 1840s	0.413***	0.304***
	(0.101)	(0.078)
Outcome in the 1840s	0.007	-0.025
	(0.021)	(0.021)
Controls	No	Yes

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

Table G.3: Effect of steam horsepower on total employment

	OLS		IV	
	(1)	(2)	(3)	(4)
Steam horsepower in 1860s	0.288***	0.285***	0.272***	0.241***
	(0.010)	(0.011)	(0.050)	(0.070)
Water adopted between the 1840s and 1860s	0.155***	0.170***	0.162***	0.191***
	(0.046)	(0.046)	(0.047)	(0.052)
Water adopted before the 1840s	-0.012	0.005	-0.005	0.030
	(0.038)	(0.039)	(0.044)	(0.054)
Wind adopted between the 1840s and 1860s	-0.150**	-0.169**	-0.147**	-0.164**
	(0.065)	(0.066)	(0.067)	(0.066)
Wind adopted before the 1840s	-0.301***	-0.318***	-0.299***	-0.309***
	(0.067)	(0.068)	(0.069)	(0.071)
Animal adopted between the 1840s and 1860s	0.012	0.018	0.017	0.028
	(0.037)	(0.038)	(0.041)	(0.042)
Animal adopted before the 1840s	-0.108***	-0.113***	-0.101**	-0.098**
	(0.039)	(0.042)	(0.048)	(0.049)
Outcome in the 1840s	-0.385***	-0.378***	-0.380***	-0.367***
	(0.016)	(0.016)	(0.024)	(0.025)
Controls	No	Yes	No	Yes
R2	0.621	0.625	0.620	0.624
N	4136	4136	4136	4136
Kleibergen-Paap F stat			53	30

	IV: 1st stage Steam horsepower in the 1860s	
Distance from Fresnes	-0.447***	-0.380***
	(0.047)	(0.055)
Distance from Coal	-0.160***	-0.143***
	(0.033)	(0.040)
Water adopted between the 1840s and 1860s	0.487***	0.502***
	(0.075)	(0.076)
Water adopted before the 1840s	0.538***	0.602***
	(0.074)	(0.069)
Wind adopted between the 1840s and 1860s	0.088	0.068
	(0.108)	(0.104)
Wind adopted before the 1840s	0.145	0.156
	(0.138)	(0.131)
Animal adopted between the 1840s and 1860s	0.244***	0.203***
	(0.067)	(0.061)
Animal adopted before the 1840s	0.398***	0.297***
	(0.095)	(0.077)
Outcome in the 1840s	0.263***	0.244***
	(0.020)	(0.020)
Controls	No	Yes

* p<0.10. ** p<0.05. *** p<0.01.

Table G.4: Effect of steam horsepower on share of women and children

	OLS		IV	
	(1)	(2)	(3)	(4)
Steam horsepower in 1860s	0.007***	0.007***	0.005	0.001
	(0.002)	(0.002)	(0.006)	(0.010)
Water adopted between the 1840s and 1860s	0.017***	0.017***	0.017**	0.020**
	(0.006)	(0.006)	(0.007)	(0.008)
Water adopted before the 1840s	0.012**	0.013**	0.013*	0.017*
	(0.005)	(0.005)	(0.007)	(0.009)
Wind adopted between the 1840s and 1860s	-0.006	-0.006	-0.006	-0.006
	(0.009)	(0.009)	(0.009)	(0.009)
Wind adopted before the 1840s	-0.036***	-0.037***	-0.036***	-0.036***
	(0.008)	(0.008)	(0.008)	(0.008)
Animal adopted between the 1840s and 1860s	-0.001	0.001	-0.000	0.002
	(0.005)	(0.005)	(0.006)	(0.006)
Animal adopted before the 1840s	-0.009	-0.007	-0.008	-0.005
	(0.008)	(0.008)	(0.008)	(0.008)
Outcome in the 1840s	-0.386***	-0.386***	-0.385***	-0.382***
	(0.016)	(0.016)	(0.017)	(0.016)
Controls	No	Yes	No	Yes
R2	0.225	0.232	0.225	0.230
N	4136	4136	4136	4136
Kleibergen-Paap F stat			64	30

			IV: 1st stage Steam horsepower in the 1860s	
Distance from Fresnes			-0.520***	-0.421***
			(0.050)	(0.060)
Distance from Coal			-0.175***	-0.143***
			(0.036)	(0.043)
Water adopted between the 1840s and 1860s			0.538***	0.538***
			(0.075)	(0.076)
Water adopted before the 1840s			0.693***	0.725***
			(0.075)	(0.070)
Wind adopted between the 1840s and 1860s			-0.047	-0.024
			(0.109)	(0.104)
Wind adopted before the 1840s			0.008	0.069
			(0.138)	(0.128)
Animal adopted between the 1840s and 1860s			0.178***	0.141**
			(0.069)	(0.061)
Animal adopted before the 1840s			0.424***	0.313***
			(0.101)	(0.079)
Outcome in the 1840s			0.727***	0.755***
			(0.138)	(0.151)
Controls			No	Yes

* p<0.10. ** p<0.05. *** p<0.01.

Table G.5: Effect of steam horsepower on labour's share

	OLS		IV	
	(1)	(2)	(3)	(4)
Steam horsepower in 1860s	-0.010	-0.005	-0.024	-0.016
	(0.011)	(0.011)	(0.049)	(0.082)
Water adopted between the 1840s and 1860s	-0.348***	-0.356***	-0.341***	-0.351***
	(0.044)	(0.043)	(0.051)	(0.062)
Water adopted before the 1840s	-0.281***	-0.305***	-0.271***	-0.297***
	(0.045)	(0.044)	(0.057)	(0.080)
Wind adopted between the 1840s and 1860s	-0.435***	-0.428***	-0.436***	-0.428***
	(0.063)	(0.062)	(0.063)	(0.062)
Wind adopted before the 1840s	-0.770***	-0.770***	-0.771***	-0.769***
	(0.073)	(0.073)	(0.073)	(0.073)
Animal adopted between the 1840s and 1860s	-0.030	-0.022	-0.028	-0.021
	(0.040)	(0.040)	(0.042)	(0.043)
Animal adopted before the 1840s	0.020	0.039	0.027	0.042
	(0.049)	(0.049)	(0.058)	(0.060)
Outcome in the 1840s	-0.381***	-0.385***	-0.382***	-0.385***
	(0.015)	(0.016)	(0.015)	(0.016)
Controls	No	Yes	No	Yes
R2	0.190	0.198	0.190	0.198
N	4136	4136	4136	4136
Kleibergen-Paap F stat			65	31

	IV: 1st stage Steam horsepower in the 1860s	
Distance from Fresnes	-0.523***	-0.430***
	(0.049)	(0.060)
Distance from Coal	-0.169***	-0.138***
	(0.036)	(0.042)
Water adopted between the 1840s and 1860s	0.565***	0.569***
	(0.078)	(0.079)
Water adopted before the 1840s	0.773***	0.823***
	(0.085)	(0.080)
Wind adopted between the 1840s and 1860s	-0.105	-0.070
	(0.111)	(0.105)
Wind adopted before the 1840s	-0.065	0.006
	(0.144)	(0.133)
Animal adopted between the 1840s and 1860s	0.146**	0.112*
	(0.068)	(0.061)
Animal adopted before the 1840s	0.413***	0.303***
	(0.101)	(0.078)
Outcome in the 1840s	0.007	0.023
	(0.020)	(0.020)
Controls	No	Yes

* p<0.10. ** p<0.05. *** p<0.01.

Table G.6: Effect of steam horsepower on male wages

	OLS		IV	
	(1)	(2)	(3)	(4)
Steam horsepower in 1860s	0.034***	0.024***	0.117***	0.080***
	(0.003)	(0.003)	(0.025)	(0.025)
Water adopted between the 1840s and 1860s	-0.020*	-0.015*	-0.065***	-0.045***
	(0.011)	(0.009)	(0.019)	(0.015)
Water adopted before the 1840s	-0.036***	-0.023***	-0.099***	-0.067***
	(0.010)	(0.009)	(0.023)	(0.020)
Wind adopted between the 1840s and 1860s	0.012	0.007	0.016	0.010
	(0.022)	(0.015)	(0.025)	(0.017)
Wind adopted before the 1840s	-0.009	-0.015	-0.003	-0.016
	(0.022)	(0.017)	(0.026)	(0.020)
Animal adopted between the 1840s and 1860s	-0.030***	-0.024**	-0.045***	-0.031***
	(0.009)	(0.009)	(0.010)	(0.009)
Animal adopted before the 1840s	-0.016	-0.028***	-0.055***	-0.047***
	(0.011)	(0.010)	(0.014)	(0.013)
Outcome in the 1840s	-0.586***	-0.693***	-0.619***	-0.701***
	(0.019)	(0.014)	(0.018)	(0.014)
Controls	No	Yes	No	Yes
R2	0.541	0.606	0.421	0.556
N	4136	4136	4136	4136
Kleibergen-Paap F stat			70	33

	IV: 1st stage Steam horsepower in the 1860s	
Distance from Fresnes	-0.521***	-0.434***
	(0.047)	(0.059)
Distance from Coal	-0.169***	-0.139***
	(0.036)	(0.042)
Water adopted between the 1840s and 1860s	0.583***	0.571***
	(0.076)	(0.077)
Water adopted before the 1840s	0.781***	0.809***
	(0.078)	(0.074)
Wind adopted between the 1840s and 1860s	-0.112	-0.093
	(0.112)	(0.106)
Wind adopted before the 1840s	-0.062	-0.018
	(0.141)	(0.131)
Animal adopted between the 1840s and 1860s	0.133**	0.103*
	(0.068)	(0.061)
Animal adopted before the 1840s	0.404***	0.305***
	(0.096)	(0.078)
Outcome in the 1840s	0.392***	0.194**
	(0.100)	(0.082)
Controls	No	Yes

* p<0.10. ** p<0.05. *** p<0.01.

Table G.7: Effect of steam horsepower on female wages

	OLS		IV	
	(1)	(2)	(3)	(4)
Steam horsepower in 1860s	0.037***	0.028***	0.127***	0.111***
	(0.004)	(0.003)	(0.023)	(0.027)
Water adopted between the 1840s and 1860s	-0.012	-0.010	-0.075***	-0.066**
	(0.019)	(0.017)	(0.028)	(0.028)
Water adopted before the 1840s	-0.031**	-0.018	-0.111***	-0.094***
	(0.014)	(0.013)	(0.029)	(0.031)
Wind adopted between the 1840s and 1860s	0.008	-0.000	0.043	0.032
	(0.026)	(0.022)	(0.036)	(0.032)
Wind adopted before the 1840s	0.044	0.025	0.082**	0.055*
	(0.030)	(0.025)	(0.035)	(0.030)
Animal adopted between the 1840s and 1860s	0.014	0.013	0.026	0.029
	(0.018)	(0.017)	(0.019)	(0.018)
Animal adopted before the 1840s	0.001	-0.009	-0.025	-0.015
	(0.018)	(0.018)	(0.021)	(0.020)
Outcome in the 1840s	-0.631***	-0.717***	-0.674***	-0.720***
	(0.031)	(0.025)	(0.027)	(0.025)
Controls	No	Yes	No	Yes
R2	0.588	0.629	0.438	0.519
N	1520	1520	1520	1520
Kleibergen-Paap F stat			60	33

	IV: 1st stage Steam horsepower in the 1860s	
Distance from Fresnes	-0.661***	-0.595***
	(0.064)	(0.077)
Distance from Coal	-0.177***	-0.069
	(0.061)	(0.067)
Water adopted between the 1840s and 1860s	0.702***	0.732***
	(0.133)	(0.128)
Water adopted before the 1840s	0.934***	0.994***
	(0.121)	(0.107)
Wind adopted between the 1840s and 1860s	-0.453***	-0.415***
	(0.164)	(0.160)
Wind adopted before the 1840s	-0.491**	-0.456**
	(0.218)	(0.197)
Animal adopted between the 1840s and 1860s	-0.173	-0.177
	(0.121)	(0.113)
Animal adopted before the 1840s	0.108	0.020
	(0.146)	(0.123)
Outcome in the 1840s	0.296**	0.029
	(0.124)	(0.107)
Controls	No	Yes

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

Table G.8: Effect of steam horsepower on child wages

| | OLS | | IV | |
	(1)	(2)	(3)	(4)
Steam horsepower in 1860s	0.031***	0.028***	0.097***	0.090***
	(0.005)	(0.004)	(0.019)	(0.020)
Water adopted between the 1840s and 1860s	0.027	0.024	-0.017	-0.017
	(0.018)	(0.017)	(0.023)	(0.026)
Water adopted before the 1840s	-0.009	0.003	-0.082***	-0.065**
	(0.018)	(0.017)	(0.028)	(0.029)
Wind adopted between the 1840s and 1860s	0.065*	0.043	0.107***	0.065
	(0.035)	(0.034)	(0.040)	(0.040)
Wind adopted before the 1840s	0.047	0.018	0.102**	0.044
	(0.045)	(0.044)	(0.051)	(0.048)
Animal adopted between the 1840s and 1860s	-0.050***	-0.044***	-0.055***	-0.042**
	(0.017)	(0.017)	(0.021)	(0.019)
Animal adopted before the 1840s	-0.034	-0.020	-0.053**	-0.023
	(0.022)	(0.022)	(0.026)	(0.025)
Outcome in the 1840s	-0.659***	-0.739***	-0.689***	-0.748***
	(0.019)	(0.018)	(0.021)	(0.019)
Controls	No	Yes	No	Yes
R2	0.615	0.665	0.551	0.616
N	1284	1284	1284	1284
Kleibergen-Paap F stat			38	33

	IV: 1st stage Steam horsepower in the 1860s	
Distance from Fresnes	-0.613***	-0.613***
	(0.078)	(0.076)
Distance from Coal	-0.219***	-0.056
	(0.057)	(0.063)
Water adopted between the 1840s and 1860s	0.691***	0.700***
	(0.139)	(0.138)
Water adopted before the 1840s	1.152***	1.163***
	(0.129)	(0.113)
Wind adopted between the 1840s and 1860s	-0.458**	-0.281
	(0.190)	(0.195)
Wind adopted before the 1840s	-0.681***	-0.417*
	(0.242)	(0.232)
Animal adopted between the 1840s and 1860s	0.073	-0.019
	(0.129)	(0.122)
Animal adopted before the 1840s	0.263	0.047
	(0.163)	(0.145)
Outcome in the 1840s	0.426***	0.177
	(0.147)	(0.114)
Controls	No	Yes

* p<0.10. ** p<0.05. *** p<0.01.

Figure G.1: The effect of steam horsepower on labour
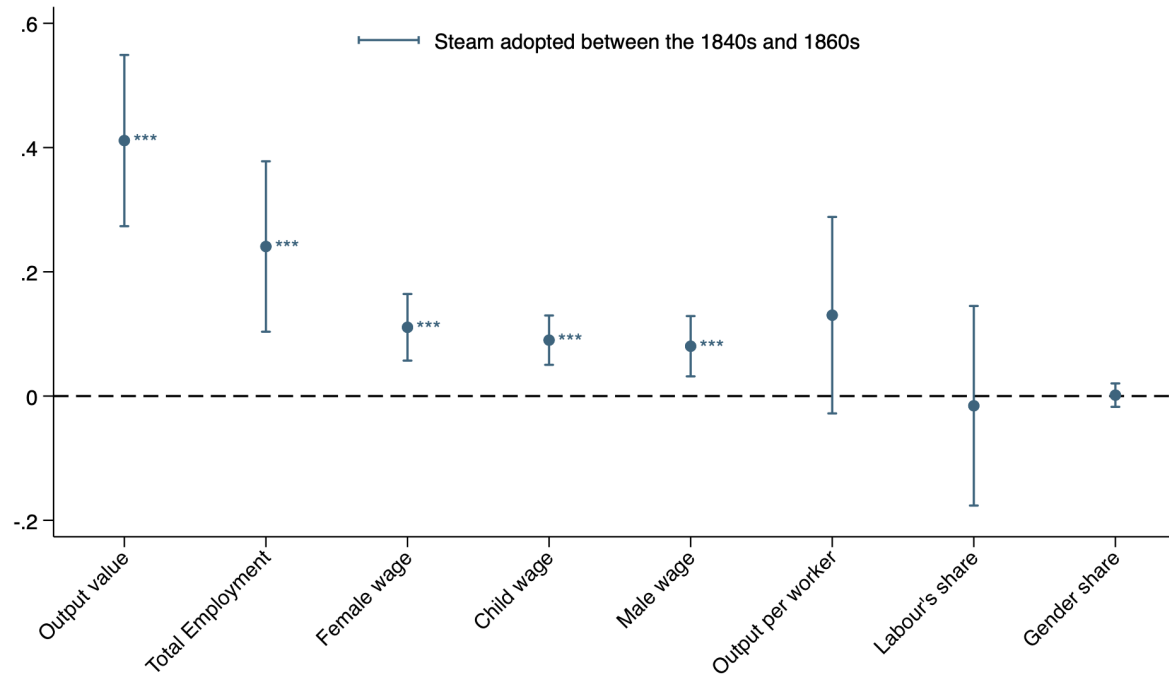
Notes: The coefficient plot is based on the Tables reported in Appendix G, estimating the effects of adopting one unit of steam horsepower before the 1840s or between the 1840s and 1860s. The coefficients and their statistical significance are based on Columns (4) in the Tables, reporting the results of the IV model jointly described by equations (1) and (2) in the main text. The models account for both time-varying sub-industry-specific and district-specific variables, time, alongside sub-industry and district fixed effects and have Conley standard error clustered within 100 km away from the centroid of the district in question. Time-varying sub-industry specific-variables include dummies for the use of traditional motive powers (water, wind, animal), the number of establishments in each local sub-industry, and the lagged outcome variable. District specific variables include longitude, rainfall, temperature, land suitability for agriculture, literacy rates, encyclopaedia subscription rates, number of banks, population density, whether the district had a metal sector and a steam engine installed in another local sub-industry in the 1840s, as well as distances to the nearest coast, river, railroad, and university. All variables are in log except dummies. * p<0.10. ** p<0.05. *** p<0.01.

H Regression results with and without water power

Notes for the tables presented in Appendix H: The models account for both time-varying sub-industry-specific and district-specific variables, time, alongside sub-industry and district fixed effects and have Conley standard error clustered within 100 km away from the centroid of the district in question. Time-varying sub-industry specific-variables include dummies for the use of traditional motive powers (water, wind, animal), the number of establishments in each local sub-industry, and the lagged outcome variable. District specific variables include longitude, rainfall, temperature, land suitability for agriculture, literacy rates, encyclopaedia subscription rates, number of banks, population density, whether the district had a metal sector and a steam engine installed in another local sub-industry in the 1840s, as well as distances to the nearest coast, river, railroad, and university. All variables are in log except dummies. The coefficients for early steam adopters do not separate between water and non-water use. * $p<0.10$. ** $p<0.05$. *** $p<0.01$.

Table H.1: Effect of steam adoption without water on the total value of output

	OLS		IV	
	(1)	(2)	(3)	(4)
Steam adopted between the 1840s and 1860s	1.225***	1.140***	2.329***	1.953***
	(0.053)	(0.052)	(0.208)	(0.316)
Steam adopted before the 1840s	1.413***	1.282***	2.187***	1.895***
	(0.062)	(0.066)	(0.146)	(0.243)
Water adopted between the 1840s and 1860s	0.745***	0.761***	1.138***	1.027***
	(0.054)	(0.051)	(0.093)	(0.109)
Water adopted before the 1840s	0.563***	0.624***	0.958***	0.864***
	(0.055)	(0.055)	(0.103)	(0.104)
Wind adopted between the 1840s and 1860s	0.399***	0.386***	0.398***	0.390***
	(0.080)	(0.080)	(0.091)	(0.087)
Wind adopted before the 1840s	0.595***	0.585***	0.591***	0.573***
	(0.090)	(0.087)	(0.101)	(0.097)
Animal adopted between the 1840s and 1860s	0.041	0.030	-0.030	-0.005
	(0.045)	(0.048)	(0.049)	(0.052)
Animal adopted before the 1840s	-0.194***	-0.218***	-0.350***	-0.308***
	(0.053)	(0.053)	(0.069)	(0.073)
Outcome in the 1840s	-0.443***	-0.457***	-0.522***	-0.499***
	(0.016)	(0.017)	(0.024)	(0.022)
Controls	No	Yes	No	Yes
R2	0.531	0.539	0.465	0.506
N	4100	4100	4100	4100
Kleibergen-Paap F stat			37	30

	IV: 1st stage Steam adopted between the 1840s and 1860s	
Distance from Fresnes	-0.086***	-0.075***
	(0.012)	(0.012)
Distance from Coal	-0.038***	-0.034***
	(0.008)	(0.009)
Steam adopted before the 1840s	-0.729***	-0.764***
	(0.019)	(0.021)
Water adopted between the 1840s and 1860s	-0.327***	-0.314***
	(0.020)	(0.019)
Water adopted before the 1840s	-0.319***	-0.279***
	(0.020)	(0.017)
Wind adopted between the 1840s and 1860s	-0.007	-0.011
	(0.022)	(0.022)
Wind adopted before the 1840s	0.008	0.010
	(0.026)	(0.027)
Animal adopted between the 1840s and 1860s	0.057***	0.043**
	(0.019)	(0.018)
Animal adopted before the 1840s	0.130***	0.108***
	(0.022)	(0.021)
Outcome in the 1840s	0.061***	0.051***
	(0.005)	(0.005)
Controls	No	Yes

* p<0.10. ** p<0.05. *** p<0.01.

Table H.2: Effect of steam adoption without water on the output per worker

	OLS		IV	
	(1)	(2)	(3)	(4)
Steam adopted between the 1840s and 1860s	0.247***	0.208***	0.561***	0.396
	(0.036)	(0.037)	(0.161)	(0.344)
Steam adopted before the 1840s	0.196***	0.135***	0.379***	0.263
	(0.035)	(0.045)	(0.092)	(0.230)
Water adopted between the 1840s and 1860s	0.474***	0.479***	0.585***	0.539***
	(0.052)	(0.050)	(0.071)	(0.114)
Water adopted before the 1840s	0.375***	0.404***	0.467***	0.448***
	(0.047)	(0.046)	(0.071)	(0.091)
Wind adopted between the 1840s and 1860s	0.445***	0.441***	0.445***	0.440***
	(0.072)	(0.068)	(0.074)	(0.069)
Wind adopted before the 1840s	0.702***	0.696***	0.697***	0.688***
	(0.087)	(0.081)	(0.089)	(0.085)
Animal adopted between the 1840s and 1860s	0.034	0.033	0.019	0.027
	(0.037)	(0.037)	(0.039)	(0.041)
Animal adopted before the 1840s	-0.061	-0.072	-0.109*	-0.093
	(0.047)	(0.048)	(0.058)	(0.068)
Outcome in the 1840s	-0.357***	-0.368***	-0.365***	-0.369***
	(0.013)	(0.013)	(0.014)	(0.013)
Controls	No	Yes	No	Yes
R2	0.231	0.238	0.218	0.234
N	4100	4100	4100	4100
Kleibergen-Paap F stat			50	32

	IV: 1st stage Steam adopted between the 1840s and 1860s	
Distance from Fresnes	-0.106***	-0.084***
	(0.012)	(0.013)
Distance from Coal	-0.039***	-0.032***
	(0.009)	(0.009)
Steam adopted before the 1840s	-0.634***	-0.695***
	(0.019)	(0.021)
Water adopted between the 1840s and 1860s	-0.319***	-0.304***
	(0.021)	(0.019)
Water adopted before the 1840s	-0.257***	-0.220***
	(0.020)	(0.017)
Wind adopted between the 1840s and 1860s	-0.008	0.000
	(0.023)	(0.023)
Wind adopted before the 1840s	0.018	0.033
	(0.028)	(0.028)
Animal adopted between the 1840s and 1860s	0.041**	0.029
	(0.019)	(0.018)
Animal adopted before the 1840s	0.136***	0.108***
	(0.023)	(0.021)
Outcome in the 1840s	0.021***	0.009*
	(0.006)	(0.005)
Controls	No	Yes

* p<0.10. ** p<0.05. *** p<0.01.

Table H.3: Effect of steam adoption without water on total employment

	OLS		IV	
	(1)	(2)	(3)	(4)
Steam adopted between the 1840s and 1860s	0.898***	0.866***	1.393***	1.468***
	(0.043)	(0.048)	(0.211)	(0.293)
Steam adopted before the 1840s	1.017***	0.961***	1.350***	1.412***
	(0.067)	(0.068)	(0.136)	(0.214)
Water adopted between the 1840s and 1860s	0.232***	0.241***	0.399***	0.429***
	(0.048)	(0.048)	(0.091)	(0.112)
Water adopted before the 1840s	0.064	0.085*	0.214***	0.237***
	(0.043)	(0.044)	(0.079)	(0.087)
Wind adopted between the 1840s and 1860s	-0.074	-0.082	-0.103	-0.108
	(0.070)	(0.073)	(0.077)	(0.079)
Wind adopted before the 1840s	-0.153**	-0.164**	-0.191**	-0.208***
	(0.066)	(0.065)	(0.075)	(0.077)
Animal adopted between the 1840s and 1860s	0.023	0.025	-0.017	-0.009
	(0.043)	(0.044)	(0.050)	(0.049)
Animal adopted before the 1840s	-0.137***	-0.140***	-0.211***	-0.207***
	(0.039)	(0.043)	(0.057)	(0.058)
Outcome in the 1840s	-0.356***	-0.355***	-0.387***	-0.386***
	(0.018)	(0.017)	(0.024)	(0.024)
Controls	No	Yes	No	Yes
R2	0.578	0.583	0.562	0.561
N	4100	4100	4100	4100
Kleibergen-Paap F stat			40	29

	IV: 1st stage Steam adopted between the 1840s and 1860s	
Distance from Fresnes	-0.095***	-0.076***
	(0.012)	(0.012)
Distance from Coal	-0.036***	-0.031***
	(0.009)	(0.009)
Steam adopted before the 1840s	-0.708***	-0.759***
	(0.019)	(0.021)
Water adopted between the 1840s and 1860s	-0.310***	-0.299***
	(0.018)	(0.017)
Water adopted before the 1840s	-0.270***	-0.238***
	(0.018)	(0.015)
Wind adopted between the 1840s and 1860s	0.042**	0.034
	(0.021)	(0.022)
Wind adopted before the 1840s	0.068***	0.065**
	(0.026)	(0.027)
Animal adopted between the 1840s and 1860s	0.071***	0.055***
	(0.019)	(0.018)
Animal adopted before the 1840s	0.135***	0.109***
	(0.022)	(0.021)
Outcome in the 1840s	0.054***	0.049***
	(0.005)	(0.005)
Controls	No	Yes

* p<0.10. ** p<0.05. *** p<0.01.

Table H.4: Effect of steam adoption without water on the share of women and children

	OLS		IV	
	(1)	(2)	(3)	(4)
Steam adopted between the 1840s and 1860s	0.024***	0.024***	0.012	-0.004
	(0.005)	(0.006)	(0.026)	(0.040)
Steam adopted before the 1840s	0.031***	0.029***	0.024	0.010
	(0.009)	(0.010)	(0.015)	(0.028)
Water adopted between the 1840s and 1860s	0.027***	0.028***	0.022**	0.019
	(0.007)	(0.007)	(0.011)	(0.015)
Water adopted before the 1840s	0.010	0.011	0.007	0.005
	(0.007)	(0.007)	(0.010)	(0.011)
Wind adopted between the 1840s and 1860s	-0.003	-0.003	-0.003	-0.002
	(0.009)	(0.010)	(0.009)	(0.010)
Wind adopted before the 1840s	-0.024***	-0.024**	-0.023**	-0.023**
	(0.009)	(0.010)	(0.009)	(0.009)
Animal adopted between the 1840s and 1860s	0.005	0.006	0.005	0.007
	(0.006)	(0.006)	(0.006)	(0.006)
Animal adopted before the 1840s	-0.013*	-0.012*	-0.011	-0.009
	(0.007)	(0.007)	(0.008)	(0.008)
Outcome in the 1840s	-0.391***	-0.388***	-0.390***	-0.387***
	(0.016)	(0.016)	(0.016)	(0.016)
Controls	No	Yes	No	Yes
R2	0.228	0.234	0.227	0.229
N	4100	4100	4100	4100
Kleibergen-Paap F stat			51	32

	IV: 1st stage Steam adopted between the 1840s and 1860s	
Distance from Fresnes	-0.108***	-0.084***
	(0.012)	(0.012)
Distance from Coal	-0.039***	-0.032***
	(0.009)	(0.009)
Steam adopted before the 1840s	-0.634***	-0.699***
	(0.019)	(0.021)
Water adopted between the 1840s and 1860s	-0.314***	-0.303***
	(0.020)	(0.019)
Water adopted before the 1840s	-0.246***	-0.218***
	(0.018)	(0.016)
Wind adopted between the 1840s and 1860s	0.014	0.012
	(0.022)	(0.022)
Wind adopted before the 1840s	0.046*	0.049*
	(0.027)	(0.027)
Animal adopted between the 1840s and 1860s	0.050**	0.034*
	(0.020)	(0.018)
Animal adopted before the 1840s	0.138***	0.110***
	(0.023)	(0.021)
Outcome in the 1840s	0.060*	0.063*
	(0.032)	(0.033)
Controls	No	Yes

* p<0.10. ** p<0.05. *** p<0.01.

Table H.5: Effect of steam adoption without water on labour's share

	OLS		IV	
	(1)	(2)	(3)	(4)
Steam adopted between the 1840s and 1860s	-0.177***	-0.157***	-0.083	0.140
	(0.036)	(0.037)	(0.202)	(0.362)
Steam adopted before the 1840s	-0.128***	-0.099**	-0.074	0.103
	(0.039)	(0.045)	(0.113)	(0.241)
Water adopted between the 1840s and 1860s	-0.505***	-0.501***	-0.472***	-0.406***
	(0.046)	(0.046)	(0.083)	(0.121)
Water adopted before the 1840s	-0.418***	-0.431***	-0.390***	-0.361***
	(0.049)	(0.050)	(0.080)	(0.096)
Wind adopted between the 1840s and 1860s	-0.443***	-0.449***	-0.444***	-0.452***
	(0.067)	(0.065)	(0.068)	(0.066)
Wind adopted before the 1840s	-0.686***	-0.689***	-0.688***	-0.702***
	(0.078)	(0.075)	(0.079)	(0.079)
Animal adopted between the 1840s and 1860s	-0.081**	-0.077**	-0.086**	-0.086**
	(0.034)	(0.035)	(0.038)	(0.039)
Animal adopted before the 1840s	0.033	0.042	0.018	0.008
	(0.044)	(0.044)	(0.058)	(0.065)
Outcome in the 1840s	-0.385***	-0.390***	-0.383***	-0.387***
	(0.016)	(0.016)	(0.017)	(0.016)
Controls	No	Yes	No	Yes
R2	0.189	0.194	0.188	0.182
N	4100	4100	4100	4100
Kleibergen-Paap F stat			50	31

	IV: 1st stage Steam adopted between the 1840s and 1860s	
Distance from Fresnes	-0.106***	-0.083***
	(0.012)	(0.013)
Distance from Coal	-0.039***	-0.032***
	(0.009)	(0.009)
Steam adopted before the 1840s	-0.632***	-0.695***
	(0.019)	(0.021)
Water adopted between the 1840s and 1860s	-0.319***	-0.304***
	(0.021)	(0.019)
Water adopted before the 1840s	-0.255***	-0.220***
	(0.020)	(0.018)
Wind adopted between the 1840s and 1860s	-0.002	0.002
	(0.022)	(0.023)
Wind adopted before the 1840s	0.025	0.035
	(0.028)	(0.028)
Animal adopted between the 1840s and 1860s	0.044**	0.030*
	(0.019)	(0.018)
Animal adopted before the 1840s	0.137***	0.108***
	(0.023)	(0.021)
Outcome in the 1840s	-0.015**	(0.006)
	(0.006)	(0.006)
Controls	No	Yes

* p<0.10. ** p<0.05. *** p<0.01.

Table H.6: Effect of steam adoption without water on male wages

	OLS		IV	
	(1)	(2)	(3)	(4)
Steam adopted between the 1840s and 1860s	0.108***	0.079***	0.446***	0.328***
	(0.011)	(0.010)	(0.115)	(0.107)
Steam adopted before the 1840s	0.137***	0.085***	0.336***	0.255***
	(0.013)	(0.014)	(0.074)	(0.077)
Water adopted between the 1840s and 1860s	-0.008	-0.002	0.106***	0.076**
	(0.016)	(0.012)	(0.036)	(0.033)
Water adopted before the 1840s	-0.026**	-0.015	0.064**	0.041*
	(0.011)	(0.009)	(0.027)	(0.023)
Wind adopted between the 1840s and 1860s	0.022	0.014	0.013	0.010
	(0.024)	(0.017)	(0.025)	(0.019)
Wind adopted before the 1840s	0.015	-0.003	-0.003	-0.016
	(0.025)	(0.020)	(0.029)	(0.023)
Animal adopted between the 1840s and 1860s	-0.024**	-0.021**	-0.041***	-0.028***
	(0.010)	(0.010)	(0.012)	(0.011)
Animal adopted before the 1840s	-0.020	-0.028**	-0.071***	-0.057***
	(0.012)	(0.012)	(0.018)	(0.016)
Outcome in the 1840s	-0.577***	-0.677***	-0.618***	-0.688***
	(0.018)	(0.014)	(0.020)	(0.014)
Controls	No	Yes	No	Yes
R2	0.525	0.587	0.369	0.509
N	4100	4100	4100	4100
Kleibergen-Paap F stat			52	34

	IV: 1st stage Steam adopted between the 1840s and 1860s	
Distance from Fresnes	-0.110***	-0.087***
	(0.012)	(0.012)
Distance from Coal	-0.038***	-0.032***
	(0.009)	(0.009)
Steam adopted before the 1840s	-0.647***	-0.698***
	(0.019)	(0.021)
Water adopted between the 1840s and 1860s	-0.303***	-0.298***
	(0.020)	(0.019)
Water adopted before the 1840s	-0.231***	-0.209***
	(0.018)	(0.016)
Wind adopted between the 1840s and 1860s	0.010	0.007
	(0.023)	(0.022)
Wind adopted before the 1840s	0.046*	0.045
	(0.027)	(0.027)
Animal adopted between the 1840s and 1860s	0.042**	0.030*
	(0.019)	(0.018)
Animal adopted before the 1840s	0.134***	0.109***
	(0.023)	(0.022)
Outcome in the 1840s	0.128***	0.060***
	(0.025)	(0.021)
Controls	No	Yes

* p<0.10. ** p<0.05. *** p<0.01.

Table H.7: Effect of steam adoption without water on female wages

	OLS		IV	
	(1)	(2)	(3)	(4)
Steam adopted between the 1840s and 1860s	0.092***	0.059***	0.600***	0.331**
	(0.016)	(0.015)	(0.173)	(0.148)
Steam adopted before the 1840s	0.150***	0.093***	0.478***	0.294***
	(0.021)	(0.019)	(0.117)	(0.112)
Water adopted between the 1840s and 1860s	-0.028	-0.023	0.172***	0.076
	(0.023)	(0.019)	(0.066)	(0.053)
Water adopted before the 1840s	-0.034*	-0.023	0.139**	0.058
	(0.018)	(0.017)	(0.055)	(0.041)
Wind adopted between the 1840s and 1860s	0.027	0.026	-0.030	-0.002
	(0.031)	(0.026)	(0.038)	(0.031)
Wind adopted before the 1840s	0.077**	0.058**	0.038	0.039
	(0.034)	(0.027)	(0.041)	(0.029)
Animal adopted between the 1840s and 1860s	0.011	0.004	0.028	0.017
	(0.017)	(0.018)	(0.023)	(0.021)
Animal adopted before the 1840s	-0.008	-0.025	-0.078***	-0.049**
	(0.019)	(0.020)	(0.028)	(0.022)
Outcome in the 1840s	-0.641***	-0.721***	-0.690***	-0.725***
	(0.027)	(0.025)	(0.038)	(0.028)
Controls	No	Yes	No	Yes
R2	0.567	0.612	0.281	0.537
N	1480	1480	1480	1480
Kleibergen-Paap F stat			21	21

	IV: 1st stage Steam adopted between the 1840s and 1860s	
Distance from Fresnes	-0.104***	-0.113***
	(0.017)	(0.018)
Distance from Coal	-0.027**	-0.007
	(0.011)	(0.011)
Steam adopted before the 1840s	-0.695***	-0.749***
	(0.027)	(0.031)
Water adopted between the 1840s and 1860s	-0.360***	-0.343***
	(0.025)	(0.026)
Water adopted before the 1840s	-0.304***	-0.276***
	(0.025)	(0.024)
Wind adopted between the 1840s and 1860s	0.097***	0.090***
	(0.027)	(0.031)
Wind adopted before the 1840s	0.071*	0.053
	(0.037)	(0.040)
Animal adopted between the 1840s and 1860s	-0.038	-0.045*
	(0.025)	(0.024)
Animal adopted before the 1840s	0.104***	0.076**
	(0.031)	(0.030)
Outcome in the 1840s	0.089**	0.027
	(0.036)	(0.035)
Controls	No	Yes

* p<0.10. ** p<0.05. *** p<0.01.

Table H.8: Effect of steam adoption without water on child wages

	OLS		IV	
	(1)	(2)	(3)	(4)
Steam adopted between the 1840s and 1860s	0.107***	0.094***	0.337***	0.231
	(0.021)	(0.022)	(0.091)	(0.218)
Steam adopted before the 1840s	0.159***	0.142***	0.294***	0.237
	(0.022)	(0.024)	(0.055)	(0.155)
Water adopted between the 1840s and 1860s	0.034	0.041*	0.135***	0.095
	(0.023)	(0.022)	(0.044)	(0.090)
Water adopted before the 1840s	0.001	0.008	0.085**	0.047
	(0.021)	(0.020)	(0.035)	(0.065)
Wind adopted between the 1840s and 1860s	0.081***	0.084***	0.068**	0.072*
	(0.028)	(0.030)	(0.032)	(0.039)
Wind adopted before the 1840s	0.127***	0.105***	0.117***	0.094**
	(0.032)	(0.033)	(0.033)	(0.038)
Animal adopted between the 1840s and 1860s	-0.015	-0.011	-0.025	-0.013
	(0.016)	(0.016)	(0.018)	(0.017)
Animal adopted before the 1840s	-0.007	-0.000	-0.042	-0.015
	(0.022)	(0.020)	(0.028)	(0.035)
Outcome in the 1840s	-0.660***	-0.718***	-0.675***	-0.719***
	(0.021)	(0.018)	(0.020)	(0.018)
Controls	No	Yes	No	Yes
R2	0.581	0.616	0.533	0.601
N	1308	1308	1308	1308
Kleibergen-Paap F stat			22	7

	IV: 1st stage Steam adopted between the 1840s and 1860s	
Distance from Fresnes	-0.075***	-0.048***
	(0.015)	(0.016)
Distance from Coal	-0.051***	-0.021
	(0.013)	(0.014)
Steam adopted before the 1840s	-0.644***	-0.716***
	(0.027)	(0.029)
Water adopted between the 1840s and 1860s	-0.405***	-0.386***
	(0.025)	(0.024)
Water adopted before the 1840s	-0.325***	-0.274***
	(0.027)	(0.026)
Wind adopted between the 1840s and 1860s	0.079**	0.088**
	(0.036)	(0.042)
Wind adopted before the 1840s	0.072	0.079
	(0.049)	(0.053)
Animal adopted between the 1840s and 1860s	0.044	0.015
	(0.029)	(0.026)
Animal adopted before the 1840s	0.145***	0.112***
	(0.033)	(0.032)
Outcome in the 1840s	0.078**	0.015
	(0.033)	(0.031)
Controls	No	Yes

* p<0.10. ** p<0.05. *** p<0.01.

Table H.9: Effect of steam adoption with water on the total value of output

	OLS		IV	
	(1)	(2)	(3)	(4)
Steam adopted between the 1840s and 1860s	0.633***	0.603***	1.723***	1.322***
	(0.045)	(0.047)	(0.295)	(0.344)
Steam adopted before the 1840s	0.782***	0.710***	1.577***	1.254***
	(0.053)	(0.054)	(0.229)	(0.270)
Water adopted between the 1840s and 1860s	0.710***	0.726***	0.240*	0.419**
	(0.053)	(0.051)	(0.145)	(0.164)
Water adopted before the 1840s	0.663***	0.705***	0.197	0.392**
	(0.055)	(0.055)	(0.141)	(0.171)
Wind adopted between the 1840s and 1860s	0.100	0.065	0.098	0.064
	(0.070)	(0.073)	(0.083)	(0.082)
Wind adopted before the 1840s	0.277***	0.226***	0.327***	0.254***
	(0.079)	(0.083)	(0.093)	(0.093)
Animal adopted between the 1840s and 1860s	-0.073*	-0.071*	-0.111**	-0.091**
	(0.043)	(0.041)	(0.047)	(0.045)
Animal adopted before the 1840s	-0.244***	-0.265***	-0.290***	-0.288***
	(0.057)	(0.054)	(0.063)	(0.058)
Controls	No	Yes	No	Yes
R2	0.555	0.563	0.502	0.541
N	4146	4146	4146	4146
Kleibergen-Paap F stat			28	21

	IV: 1st stage Steam adopted between the 1840s and 1860s	
Distance from Fresnes	-0.086***	-0.081***
	(0.012)	(0.013)
Distance from Coal	-0.032***	-0.036***
	(0.008)	(0.010)
Steam adopted before the 1840s	-0.745***	-0.762***
	(0.019)	(0.020)
Water adopted between the 1840s and 1860s	0.431***	0.429***
	(0.024)	(0.024)
Water adopted before the 1840s	0.429***	0.437***
	(0.023)	(0.022)
Wind adopted between the 1840s and 1860s	-0.009	-0.007
	(0.029)	(0.028)
Wind adopted before the 1840s	-0.043	-0.043
	(0.040)	(0.039)
Animal adopted between the 1840s and 1860s	0.031**	0.028**
	(0.013)	(0.014)
Animal adopted before the 1840s	0.042**	0.033*
	(0.019)	(0.018)
Controls	No	Yes

* p<0.10. ** p<0.05. *** p<0.01.

Table H.10: Effect of steam adoption with water on output per worker

	OLS		IV	
	(1)	(2)	(3)	(4)
Steam adopted between the 1840s and 1860s	-0.108***	-0.122***	0.056	0.068
	(0.041)	(0.040)	(0.207)	(0.356)
Steam adopted before the 1840s	-0.165***	-0.197***	-0.053	-0.059
	(0.046)	(0.046)	(0.145)	(0.263)
Water adopted between the 1840s and 1860s	0.442***	0.448***	0.367***	0.363**
	(0.051)	(0.050)	(0.108)	(0.170)
Water adopted before the 1840s	0.372***	0.406***	0.290***	0.313*
	(0.046)	(0.045)	(0.102)	(0.178)
Wind adopted between the 1840s and 1860s	0.443***	0.425***	0.442***	0.421***
	(0.062)	(0.058)	(0.062)	(0.059)
Wind adopted before the 1840s	0.733***	0.695***	0.738***	0.698***
	(0.075)	(0.073)	(0.074)	(0.073)
Animal adopted between the 1840s and 1860s	-0.057	-0.054	-0.061	-0.059
	(0.037)	(0.037)	(0.038)	(0.039)
Animal adopted before the 1840s	-0.119***	-0.138***	-0.126***	-0.143***
	(0.045)	(0.045)	(0.046)	(0.046)
Outcome in the 1840s	-0.359***	-0.365***	-0.358***	-0.362***
	(0.013)	(0.013)	(0.013)	(0.015)
Controls	No	Yes	No	Yes
R2	0.241	0.252	0.238	0.248
N	4146	4146	4146	4146
Kleibergen-Paap F stat			31	20

	IV: 1st stage Steam adopted between the 1840s and 1860s	
Distance from Fresnes	-0.098***	-0.087***
	(0.013)	(0.014)
Distance from Coal	-0.032***	-0.033***
	(0.008)	(0.010)
Steam adopted before the 1840s	-0.709***	-0.737***
	(0.019)	(0.020)
Water adopted between the 1840s and 1860s	0.453***	0.448***
	(0.025)	(0.025)
Water adopted before the 1840s	0.486***	0.489***
	(0.023)	(0.022)
Wind adopted between the 1840s and 1860s	0.001	0.010
	(0.029)	(0.028)
Wind adopted before the 1840s	-0.028	-0.019
	(0.041)	(0.040)
Animal adopted between the 1840s and 1860s	0.028**	0.025*
	(0.014)	(0.014)
Animal adopted before the 1840s	0.040**	0.029
	(0.019)	(0.018)
Outcome in the 1840s	-0.011**	-0.014***
	(0.005)	(0.005)
Controls	No	Yes

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

Table H.11: Effect of steam adoption with water on total employment

	OLS		IV	
	(1)	(2)	(3)	(4)
Steam adopted between the 1840s and 1860s	0.681***	0.679***	1.309***	1.196***
	(0.041)	(0.045)	(0.275)	(0.334)
Steam adopted before the 1840s	0.768***	0.751***	1.235***	1.152***
	(0.051)	(0.054)	(0.211)	(0.261)
Water adopted between the 1840s and 1860s	0.222***	0.233***	-0.051	0.012
	(0.051)	(0.051)	(0.137)	(0.153)
Water adopted before the 1840s	0.142***	0.148***	-0.136	-0.080
	(0.043)	(0.044)	(0.132)	(0.153)
Wind adopted between the 1840s and 1860s	-0.344***	-0.364***	-0.371***	-0.383***
	(0.065)	(0.067)	(0.077)	(0.075)
Wind adopted before the 1840s	-0.464***	-0.487***	-0.466***	-0.489***
	(0.067)	(0.070)	(0.072)	(0.074)
Animal adopted between the 1840s and 1860s	0.008	0.011	-0.021	-0.009
	(0.040)	(0.039)	(0.045)	(0.043)
Animal adopted before the 1840s	-0.112**	-0.110**	-0.141***	-0.128***
	(0.046)	(0.046)	(0.050)	(0.049)
Outcome in the 1840	-0.353***	-0.351***	-0.381***	-0.371***
	(0.016)	(0.015)	(0.022)	(0.022)
Controls	No	Yes	No	Yes
R2	0.596	0.601	0.575	0.587
N	4146	4146	4146	4146
Kleibergen-Paap F stat			27	21

	IV: 1st stage Steam adopted between the 1840s and 1860s	
Distance from Fresnes	-0.087***	-0.080***
	(0.012)	(0.013)
Distance from Coal	-0.032***	-0.036***
	(0.008)	(0.010)
Steam adopted before the 1840s	-0.760***	-0.781***
	(0.019)	(0.020)
Water adopted between the 1840s and 1860s	0.432***	0.429***
	(0.025)	(0.024)
Water adopted before the 1840s	0.437***	0.442***
	(0.022)	(0.021)
Wind adopted between the 1840s and 1860s	0.027	0.026
	(0.029)	(0.028)
Wind adopted before the 1840s	0.001	-0.001
	(0.040)	(0.040)
Animal adopted between the 1840s and 1860s	0.042***	0.038***
	(0.014)	(0.014)
Animal adopted before the 1840s	0.045**	0.035*
	(0.019)	(0.018)
Outcome in the 1840s	0.040***	0.038***
	(0.005)	(0.005)
Controls	No	Yes

* p<0.10. ** p<0.05. *** p<0.01.

Table H.12: Effect of steam adoption with water on the share of women and children

	OLS		IV	
	(1)	(2)	(3)	(4)
Steam adopted between the 1840s and 1860s	0.013**	0.014**	0.020	-0.018
	(0.007)	(0.007)	(0.041)	(0.049)
Steam adopted before the 1840s	0.026***	0.025***	0.031	0.001
	(0.008)	(0.009)	(0.029)	(0.037)
Water adopted between the 1840s and 1860s	0.016**	0.017**	0.013	0.031
	(0.007)	(0.007)	(0.021)	(0.023)
Water adopted before the 1840s	0.015**	0.016**	0.012	0.031
	(0.006)	(0.006)	(0.021)	(0.024)
Wind adopted between the 1840s and 1860s	-0.012	-0.012	-0.012	-0.011
	(0.008)	(0.009)	(0.008)	(0.009)
Wind adopted before the 1840s	-0.039***	-0.039***	-0.038***	-0.039***
	(0.008)	(0.008)	(0.008)	(0.009)
Animal adopted between the 1840s and 1860s	0.001	0.003	0.001	0.004
	(0.005)	(0.005)	(0.005)	(0.005)
Animal adopted before the 1840s	-0.005	-0.002	-0.005	-0.001
	(0.006)	(0.006)	(0.006)	(0.006)
Outcome in the 1840s	-0.341***	-0.340***	-0.341***	-0.336***
	(0.016)	(0.016)	(0.017)	(0.017)
Controls	No	Yes	No	Yes
R2	0.198	0.206	0.197	0.201
N	4146	4146	4146	4146
Kleibergen-Paap F stat			30	20

	IV: 1st stage Steam adopted between the 1840s and 1860s	
Distance from Fresnes	-0.097***	-0.085***
	(0.013)	(0.014)
Distance from Coal	-0.033***	-0.034***
	(0.008)	(0.010)
Steam adopted before the 1840s	-0.719***	-0.745***
	(0.019)	(0.020)
Water adopted between the 1840s and 1860s	0.447***	0.441***
	(0.025)	(0.024)
Water adopted before the 1840s	0.466***	0.465***
	(0.022)	(0.021)
Wind adopted between the 1840s and 1860s	0.002	0.008
	(0.029)	(0.028)
Wind adopted before the 1840s	-0.025	-0.020
	(0.040)	(0.039)
Animal adopted between the 1840s and 1860s	0.030**	0.027*
	(0.014)	(0.014)
Animal adopted before the 1840s	0.043**	0.032*
	(0.019)	(0.018)
Outcome in the 1840s	0.108***	0.110***
	(0.036)	(0.038)
Controls	No	Yes

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

Table H.13: Effect of steam adoption with water on labour's share

	OLS		IV	
	(1)	(2)	(3)	(4)
Steam adopted between the 1840s and 1860s	0.174***	0.165***	0.568***	0.469
	(0.040)	(0.041)	(0.213)	(0.369)
Steam adopted before the 1840s	0.224***	0.223***	0.493***	0.445
	(0.046)	(0.047)	(0.152)	(0.274)
Water adopted between the 1840s and 1860s	-0.459***	-0.456***	-0.641***	-0.592***
	(0.045)	(0.045)	(0.107)	(0.172)
Water adopted before the 1840s	-0.405***	-0.422***	-0.603***	-0.572***
	(0.049)	(0.048)	(0.110)	(0.185)
Wind adopted between the 1840s and 1860s	-0.467***	-0.458***	-0.473***	-0.465***
	(0.059)	(0.058)	(0.060)	(0.058)
Wind adopted before the 1840s	-0.730***	-0.710***	-0.719***	-0.706***
	(0.072)	(0.072)	(0.074)	(0.074)
Animal adopted between the 1840s and 1860s	0.027	0.031	0.015	0.023
	(0.037)	(0.037)	(0.040)	(0.040)
Animal adopted before the 1840s	0.091**	0.106**	0.076	0.098**
	(0.044)	(0.044)	(0.047)	(0.047)
Outcome in the 1840s	-0.382***	-0.382***	-0.387***	-0.387***
	(0.015)	(0.015)	(0.015)	(0.017)
Controls	No	Yes	No	Yes
R2	0.192	0.201	0.175	0.190
N	4146	4146	4146	4146
Kleibergen-Paap F stat			32	21

	IV: 1st stage Steam adopted between the 1840s and 1860s	
Distance from Fresnes	-0.099***	-0.088***
	(0.013)	(0.014)
Distance from Coal	-0.031***	-0.033***
	(0.008)	(0.009)
Steam adopted before the 1840s	-0.710***	-0.737***
	(0.019)	(0.020)
Water adopted between the 1840s and 1860s	0.456***	0.450***
	(0.025)	(0.025)
Water adopted before the 1840s	0.493***	0.495***
	(0.024)	(0.022)
Wind adopted between the 1840s and 1860s	0.006	0.012
	(0.029)	(0.028)
Wind adopted before the 1840s	-0.023	-0.017
	(0.040)	(0.040)
Animal adopted between the 1840s and 1860s	0.028**	0.025*
	(0.014)	(0.014)
Animal adopted before the 1840s	0.039**	0.029
	(0.019)	(0.018)
Outcome in the 1840s	0.017***	0.019***
	(0.005)	(0.005)
Controls	No	Yes

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

Table H.14: Effect of steam adoption with water on male wages

	OLS		IV	
	(1)	(2)	(3)	(4)
Steam adopted between the 1840s and 1860s	0.093***	0.067***	0.689***	0.419***
	(0.015)	(0.011)	(0.111)	(0.127)
Steam adopted before the 1840s	0.116***	0.072***	0.530***	0.330***
	(0.016)	(0.012)	(0.084)	(0.094)
Water adopted between the 1840s and 1860s	-0.007	-0.000	-0.280***	-0.157***
	(0.016)	(0.012)	(0.049)	(0.054)
Water adopted before the 1840s	-0.019	-0.009	-0.313***	-0.179***
	(0.012)	(0.010)	(0.052)	(0.059)
Wind adopted between the 1840s and 1860s	-0.016	-0.024*	-0.019	-0.026
	(0.020)	(0.014)	(0.025)	(0.017)
Wind adopted before the 1840s	-0.011	-0.029*	0.013	-0.018
	(0.020)	(0.017)	(0.034)	(0.023)
Animal adopted between the 1840s and 1860s	-0.018**	-0.009	-0.032***	-0.017*
	(0.009)	(0.009)	(0.012)	(0.009)
Animal adopted before the 1840s	-0.019*	-0.025**	-0.040***	-0.035***
	(0.011)	(0.010)	(0.015)	(0.012)
Outcome in the 1840s	-0.585***	-0.685***	-0.644***	-0.709***
	(0.020)	(0.015)	(0.024)	(0.017)
Controls	No	Yes	No	Yes
R2	0.521	0.590	0.155	0.467
N	4146	4146	4146	4146
Kleibergen-Paap F stat			34	22

	IV: 1st stage Steam adopted between the 1840s and 1860s	
Distance from Fresnes	-0.095***	-0.088***
	(0.012)	(0.013)
Distance from Coal	-0.031***	-0.033***
	(0.008)	(0.009)
Steam adopted before the 1840s	-0.721***	-0.740***
	(0.019)	(0.020)
Water adopted between the 1840s and 1860s	0.453***	0.446***
	(0.024)	(0.024)
Water adopted before the 1840s	0.481***	0.482***
	(0.022)	(0.021)
Wind adopted between the 1840s and 1860s	-0.007	-0.004
	(0.029)	(0.028)
Wind adopted before the 1840s	-0.039	-0.037
	(0.040)	(0.039)
Animal adopted between the 1840s and 1860s	0.022*	0.020
	(0.014)	(0.014)
Animal adopted before the 1840s	0.036*	0.029
	(0.019)	(0.018)
Outcome in the 1840s	0.088***	0.072***
	(0.018)	(0.021)
Controls	No	Yes

* p<0.10. ** p<0.05. *** p<0.01.

Table H.15: Effect of steam adoption with water on female wages

	OLS		IV	
	(1)	(2)	(3)	(4)
Steam adopted between the 1840s and 1860s	0.111***	0.084***	0.716***	0.570***
	(0.018)	(0.015)	(0.092)	(0.134)
Steam adopted before the 1840s	0.147***	0.116***	0.575***	0.488***
	(0.020)	(0.019)	(0.069)	(0.103)
Water adopted between the 1840s and 1860s	-0.020	-0.016	-0.331***	-0.258***
	(0.023)	(0.020)	(0.052)	(0.070)
Water adopted before the 1840s	-0.020	-0.009	-0.374***	-0.289***
	(0.017)	(0.017)	(0.057)	(0.077)
Wind adopted between the 1840s and 1860s	-0.029	-0.027	0.015	0.003
	(0.023)	(0.020)	(0.038)	(0.033)
Wind adopted before the 1840s	0.026	0.004	0.110***	0.072*
	(0.026)	(0.024)	(0.043)	(0.039)
Animal adopted between the 1840s and 1860s	0.033*	0.034**	0.021	0.030
	(0.017)	(0.016)	(0.021)	(0.018)
Animal adopted before the 1840s	-0.017	-0.008	-0.044*	-0.022
	(0.020)	(0.019)	(0.027)	(0.024)
Outcome in the 1840s	-0.629***	-0.732***	-0.728***	-0.766***
	(0.031)	(0.024)	(0.031)	(0.028)
Controls	No	Yes	No	Yes
R2	0.580	0.627	0.178	0.386
N	1754	1754	1754	1754
Kleibergen-Paap F stat			29	17

	IV: 1st stage Steam adopted between the 1840s and 1860s	
Distance from Fresnes	-0.127***	-0.116***
	(0.017)	(0.020)
Distance from Coal	-0.044***	-0.036**
	(0.013)	(0.015)
Steam adopted before the 1840s	-0.734***	-0.772***
	(0.026)	(0.025)
Water adopted between the 1840s and 1860s	0.501***	0.501***
	(0.030)	(0.028)
Water adopted before the 1840s	0.563***	0.573***
	(0.031)	(0.030)
Wind adopted between the 1840s and 1860s	-0.061	-0.057
	(0.044)	(0.044)
Wind adopted before the 1840s	-0.122**	-0.137**
	(0.054)	(0.054)
Animal adopted between the 1840s and 1860s	0.019	0.014
	(0.026)	(0.026)
Animal adopted before the 1840s	0.038	0.026
	(0.031)	(0.031)
Outcome in the 1840s	0.119***	0.071**
	(0.032)	(0.035)
Controls	No	Yes

* p<0.10. ** p<0.05. *** p<0.01.

Table H.16: Effect of steam adoption with water on child wages

	OLS		IV	
	(1)	(2)	(3)	(4)
Steam adopted between the 1840s and 1860s	0.095***	0.079***	0.542***	0.362***
	(0.021)	(0.018)	(0.101)	(0.137)
Steam adopted before the 1840s	0.114***	0.095***	0.434***	0.310***
	(0.022)	(0.020)	(0.071)	(0.104)
Water adopted between the 1840s and 1860s	0.040*	0.051**	-0.213***	-0.105
	(0.024)	(0.021)	(0.062)	(0.079)
Water adopted before the 1840s	0.009	0.023	-0.275***	-0.154*
	(0.020)	(0.019)	(0.064)	(0.084)
Wind adopted between the 1840s and 1860s	0.043	0.023	0.093*	0.047
	(0.034)	(0.030)	(0.049)	(0.041)
Wind adopted before the 1840s	0.044	0.012	0.127**	0.057
	(0.038)	(0.034)	(0.053)	(0.046)
Animal adopted between the 1840s and 1860s	-0.051***	-0.054***	-0.054**	-0.053***
	(0.019)	(0.018)	(0.022)	(0.019)
Animal adopted before the 1840s	-0.053**	-0.047**	-0.054**	-0.047**
	(0.021)	(0.020)	(0.023)	(0.022)
Outcome in the 1840s	-0.656***	-0.739***	-0.732***	-0.775***
	(0.020)	(0.019)	(0.027)	(0.027)
Controls	No	Yes	No	Yes
R2	0.621	0.674	0.486	0.624
N	1458	1458	1458	1458
Kleibergen-Paap F stat			17	11

	IV: 1st stage Steam adopted between the 1840s and 1860s	
Distance from Fresnes	-0.111***	-0.107***
	(0.019)	(0.022)
Distance from Coal	-0.039***	-0.028*
	(0.013)	(0.015)
Steam adopted before the 1840s	-0.745***	-0.774***
	(0.023)	(0.024)
Water adopted between the 1840s and 1860s	0.563***	0.559***
	(0.031)	(0.030)
Water adopted before the 1840s	0.628***	0.628***
	(0.030)	(0.029)
Wind adopted between the 1840s and 1860s	-0.092	-0.077
	(0.058)	(0.057)
Wind adopted before the 1840s	-0.161***	-0.153***
	(0.055)	(0.054)
Animal adopted between the 1840s and 1860s	0.011	0.004
	(0.025)	(0.024)
Animal adopted before the 1840s	0.012	0.003
	(0.030)	(0.030)
Outcome in the 1840s	0.152***	0.126***
	(0.028)	(0.026)
Controls	No	Yes

* p<0.10. ** p<0.05. *** p<0.01.

I   Regression results for wool milling

Notes for the tables presented in Appendix I: Columns (1) and (2) report the results of the OLS model described by equation (1), while Columns (3) and (4) report the results of the IV model jointly described by equations (1) and (2). Columns (1) and (3) include time-varying sub-industry specific variables while Columns (2) and (4) also include district specific variables. Both models account for time and sub-industry and district fixed effects, with Conley standard error clustered within 100 km away from the centroid of the district in question. Time-varying sub-industry specific variables include dummies for the use of traditional motive powers (water and animal, but not wind because there were too few observations) and the lagged outcome variable. District-specific variables include longitude, rainfall, temperature, land suitability for agriculture, literacy rates, encyclopaedias subscription rates, number of banks, population density, whether the district had a metal sector and a steam engine installed in another local sub-industry in the 1840s, as well as distances to the nearest coast, river, railroad, and university. All variables are in log except dummies. The effect on child wages is not estimated due to a poor Kleibergen-Paap test statistic * $p<0.10$. ** $p<0.05$. *** $p<0.01$.

Table I.1: Effect of steam adoption in wool milling on the total value of output

	OLS		IV	
	(1)	(2)	(3)	(4)
Steam adopted between the 1840s and 1860s	0.995***	0.780***	2.495**	2.042***
	(0.176)	(0.131)	(0.972)	(0.454)
Steam adopted before the 1840s	1.168***	0.416**	2.304***	1.461***
	(0.209)	(0.183)	(0.709)	(0.365)
Water adopted between the 1840s and 1860s	0.622**	0.871***	0.839**	1.053***
	(0.248)	(0.201)	(0.426)	(0.305)
Water adopted before the 1840s	0.245	0.508*	0.332	0.512
	(0.310)	(0.266)	(0.477)	(0.360)
Animal adopted between the 1840s and 1860s	-0.317*	-0.325**	-0.335	-0.423**
	(0.178)	(0.155)	(0.302)	(0.202)
Animal adopted before the 1840s	-0.080	-0.090	-0.117	-0.198
	(0.233)	(0.248)	(0.345)	(0.318)
Outcome in the 1840s	-0.572***	-0.548***	-0.672***	-0.656***
	(0.098)	(0.060)	(0.105)	(0.079)
Controls	No	Yes	No	Yes
R2	0.704	0.816	0.499	0.702
N	140	140	140	140
Kleibergen-Paap F stat			3	9

	IV: 1st stage Steam adopted between the 1840s and 1860s	
Distance from Fresnes	-0.101*	-0.441***
	(0.060)	(0.087)
Distance from Coal	-0.092*	-0.132*
	(0.050)	(0.073)
Steam adopted before the 1840s	-0.782***	-0.930***
	(0.099)	(0.081)
Water adopted between the 1840s and 1860s	-0.120	-0.195
	(0.142)	(0.129)
Water adopted before the 1840s	-0.016	0.042
	(0.155)	(0.152)
Animal adopted between the 1840s and 1860s	0.005	0.061
	(0.119)	(0.099)
Animal adopted before the 1840s	-0.012	0.055
	(0.127)	(0.135)
Outcome in the 1840s	0.041	0.024
	(0.033)	(0.029)
Controls	No	Yes

* p<0.10. ** p<0.05. *** p<0.01.

Table I.2: Effect of steam adoption in wool milling on output per worker

	OLS		IV	
	(1)	(2)	(3)	(4)
Steam adopted between the 1840s and 1860s	0.262**	0.166*	0.347	0.373
	(0.118)	(0.100)	(0.478)	(0.256)
Steam adopted before the 1840s	0.301**	-0.142	0.364	0.023
	(0.134)	(0.138)	(0.339)	(0.220)
Water adopted between the 1840s and 1860s	-0.101	0.142	-0.086	0.184
	(0.138)	(0.156)	(0.157)	(0.163)
Water adopted before the 1840s	-0.007	0.108	-0.001	0.114
	(0.148)	(0.148)	(0.169)	(0.151)
Animal adopted between the 1840s and 1860s	-0.219	-0.194	-0.215	-0.193
	(0.178)	(0.127)	(0.190)	(0.136)
Animal adopted before the 1840s	0.026	0.104	0.031	0.110
	(0.215)	(0.134)	(0.222)	(0.136)
Outcome in the 1840s	-0.855***	-0.961***	-0.867***	-0.998***
	(0.063)	(0.056)	(0.097)	(0.071)
Controls	No	Yes	No	Yes
R2	0.644	0.796	0.643	0.790
N	140	140	140	140
Kleibergen-Paap F stat			2	8

	IV: 1st stage Steam adopted between the 1840s and 1860s	
Distance from Fresnes	-0.077	-0.423***
	(0.063)	(0.085)
Distance from Coal	-0.099**	-0.098
	(0.049)	(0.077)
Steam adopted before the 1840s	-0.764***	-0.933***
	(0.092)	(0.079)
Water adopted between the 1840s and 1860s	-0.151	-0.230*
	(0.142)	(0.128)
Water adopted before the 1840s	-0.036	0.020
	(0.149)	(0.147)
Animal adopted between the 1840s and 1860s	-0.038	0.024
	(0.113)	(0.095)
Animal adopted before the 1840s	-0.070	0.024
	(0.121)	(0.131)
Outcome in the 1840s	0.120**	0.120**
	(0.050)	(0.049)
Controls	No	Yes

* p<0.10. ** p<0.05. *** p<0.01.

Table I.3: Effect of steam adoption in wool milling on total employment

	OLS		IV	
	(1)	(2)	(3)	(4)
Steam adopted between the 1840s and 1860s	0.834***	0.791***	2.050***	2.030***
	(0.150)	(0.140)	(0.778)	(0.399)
Steam adopted before the 1840s	1.052***	0.793***	1.878***	1.706***
	(0.223)	(0.175)	(0.549)	(0.329)
Water adopted between the 1840s and 1860s	0.739***	0.863***	0.961***	1.071***
	(0.220)	(0.238)	(0.360)	(0.327)
Water adopted before the 1840s	0.277	0.473	0.349	0.467
	(0.289)	(0.292)	(0.394)	(0.372)
Animal adopted between the 1840s and 1860s	-0.080	-0.029	-0.030	-0.060
	(0.224)	(0.196)	(0.283)	(0.214)
Animal adopted before the 1840s	-0.098	-0.158	-0.017	-0.101
	(0.331)	(0.334)	(0.403)	(0.395)
Outcome in the 1840s	-0.612***	-0.559***	-0.576***	-0.520***
	(0.131)	(0.103)	(0.135)	(0.106)
Controls	No	Yes	No	Yes
R2	0.598	0.704	0.411	0.550
N	140	140	140	140
Kleibergen-Paap F stat			4	13

	IV: 1st stage	
	Steam adopted between the 1840s and 1860s	
Distance from Fresnes	-0.116*	-0.488***
	(0.061)	(0.087)
Distance from Coal	-0.103**	-0.137*
	(0.049)	(0.072)
Steam adopted before the 1840s	-0.725***	-0.882***
	(0.096)	(0.079)
Water adopted between the 1840s and 1860s	-0.151	-0.233*
	(0.146)	(0.137)
Water adopted before the 1840s	-0.012	0.044
	(0.151)	(0.153)
Animal adopted between the 1840s and 1860s	-0.046	0.006
	(0.124)	(0.103)
Animal adopted before the 1840s	-0.101	-0.055
	(0.131)	(0.133)
Outcome in the 1840s	-0.048	-0.075*
	(0.049)	(0.045)
Controls	No	Yes

* p<0.10. ** p<0.05. *** p<0.01.

Table I.4: Effect of steam adoption in wool milling on the share of women and children

	OLS		IV	
	(1)	(2)	(3)	(4)
Steam adopted between the 1840s and 1860s	-0.020	-0.052***	-0.017	0.035
	(0.017)	(0.019)	(0.076)	(0.042)
Steam adopted before the 1840s	0.012	-0.005	0.014	0.061*
	(0.021)	(0.023)	(0.055)	(0.035)
Water adopted between the 1840s and 1860s	0.087***	0.087***	0.087**	0.100***
	(0.029)	(0.027)	(0.036)	(0.033)
Water adopted before the 1840s	0.033	0.044	0.033	0.044
	(0.031)	(0.032)	(0.033)	(0.039)
Animal adopted between the 1840s and 1860s	0.004	0.021	0.004	0.017
	(0.032)	(0.030)	(0.032)	(0.034)
Animal adopted before the 1840s	0.001	0.041	0.001	0.042
	(0.035)	(0.034)	(0.036)	(0.038)
Outcome in the 1840s	-0.428***	-0.503***	-0.427***	-0.516***
	(0.114)	(0.134)	(0.115)	(0.148)
Controls	No	Yes	No	Yes
R2	0.287	0.454	0.286	0.374
N	140	140	140	140
Kleibergen-Paap F stat			3	12
			IV: 1st stage	
			Steam adopted between the 1840s and 1860s	
Distance from Fresnes			-0.116*	-0.463***
			(0.063)	(0.084)
Distance from Coal			-0.097**	-0.148**
			(0.049)	(0.073)
Steam adopted before the 1840s			-0.754***	-0.920***
			(0.092)	(0.077)
Water adopted between the 1840s and 1860s			-0.130	-0.171
			(0.141)	(0.130)
Water adopted before the 1840s			-0.009	0.049
			(0.154)	(0.156)
Animal adopted between the 1840s and 1860s			-0.014	0.053
			(0.121)	(0.100)
Animal adopted before the 1840s			-0.050	0.010
			(0.130)	(0.143)
Outcome in the 1840s			0.014	0.486
			(0.516)	(0.419)
Controls			No	Yes

* p<0.10. ** p<0.05. *** p<0.01.

Table I.5: Effect of steam adoption in wool milling on labour's share

	OLS		IV	
	(1)	(2)	(3)	(4)
Steam adopted between the 1840s and 1860s	-0.094	-0.050	0.096	-0.182
	(0.111)	(0.105)	(0.385)	(0.243)
Steam adopted before the 1840s	-0.009	0.318**	0.123	0.217
	(0.110)	(0.130)	(0.246)	(0.209)
Water adopted between the 1840s and 1860s	0.076	-0.024	0.109	-0.045
	(0.157)	(0.175)	(0.164)	(0.183)
Water adopted before the 1840s	0.083	0.096	0.096	0.097
	(0.174)	(0.178)	(0.176)	(0.181)
Animal adopted between the 1840s and 1860s	0.329*	0.341**	0.338**	0.338**
	(0.171)	(0.138)	(0.168)	(0.144)
Animal adopted before the 1840s	0.056	-0.008	0.067	-0.015
	(0.199)	(0.153)	(0.200)	(0.155)
Outcome in the 1840s	-1.021***	-1.086***	-1.001***	-1.109***
	(0.049)	(0.055)	(0.064)	(0.069)
Controls	No	Yes	No	Yes
R2	0.643	0.761	0.635	0.758
N	140	140	140	140
Kleibergen-Paap F stat			3	9

	IV: 1st stage Steam adopted between the 1840s and 1860s	
Distance from Fresnes	-0.102*	-0.442***
	(0.062)	(0.086)
Distance from Coal	-0.098**	-0.100
	(0.049)	(0.079)
Steam adopted before the 1840s	-0.745***	-0.921***
	(0.092)	(0.079)
Water adopted between the 1840s and 1860s	-0.140	-0.204
	(0.142)	(0.128)
Water adopted before the 1840s	-0.022	0.044
	(0.151)	(0.149)
Animal adopted between the 1840s and 1860s	-0.041	0.008
	(0.117)	(0.096)
Animal adopted before the 1840s	-0.071	0.007
	(0.124)	(0.130)
Outcome in the 1840s	-0.096*	-0.132**
	(0.054)	(0.053)
Controls	No	Yes

* p<0.10. ** p<0.05. *** p<0.01.

Table I.6: Effect of steam adoption in wool milling on male wages

	OLS		IV	
	(1)	(2)	(3)	(4)
Steam adopted between the 1840s and 1860s	0.181***	0.137***	0.683***	0.380***
	(0.035)	(0.036)	(0.223)	(0.069)
Steam adopted before the 1840s	0.225***	0.176***	0.643***	0.380***
	(0.042)	(0.043)	(0.183)	(0.071)
Water adopted between the 1840s and 1860s	0.136***	0.230***	0.210***	0.277***
	(0.035)	(0.047)	(0.080)	(0.051)
Water adopted before the 1840s	0.140***	0.234***	0.177**	0.248***
	(0.042)	(0.043)	(0.084)	(0.050)
Animal adopted between the 1840s and 1860s	0.201***	0.227***	0.190**	0.209***
	(0.044)	(0.038)	(0.082)	(0.053)
Animal adopted before the 1840s	0.197***	0.220***	0.205**	0.218***
	(0.057)	(0.052)	(0.097)	(0.074)
Outcome in the 1840s	-0.638***	-0.829***	-0.877***	-0.916***
	(0.060)	(0.068)	(0.131)	(0.084)
Controls	No	Yes	No	Yes
R2	0.722	0.801	0.192	0.700
N	140	140	140	140
Kleibergen-Paap F stat			3	9

	IV: 1st stage Steam adopted between the 1840s and 1860s	
Distance from Fresnes	-0.068	-0.445***
	(0.056)	(0.094)
Distance from Coal	-0.099**	-0.139*
	(0.049)	(0.072)
Steam adopted before the 1840s	-0.834***	-0.926***
	(0.097)	(0.085)
Water adopted between the 1840s and 1860s	-0.129	-0.205
	(0.135)	(0.128)
Water adopted before the 1840s	-0.043	0.034
	(0.149)	(0.160)
Animal adopted between the 1840s and 1860s	0.015	0.055
	(0.116)	(0.102)
Animal adopted before the 1840s	-0.035	0.029
	(0.122)	(0.138)
Outcome in the 1840s	0.397**	0.062
	(0.180)	(0.196)
Controls	No	Yes

* p<0.10. ** p<0.05. *** p<0.01.

Table I.7: Effect of steam adoption in wool milling on female wages

	OLS		IV	
	(1)	(2)	(3)	(4)
Steam adopted between the 1840s and 1860s	0.107**	0.044	0.452***	0.142**
	(0.043)	(0.037)	(0.154)	(0.070)
Steam adopted before the 1840s	0.249***	0.165***	0.504***	0.241***
	(0.053)	(0.040)	(0.109)	(0.055)
Water adopted between the 1840s and 1860s	0.019	0.077	0.073	0.093
	(0.051)	(0.055)	(0.075)	(0.058)
Water adopted before the 1840s	0.103*	0.226***	0.120*	0.230***
	(0.055)	(0.074)	(0.069)	(0.072)
Animal adopted between the 1840s and 1860s	0.120***	0.191***	0.133*	0.187***
	(0.044)	(0.039)	(0.070)	(0.044)
Animal adopted before the 1840s	0.077	0.173***	0.090	0.174***
	(0.058)	(0.055)	(0.083)	(0.061)
Outcome in the 1840s	-0.676***	-0.856***	-0.775***	-0.876***
	(0.072)	(0.058)	(0.098)	(0.065)
Controls	No	Yes	No	Yes
R2	0.674	0.818	0.454	0.803
N	134	134	134	134
Kleibergen-Paap F stat			3	12

	IV: 1st stage Steam adopted between the 1840s and 1860s	
Distance from Fresnes	-0.098	-0.459***
	(0.063)	(0.079)
Distance from Coal	-0.105**	-0.135*
	(0.051)	(0.072)
Steam adopted before the 1840s	-0.772***	-0.933***
	(0.094)	(0.079)
Water adopted between the 1840s and 1860s	-0.113	-0.213
	(0.139)	(0.133)
Water adopted before the 1840s	-0.006	0.006
	(0.156)	(0.163)
Animal adopted between the 1840s and 1860s	-0.041	0.056
	(0.124)	(0.103)
Animal adopted before the 1840s	-0.052	0.023
	(0.131)	(0.134)
Outcome in the 1840s	0.219	0.242
	(0.180)	(0.189)
Controls	No	Yes

* p<0.10. ** p<0.05. *** p<0.01.