NBER WORKING PAPER SERIES

INDUSTRIAL DEVELOPMENT AND LONG-RUN PROSPERITY

Raphaël Franck
Oded Galor

Working Paper 23701
http://www.nber.org/papers/w23701

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
August 2017

We thank Joshua Angrist, Mario Carillo, Gregory Casey, Pedro Dal Bo, Martin Fiszbein, Naomi Hausman, Marc Klemp, Esteban Klor, David Le Bris, Michael Makowsky, Stelios Michalopoulos, Omer Ozak, Assaf Sarid, Yannay Spitzer, Uwe Sunde and David Weil for helpful discussions and participants in various seminars for comments. We thank Guillaume Daudin, Alan Fernihough and Omer Ozak for sharing their data with us. Raphal Franck wrote part of this paper as Marie Curie Fellow at the Department of Economics at Brown University under funding from the People Programme (Marie Curie Actions) of the European Union's Seventh Framework Programme (FP 2007-2013) under REA Grant agreement PIOF-GA-2012-327760 (TCDOFT). The views expressed herein are those of the authors and do not necessarily reflect the views of the National Bureau of Economic Research.

Industrial Development and Long-Run Prosperity
Raphaël Franck and Oded Galor
NBER Working Paper No. 23701
August 2017
JEL No. N33,N34,O14,O33

ABSTRACT

This research explores the long-run effect of industrialization on the process of development. In contrast to conventional wisdom that views industrial development as a catalyst for economic growth, the study establishes that while the adoption of industrial technology was conducive to economic development in the short-run, it has had a detrimental effect on standards of living in the long-run. Exploiting exogenous geographic and climatic sources of regional variation in the diffusion and adoption of steam engines during the French industrial revolution, the research establishes that regions in which industrialization was more intensive experienced an increase in literacy rates more swiftly and generated higher income per capita in the subsequent decades. Nevertheless, intensive industrialization has had an adverse effect on income per capita, employment and equality by the turn of the 21st century. This adverse effect reflects neither higher unionization and wage rates nor trade protection, but rather underinvestment in human capital and lower employment in skilled-intensive occupations. These findings suggest that the characteristics that permitted the onset of industrialization, rather than the adoption of industrial technology per se, have been the source of prosperity among the currently developed economies that experienced an early industrialization. Thus, developing economies may benefit from the allocation of resources towards human capital formation rather than towards the promotion of industrial development.

Raphaël Franck
Hebrew University of Jerusalem
Department of Economics
Mount Scopus
Jerusalem 91905
Israel
raphael.franck@mail.huji.ac.il

Oded Galor
Department of Economics
Brown University
Box B
Providence, RI 02912
and CEPR
and also NBER
oded_galor@brown.edu

1 Introduction

The process of development has been marked by persistence as well as reversals in the relative wealth of nations. While some geographical characteristics that were conducive for economic development in the agricultural stage had detrimental effects on the transition to the industrial stage of development, conventional wisdom, as captured by Figure 1, suggests that prosperity has persisted among societies that experienced an earlier industrialization.[1]

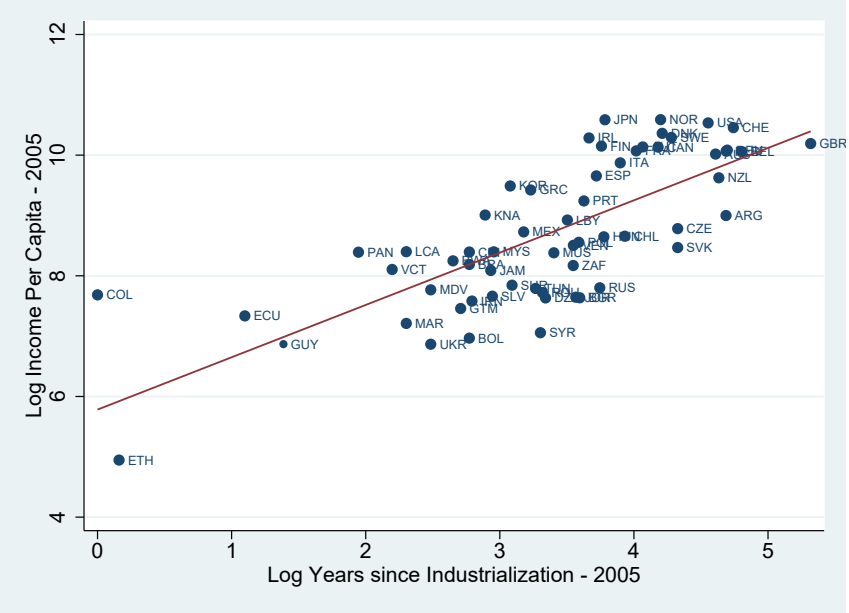


Figure 1: Early industrialization and GDP per capita

Source: Galor (2011).

Regional development within advanced economies, nevertheless, appears far from being indicative of the presence of a persistent beneficial effect of early industrialization. In particular, anecdotal evidence suggests that regions which were prosperous industrial centers in Western Europe and in the Americas in the 19^{th} century (e.g., the Rust Belt in the USA, the Midlands in the UK, and the Ruhr valley in Germany) have experienced a reversal in their comparative development.

These conflicting observations about the long-run effect of industrialization on the prosperity of regions and nations may suggest that factors which fostered industrial development in the Western world, rather than the forces of industrialization *per se*, are associated with the persistence of fortune across these industrial nations. In particular, it is not inconceivable that the process of

[1] The persistence effect of geographical, cultural, institutional and human characteristics have been at the center of a debate regarding the origins of the differential timing of transitions from stagnation to growth and the remarkable transformation of the world income distribution in the last two centuries (e.g., Acemoglu et al. (2001), Alesina et al. (2013), Andersen et al. (2016), Ashraf and Galor (2013), Cervellati and Sunde (2005), Galor and Özak (2016), Mokyr (2016)).

industrialization *per se*, despite its earlier virtues, has had detrimental effects on the transition to the post-industrial stage of development. Nevertheless, despite the enormous importance of the resolution of this question from a policy perspective, this issue has, largely, neither been raised nor explored in the modern economic growth literature.

The research explores the long-run effect of industrialization on the process of development. In contrast to conventional wisdom that views industrial development as a catalyst for economic growth, highlighting its persistent effect on economic prosperity, the study establishes that while the adoption of industrial technology was initially conducive for economic development, it has had a detrimental effect on standards of living in the long-run.

The study utilizes French regional data from the second half of the 19^{th} century until the beginning of the 21^{st} century to explore the impact of the adoption of industrial technology on the evolution of income per capita and human capital formation. It establishes that regions which industrialized more intensively experienced an increase in literacy rates more swiftly and generated higher income per capita in the subsequent decades. Nevertheless, industrialization has had an adverse effect on income per capita, employment and equality by the turn of the 21^{st} century.

The observed relationship between industrialization and economic development may reflect the potential effect of industrialization on economic prosperity, the impact of development on industrialization, as well as the influence of geographical, institutional, cultural and human capital characteristics on the joint evolution of industrialization and economic prosperity. Thus, the research exploits geographic and climatic sources of regional variation in the diffusion and adoption of steam engines across France to establish the effect of industrialization on the process of development.

The identification strategy consists of two distinct components that govern: (i) the regional diffusion and thus the supply of industrial technologies, and (ii) the differential decline in the profitability of agriculture across regions and thus variations in the pace of industrialization as well as the demand for industrials technologies. First, in light of the association between industrialization and the intensity of the use of the steam engine (Mokyr, 1990; Bresnahan and Trajtenberg, 1995; Rosenberg and Trajtenberg, 2004). the study takes advantage of historical evidence regarding the regional diffusion of the steam engine (Ballot, 1923; Sée, 1925; Léon, 1976) to identify the effect of regional variations in the intensity of the use steam engine in 1860-1865 on the process of development. In particular, it exploits the distances of each French department from Fresnes-sur-Escaut, where a steam engine was first successfully operated for commercial use from 1732 onwards, as exogenous source of variations in industrialization across French regions.[2] Second, the study ex-

[2]In 1726, an Englishman named John May obtained a privilege to operate steam engines to pump water throughout the French kingdom. With another Englishman named John Meeres, he installed the first steam engine in Passy (which was then outside but is now within the administrative boundaries of Paris) to raise water from the Seine river to supply the French capital with water. However it seems that their commercial and industrial operation stopped quickly or even never took off. Indeed, when Forest de Bélidor (1737) published his massive treatise on engineering

ploits contemporaneous regional variations in temperature deviations from their historical trend to capture exogenous sources of variation in the profitability of agriculture and therefore the pace of industrialization as well as the demand for steam engine technologies across regions.

Indeed, in line with the historical account, the unequal distribution of steam engines across French departments is indicative of a local diffusion process from Fresnes-sur-Escaut. Accounting for confounding geographical and institutional characteristics, pre-industrial development as well as distances from major economic centers, if the distance of a department away from Fresnes-sur-Escaut was to increase from the 40th (426 km) to the 60th percentile (559 km) of the distance distribution, this department would experience an aggregate drop of 275 in the horse power of steam engines (relative to a sample mean of 1839.35 hp).

The validity of the distance from Fresnes-sur-Escaut as an instrumental variable for the intensity of the adoption of steam engines across France is enhanced by three additional factors. First, conditional on the distance from Fresnes-sur-Escaut, distances between each department and major centers of economic power in 1860-1865 (e.g., Paris, Marseille, Lyon, Rouen, Mulhouse, Bordeaux) are uncorrelated with the intensive use of the steam engine over this period. Second, the distance from Fresnes-sur-Escaut is uncorrelated with economic development across France in the pre-industrial period. Third, it appears that the Nord department had neither superior human capital characteristics nor higher standard of living in comparison to the average department in France.

Moreover, regional variations in temperature deviations from their historical trend is associated with regional variation in the profitability of agriculture (as reflected by wheat prices), and in the adoption of steam engines. In particular, conditional on the distance from Fresnes-sur-Escaut, in comparison to a department at the 40th percentile of the squared temperature deviation (i.e., 0.14), a department with a 60th percentile of the squared temperature deviation (i.e., 0.25), will be expected to experience a drop of 13.9 in the horse power of steam engines. These estimates suggest that, while the diffusion of the steam engine as well the transition from agriculture to industry contributed to the adoption of steams engines, the effect of gradual diffusion of steam engines from the North of France to the rest of the country dominated the effect of the climatic volatility on the slower transition of French regions from agriculture to industry in the 19th century.

The study establishes that the horse power of steam engines in industrial production in the 1860-1865 period had a positive and significant impact on income per capita in 1860, 1901 and 1930. In particular, a one-percent increase in the total horse power of steam engines in a department in 1860-1865 increased GDP per capita by 0.10 percent in 1860, 0.23 percent in 1901 and 0.10 percent

in 1737-1739, he mentioned that the steam engine in Fresnes-sur-Escaut was the only one operated in France (see, e.g., Lord (1923) and Dickinson (1939)). This is very similar to what happened in England: Nuvolari et al. (2011) indicate that the first industrial use of the steam engine was in the Wheal Vor tin mine in Cornwall in 1710, but stopped quickly, and that the first successful commercial use of a steam engine took place in 1712 in England, in a coal mine near Wolverhampton (see also Mokyr (1990, p.85)).

in 1930. Nevertheless, industrialization had an adverse effect on income per capita, human capital formation, employment and equality in the post-2000 period. In particular, a one-percent increase in the total horse power of steam engines in a department in 1860-1865 led to a 0.06 percent decrease in GDP per capita in 2001-2005.[3]

It is important to note that the IV estimation reverses the OLS estimates of the relationship between industrialization and the long-run level of income per capita from a positive to a negative one. This reversal suggests that factors which fostered industrial development, rather than industrialization per se, contributed to the positive association between industrialization and long-run development. In particular, once one accounts for the effect of these omitted factors, industrialization has an adverse effect on the standard of living in the long-run.

The empirical analysis accounts for a wide range of exogenous confounding geographical and institutional characteristics, as well as for pre-industrial development, which may have contributed to the relationship between industrialization and economic development. First, it accounts for the potentially confounding impact of exogenous geographical characteristics (i.e, latitude, land suitability, average temperature, average rainfall and share of carboniferous area in each department) of each French department on the relationship between industrialization and economic development. In particular, it captures the potential effect of these geographical factors on the profitability of the adoption of the steam engine, the pace of its regional diffusion, as well as on productivity and thus the evolution of income per capita in the process of development. Second, it captures the potentially confounding effects of the location of departments (i.e., border departments, maritime departments, departments at a greater distance from the concentration of political power in Paris, and those that were temporarily under German domination) on the diffusion of the steam engine and the diffusion of development. Third, the analysis accounts for the differential level of development across France in the pre-industrial era that may have affected jointly the process of development and the process of industrialization. In particular, it controls for the effect of pre-industrial development on the adoption of the steam engine and, independently, on the persistence of development.

The research further explores the mediating channels through which earlier industrial development has an adverse effect of the contemporary level of development. It establishes that the adverse long-run effect of industrialization on the formation of human capital, beyond basic literacy skills, is the underlining force that brought about the relative demise of the industrial regions.[4] This result is in line with the notion that growth in the 19th century was characterized by physical capital accumulation while post-WWI growth was characterized by human capital accumulation (Galor and Moav, 2004). Thus, in the 20th century, regions with relatively lower levels of human

[3]To put these figures in perspective, it must be borne in mind that Crafts (2004) finds that the contribution of steam technology to labor productivity growth in Great Britain was equal to 0.41 percent per year over the 1850-1870 period and to 0.31 percent per year over the 1870-1910 period.

[4]Such a result is in line with the idea that industrialization had a positive impact on human capital formation during the second phase of industrialization in the late 19th century (Galor and Moav, 2006).

capital experienced a relative economic decline. In contrast, greater unionization, higher wages and trade protection in these industrial regions during their economic prosperity, as well as destruction in the two world wars, did not contribute to their current decline. Moreover, their decline cannot be attributed to variations in employment rates in the service sector, but rather to the detrimental effect on the share of employment in skilled-intensive occupations.

The remainder of this paper is as follows. Section 2 presents our data. Section 3 discusses our empirical strategy. Section 4 presents our main results and our robustness checks. Section 5 assesses the relevance of potential mechanisms for these findings and Section 6 offers concluding remarks.

2 Data and Main Variables

France was among the first countries to industrialize in Europe in the 18th century and its industrialization continued during the 19th century. Nevertheless, by 1914, the living standard in France remained below that of England and of Germany, which had become the leading industrial country in continental Europe. The slower path of industrialization in France has been attributed to the consequences of the French Revolution (e.g., wars, legal reforms and land redistribution), the patterns of domestic and foreign investment, cultural preferences for public services, as well as the comparative advantage of France in agriculture vis-a-vis England and Germany (see the discussion in, e.g., Lévy-Leboyer and Bourguignon, 1990; Grantham, 1997; Crouzet, 2003).

This section examines the evolution of industrialization and income across 89 French departments, based on the administrative division of France in the 1860-1865 period, accounting for the geographical and the institutional characteristics of these regions. The initial partition of the French territory in 1790 was designed to ensure that the travel distance by horse from any location within the department to the main administrative center would not exceed one day. The initial territory of each department was therefore orthogonal to the process of development and the subsequent minor changes in the borders of some departments did not reflect the effect of industrialization.

In light of the changes in the internal and external boundaries of the French territory during the period of study, the number of departments that is included in different stages of the analysis varies from 81 to 89. In particular, several departments that were split into smaller units are aggregated into their historical territorial borders and regions that were temporarily removed from the French territory are excluded from the analysis during those time periods.[5] Table A.1 reports

[5]The Parisian region encompassed three departments (Seine, Seine-et-Marne and Seine-et-Oise) before 1968 and it was split into eight (Essonne, Hauts-de-Seine, Paris, Seine-et-Marne, Seine-Saint-Denis, Val-de-Marne, Val d'Oise and Yvelines) afterwards. Likewise, the Corsica department was split in 1975 into Corse-du-Sud and Haute-Corse. The three departments (i.e., Bas-Rhin, Haut-Rhin and Meurthe) which were under German rule between 1871 and 1918 are excluded from the analysis of economic development over that time period. In addition, in the examination of the robustness of the analysis with data prior to 1860, the three departments (i.e., Alpes-Maritimes, Haute-Savoie

the descriptive statistics for the variables in the empirical analysis across these departments.

2.1 Past and Present Measures of Income, Workforce and Human Capital

2.1.1 Income, Unemployment and Inequality

This study seeks to examine the effect of industrialization on the evolution of income per capita in the process of development. Given that the industrial survey which is the basis for our analysis was conducted between 1860 and 1865, the relevant data to capture the short-run and medium-run effects of industrialization on income per capita are provided at the departmental level prior to WWII for the years 1860, 1872, 1886, 1901, 1911 and 1930 by Combes et al. (2011) and Caruana-Galizia (2013). Thus, for the sake of brevity, and equal spacing between those years, the analysis focuses on income per capita in 1860, 1901 and 1930.

To assess the effects of industrialization on income per capita in the long-run, the analysis is restricted to the 2001-2005 period (INSEE - *Institut National de la Statistique et des Etudes Economiques*).[6] Moreover, to lessen the potential impact of fluctuations in income per capita, the effect of industrialization in the long-run is captured by its differential impact on the average GDP per capita across departments over the 2001-2005 period.

Furthermore, the analysis examines the effect of industrialization on additional indicators of economic development, unemployment and inequality. The data on unemployment are available across departments over the 2003-2005 period and those on inequality over the 2001-2005 period.

2.1.2 Workforce

The effect of industrialization on the sectoral composition of the workforce in the post-1860 period is captured by the impact on the shares of employment in the agricultural, industrial and service sectors. The surveys which capture the short-run and mid-run effects of industrialization are those undertaken in 1861, 1901 and 1930 (Statistique Générale de la France). Similarly, to assess the effects of industrialization on the sectoral composition in the post-WWII period, all available surveys of the French population across departments (i.e., 1968, 1975, 1982, 1990, 1999 and 2010) are used (INSEE - *Institut National de la Statistique et des Etudes Economiques*).

and Savoie) that were not part of France are excluded from the analysis.

[6] Data on income per capita at the departmental level is only available in the post-1995 period and the corresponding data for the other indicators of the standards of living only in the post-2001 period. Note that the qualitative results remain unchanged if one considers the average income per capita over the entire sample period available, 1995-2010.

2.1.3 Human Capital

The study further explores the effect of industrialization on the evolution of human capital in the process of development. The effect of industrialization on human capital formation in the pre-WWI period is captured by its impact on the literacy rates of French army conscripts (i.e., 20-year-old men who reported for military service in the department where their father lived - *Annuaire Statistique De La France* (1878-1939)). In particular, given the data limitations, the analysis focuses on the share of the literate conscripts over the 1874-1883 and 1894-1903 decades. As reported in Table A.1, 82.0% of the French conscripts were literate over the 1874-1883 period and 94.1% over the 1894-1903 period.[7]

The effect of industrialization on human capital formation in the post-WWII period is captured by its impact on the share of men and women (age 25 and above) who completed high-school as reported in the available surveys of the French population across departments (i.e., 1968, 1975, 1982, 1990, 1999 and 2010). As can be seen in Table A.1, there was a continuous increase in the educational achievements of the French population during this period. Indeed the shares of men and women (age 25 and above) who completed high-school, respectively, rose from 8.8% and 6.0% in 1968 to 36.3% and 39.1% in 2010.

Furthermore, to examine the role of the composition of human capital in the non-monotonic evolution of income per capita, the study explores the impact of industrialization on the evolution of high-, medium- and low-levels of human capital in France after WWII . This composition is captured by the division of the workforce (age 25-54) between executives and other intellectual professions, middle management professionals, and employees, in the available surveys of the French population across departments (1968, 1975, 1982, 1990, 1999 and 2010).

Moreover, to capture the effect of industrialization on human capital formation in the contemporary period, in which school attendance is mandatory until the age of 16, the study explores its impact on the shares of men and women in the 15-17 and 18-24 age categories attending school or any other (post-secondary) learning institution as reported in the 2010 census. As indicated in Table A.1, in 2010, most men and women age 15-17 (respectively 95.5% and 96.7%) attended school but fewer (44.3% and 48.0%) pursued post-secondary studies.

2.2 Steam Engines

The research explores the effect of the introduction of industrial technology on the process of development. In light of the pivotal role played by the steam engine in the process of industrialization, it exploits variations in the industrial use of the steam engine across the French regions during

[7] In line with the historical evidence (e.g., Grew and Harrigan, 1991; Diebolt et al., 2005; Diebolt and Fontvieille, 2001), as reported in Table A.1, a sizeable share of the French population was literate even before the passing of the 1881-1882 laws which made primary school attendance "free"and mandatory for boys and girls until age 13.

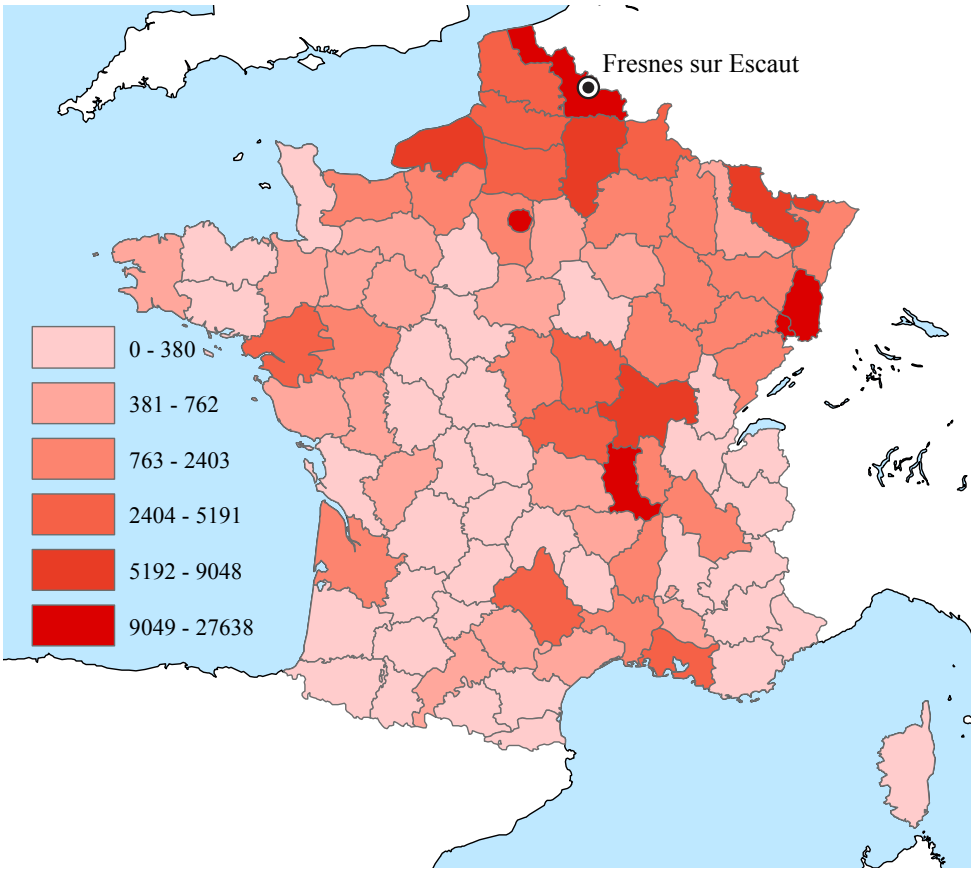


Figure 2: The distribution of the total horse power of steam engines across departments in France, 1860-1865.

its early stages of industrialization to capture the intensity of industrialization. In particular, the analysis focuses on the horse power of steam engines used in each French department as reported in the industrial survey carried out by the French government between 1860 and 1865.[8]

As depicted in Figure 2, and analyzed further in the discussion of the identification strategy in Section 3, the unequal distribution of the steam engines across French departments in 1860-1865 suggests a regional pattern of diffusion from Fresnes-sur-Escaut (in the Nord department, at the northern tip of continental France) where a steam engine was first successfully operated for commercial and industrial purposes in France from 1732 onwards. The most intensive use of the steam engine over this period was in the Northern part of France. The intensity diminished somewhat in the East and in the South East, and declined further in the South West. Three departments had no steam engine in 1860-1865 (i.e., Ariège and Lot in the South-West and Hautes-

[8]The 1860-1865 survey is the second industrial survey undertaken in France which was published by the French government: it provides the horse power of steam engines but not the number of steam engines. Conversely, the first industrial survey, which was carried out in 1839-1847, indicates the number of steam engines but not the horse power of the steam engines. Below, we establish the robustness of the results to using the 1839-1847 data, as well data from 1897. For details on the implementation of these surveys, see Chanut et al. (2000).

Alpes in the South-East). Potential anomalies associated with these departments are accounted for by the introduction of a dummy variable that represents them. In particular, potential concerns about the distance of these departments from the threshold level of development that permits the adoption of the steam engines is accounted for by this dummy variable.

Table A.3 reports descriptive statistics for the horse power of steam engines in each of the 16 sectors listed in the 1860-1865 survey: ceramics, chemistry, clothing, construction, food, furniture, leather, lighting, luxury goods, metal objects, metallurgy, mines, sciences & arts, textile, transportation and wood. It shows that the five sectors with the largest mean horse power per department are textile, metallurgy, mines, food industry and metal objects. In particular, the textile sector had the largest average horse power of all the sectors and 43% more horse power than metallurgy, the sector with the second largest mean horse power. Moreover, using the descriptive statistics on the number of workers in each of the 16 sectors reported in Table A.3 that the textile sector has a smaller ratio of steam engine horse power per worker than the metallurgy, mining and food sectors, most likely because not all the activities of the textile sector required steam engines.

2.3 Confounding Characteristics of each Department

The empirical analysis accounts for a wide range of exogenous confounding geographical and institutional characteristics, as well as for pre-industrial development, which may have contributed to the relationship between industrialization and economic development. Institutions may have affected jointly the process of development and the process of industrialization. Geographical characteristics may have impacted the pace of industrialization as well as agricultural productivity and thus income per capita. Moreover, geographical and institutional factors may have affected the process of development indirectly by governing the pace of the diffusion of steam engines across departments. Finally, pre-industrial development may have affected the onset of industrialization and may have had an independent persistent effect on the process of development.

2.3.1 Geographic Characteristics

The empirical analysis accounts for the potentially confounding impact of exogenous geographical characteristics of each of the French departments on the relationship between industrialization and economic development. In particular, it captures the potential effect of these geographical factors on the profitability of the adoption of the steam engine, the pace of its regional diffusion, as well as on productivity and thus the evolution of income per capita in the process of development.

First, the study accounts for climatic and soil characteristics of each department mapped in Figure 3 (i.e., land suitability, average temperature, average rainfall, and latitude (Ramankutty et al., 2002; Luterbacher et al., 2004, 2006; Pauling et al., 2006)), that could have affected natural land productivity and therefore the feasibility and profitability of the transition to the indus-

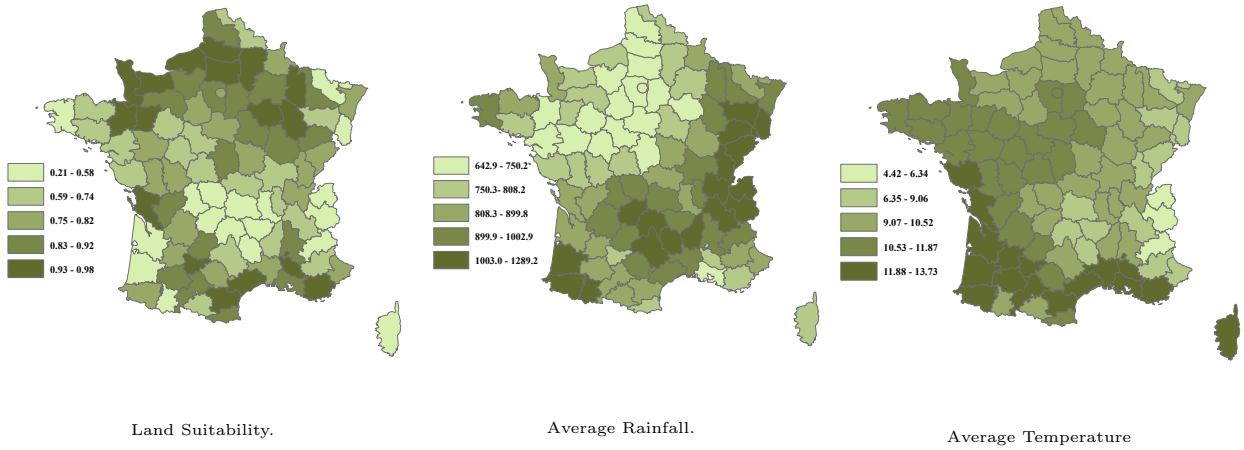


Figure 3: Geographic characteristics of French departments

trial stage of development, as well as the evolution of aggregate productivity in each department. Moreover, the diffusion of the steam engine across French departments as well as the process of development could have been affected by the presence of raw material required for industrialization. Our regressions thus account for the share of carboniferous area in each department (Fernihough and O'Rourke, 2014).

Second, the analysis captures the confounding effect of the location of each department on the diffusion of development from nearby regions or countries, as well as its effect on the regional diffusion of the steam engine. In particular, it accounts for the effect of the latitude of each department, border departments (i.e., positioned along the border with Belgium, Luxembourg, Germany, Switzerland, Italy and Spain), and maritime departments (i.e., positioned along the sea shore of France) on the pace of this diffusion process. It also accounts for the presence of rivers and their main tributaries within the perimeter of the department by using data on the paths of the Rhine, Loire, Meuse, Rhône, Seine and Garonne rivers as well as of their major tributaries (Dordogne, Charente and Escaut).

Finally, the research accounts for the potential differential effects of international trade on process of development as well as on the adoption the steam engine. In particular, it captures the potential effect of maritime departments (i.e., those departments that are positioned along the sea shore of France), via trade, on the diffusion of the steam engine and thus on economic development as well as the effect of trade on the evolution of income per capita over this time period.

2.3.2 Institutional Characteristics

The analysis deals with the effect of variations in the adoption of the steam engine across French departments on their comparative development. This empirical strategy ensures that institutional factors that were unique to France as a whole over this time period are not the source of the

differential pattern of development across these regions. Nevertheless, two regions of France over this time period had a unique exposure to institutional characteristics that may have contributed to the observed relationship between industrialization and economic development.

First, the emergence of state centralization in France, centuries prior to the process of industrialization, and the concentration of political power in Paris, may have affected differentially the political culture and economic prosperity in *Paris and its suburbs* (i.e., Seine, Seine-et-Marne and Seine-et-Oise). Hence, the empirical analysis includes a dummy variable for these three departments, accounting for their potential confounding effects on the observed relationship between industrialization and economic development, in general, and the adoption of the steam engine, in particular. Moreover, the analysis captures the potential decline in the grip of the central government in regions at a greater distance from Paris, and the diminished potential diffusion of development into these regions, accounting for the effect of the aerial distance between the administrative center of each department and Paris.

Second, the relationship between industrialization and development in the *Alsace-Lorraine* region (i.e., the Bas-Rhin, Haut-Rhin and the Moselle departments) that was under German domination in the 1871-1918 period may represent the persistence of institutional and economic characteristics that reflected their unique experience.[9] Hence, the empirical analysis includes a dummy variable for these regions, accounting for the confounding effects of the characteristics of the region.

2.3.3 Pre-Industrial Development

The differential level of development across France in the pre-industrial era may have affected jointly the process of development and the process of industrialization. In particular, it may have affected the adoption of the steam engine and it may have generated, independently, a persistent effect on the process of development. Hence, the empirical analysis accounts for the potentially confounding effects of the level of development in the pre-industrial period, more than 150 years prior to the 1860-1865 industrial survey. This early level of development is captured by the degree of urbanization (i.e., population of urban centers with more than 10,000 inhabitants) in each French department in 1700 (Lepetit, 1994) as well as by the number of universities in 1700 (Bosker et al., 2013).[10]

[9] Differences in the welfare laws and labor market regulations in Alsace-Lorraine and the rest of France persisted throughout most of the 20^{th} century. Moreover the laws on the separation of Church and State are different, and these differences were reaffirmed by a decision of the Supreme French Constitutional Court in 2013 (Decision 2012-297 QPC, 21 February 2013).

[10] The qualitative analysis remains intact if the potential effect of past population density is accounted for as we show in Section 4.2.2.

3 Empirical Methodology

3.1 Empirical Strategy

The observed relationship between industrialization and economic development is not necessarily indicative of the causal effect of industrialization on economic prosperity. It may reflect the impact of economic development on the process of industrialization as well as the influence of institutional, geographical, cultural and human capital characteristics on the joint evolution of process of development and the onset of industrialization. In light of the endogeneity of industrialization and economic development, this research exploits geographic and climatic sources of regional variation in the diffusion and adoption of steam engines across France to establish the effect of industrialization on the process of development.

The identification strategy consists of two distinct components that govern: (i) the regional diffusion and thus the supply of industrial technologies, and (ii) the differential decline in the profitability of agriculture across regions and thus variations in the pace of industrialization as well as in the demand for industrials technologies.

3.1.1 The Diffusion of the Steam Engines from Fresnes-sur-Escaut

The first component of the identification strategy is motivated by the historical account of the gradual regional diffusion of the steam engine in France during the 18^{th} and 19^{th} century (Ballot, 1923; Sée, 1925; Léon, 1976).[11] Considering the positive association between industrialization and the intensity in the use of the steam engine (Mokyr, 1990; Bresnahan and Trajtenberg, 1995; Rosenberg and Trajtenberg, 2004), the study takes advantage of the regional diffusion of the steam engine to identify the effect of local variations in the intensity of the use of the steam engine during the 1860-1865 period on the process of development. In particular, it exploits the distances between each French department and Fresnes-sur-Escaut (in the Nord department), where the first successful commercial and industrial application of the steam engine in France was made in 1732, as an instrument for the use of the steam engines in 1860-1865.[12]

Consistent with the diffusion hypothesis, the second steam engine in France that was utilized for commercial purposes was operated in 1737 in the mines of Anzin, also in the Nord department, less than 10 km away from Fresnes-sur-Escaut. Furthermore, in the subsequent decades till the French Revolution the commercial use of the steam engine expanded predominantly to the nearby northern and north-western regions. Nevertheless, at the onset of the French revolution in 1789,

[11] There was also a regional pattern in the diffusion of steam engines in England (Kanefsky and Robey, 1980; Nuvolari et al., 2011).

[12] This steam engine was used to pump water in an ordinary mine of Fresnes-sur-Escaut. It is unclear whether Pierre Mathieu, the owner of the mine, built the engine himself after a trip in England or employed an Englishman for this purpose (Ballot, 1923, p.385).

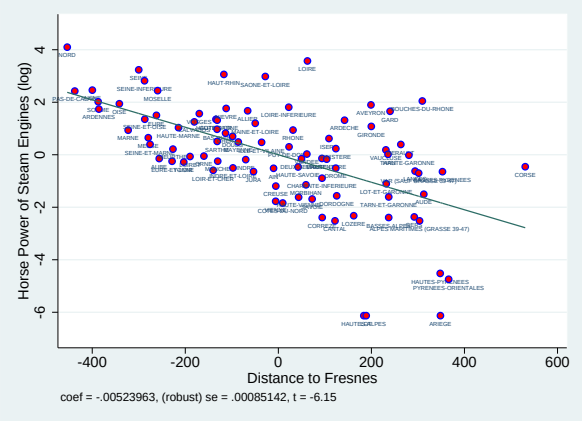
Table 1: The determinants of the diffusion of the steam engine

	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) OLS	(6) OLS
	Horse Power of Steam Engines					
Distance to Fresnes	-0.0052***	-0.0068***	-0.0092***	-0.0082***		-0.013***
	[0.00085]	[0.0020]	[0.0025]	[0.0024]		[0.0028]
Latitude		-4.756	-16.81	-13.69	24.59**	-6.259
		[9.549]	[12.26]	[11.87]	[11.24]	[11.52]
Land Suitability		-0.797	-0.0103	-0.0825	0.241	-0.453
		[0.685]	[0.676]	[0.709]	[0.794]	[0.670]
Average Rainfall (Fall 1845-1859)		-0.0015	-0.0001	-0.0005	-0.0019	-0.0014
		[0.0027]	[0.0027]	[0.0027]	[0.0029]	[0.0027]
Average Temperature		4.240***	2.441*	2.396*	2.161	3.239**
		[1.402]	[1.361]	[1.382]	[1.482]	[1.409]
Rivers and Tributaries			0.861**	0.765**	0.904**	0.677**
			[0.334]	[0.341]	[0.349]	[0.336]
Share of Carboniferous Area			1.776	1.933	1.515	1.341
			[1.318]	[1.347]	[1.392]	[1.262]
Paris and Suburbs			-0.199	-0.317	0.111	0.533
			[0.722]	[0.518]	[0.553]	[0.574]
Alsace-Lorraine			2.128***	1.862**	1.197	1.057
			[0.630]	[0.733]	[0.999]	[0.834]
Maritime Department			1.161***	0.939**	0.266	0.370
			[0.400]	[0.386]	[0.459]	[0.446]
Border Department			-0.303	-0.184	-0.113	-0.775
			[0.440]	[0.451]	[0.534]	[0.535]
Urban Population in 1700				0.163	0.226**	0.170
				[0.103]	[0.107]	[0.103]
Distance to Paris					0.0012	0.0089***
					[0.0027]	[0.0029]
Adjusted R2	0.326	0.387	0.456	0.465	0.419	0.495
Observations	89	89	89	89	89	89

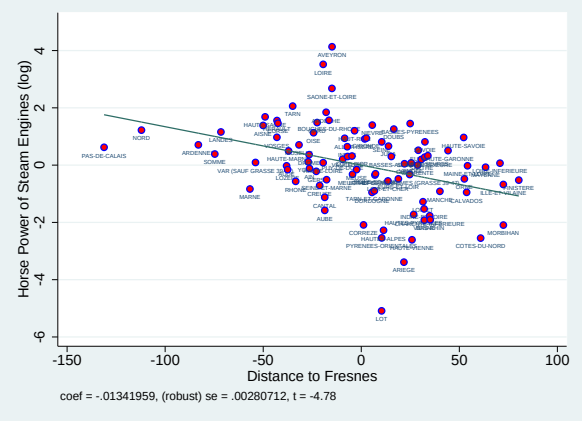
Note: All regressions include a dummy variable for the three departments which had no steam engine in 1860-1865. Aerial distances are measured in kilometers. Other explanatory variables except the dummies are in logarithm. The dependent variable is in logarithm. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** at the 5%-level, * at the 10%-level.

steam engines were less widespread in France than in England. A few additional steam engines were introduced until the fall of the Napoleonic Empire in 1815, notably in Saint-Quentin in 1803 and in Mulhouse in 1812, but it is only after 1815 that the diffusion of steam engines in France accelerated (Sée, 1925; Léon, 1976).

Indeed, in line with the historical account, the unequal distribution of steam engines across French departments, as reported in the 1860-1865 industrial survey, is indicative of a local diffusion process from Fresnes-sur-Escaut. As reported in Column 1 of Table 1 and shown in Panel A of Figure 4, there is a highly significant negative correlation between the aerial distance from Fresnes-sur-Escaut to the administrative center of each department and the intensity of the use of steam engines in the department. Nevertheless, as discussed in Section 2.3, pre-industrial development and a wide range of confounding geographical and institutional characteristics may have contributed to the adoption of the steam engine. Reassuringly, the unconditional negative relationship remains highly significant and is larger in absolute value when exogenous confounding geographical controls (i.e., land suitability, latitude, rainfall and temperature) (Column 2), as well as institutional factors (Column 3) and pre-industrial development (Column 4), are accounted for. In particular, the findings suggest that pre-industrial development, as captured by the degree of urbanization in



Panel A. Unconditional.



Panel B. Conditional on geography, institutions & distance from Paris.

Figure 4: The geographical diffusion of the steam engine − the negative relationship between the distance from Fresnes-sur-Escaut and the intensity in the use of the steam engine.

Note: These figures depict the partial regression line for the effect of the distance from Fresnes-sur-Escaut on the horse power in steam engines in each French department in 1860-1865. Panel A presents the unconditional relationship while Panel B reports the relationship which controls for geographic and institutional characteristics, as well as for pre-industrial development. Thus, the x- and y-axes in Panels A and B plot the residuals obtained from regressing steam engine intensity and the distance from Fresnes, respectively with and without the aforementioned set of covariates.

each department in 1700 and the characteristics that may have brought this early prosperity, had a persistent positive and significant association with the adoption of the steam engine.[13] Importantly, the diffusion pattern of steam engines is not significantly correlated with the distance between Paris and the administrative center of each department when the distance from Fresnes to each department's administrative center is excluded from the analysis (Column 5). Moreover, Column 6 of Table 1 and Panel B of Figure 4 indicate that, when the distance to Paris is accounted for, there is still a highly significant negative correlation between the distance from Fresnes-sur-Escaut to the administrative center of each department and the intensity of the use of steam engines in the department.

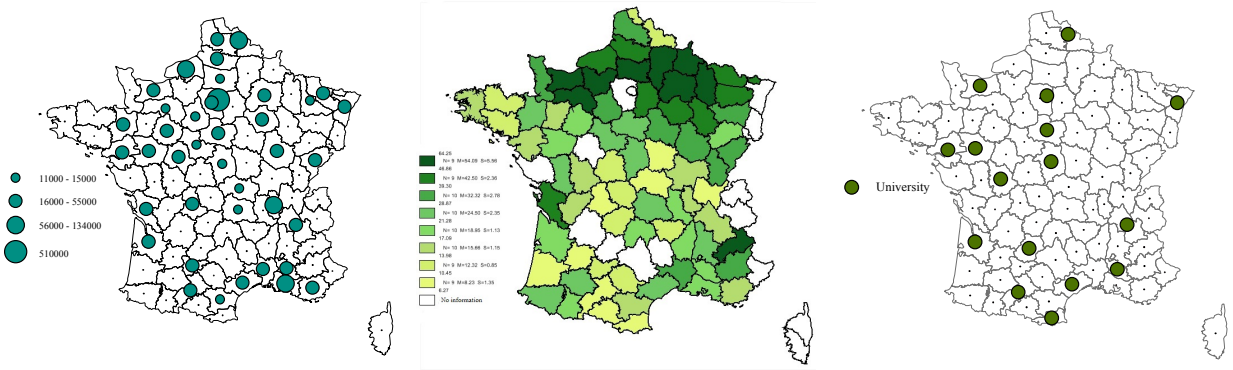
The validity of the aerial distance from Fresnes-sur-Escaut as an instrumental variable for the intensity of the adoption of steam engines across France is enhanced by third additional factors. First, Table 2 establishes that, conditional on the distance from Fresnes-sur-Escaut, distances between each department and major centers of economic power in 1860-1865 are uncorrelated with the intensive use of the steam engine over this period. In particular, conditional on the distance from Fresnes-sur-Escaut, distances between each department and Marseille and Lyon (the largest

[13] Conceivably, human capital in the pre-industrial area could have affected the adoption of the steam engine, as well as the subsequent process of development. Nevertheless, in light of the scarcity of data on reliable human capital for the pre-industrial period, the baseline analysis does not account for this confounding factor. Instead, Section 4.2.3 shows the robustness of the results to the inclusion of pre-industrial levels of human capital for a smaller set of departments.

Table 2: The determinants of the diffusion of the steam engine: the insignificance of distances from other major French cities

	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) OLS	(6) OLS
	Horse Power of Steam Engines					
Distance to Fresnes	-0.0052***	-0.0059***	-0.0053***	-0.0073***	-0.0047***	-0.0045***
	[0.0009]	[0.0011]	[0.0009]	[0.0013]	[0.0010]	[0.0010]
Distance to Marseille		-0.0010				
		[0.0012]				
Distance to Lyon			-0.0008			
			[0.0012]			
Distance to Rouen				0.0024		
				[0.0015]		
Distance to Mulhouse					-0.0012	
					[0.0009]	
Distance to Bordeaux						0.0019
						[0.0012]
Adjusted R^2	0.326	0.324	0.322	0.331	0.328	0.339
Observations	89	89	89	89	89	89

Note: Robust standard errors are reported in brackets. The dependent variable is in logarithm. Aerial distances are measured in kilometers. *** indicates significance at the 1%-level, ** at the 5%-level, * at the 10%-level.



A. Urban population in 1700.

B. Literacy rates in 1686-1690.

C. Universities in 1700.

Figure 5: Pre-industrial characteristics of French departments

Note: In Panel B, literacy in 1686-1690 is captured by the share of grooms who signed their marriage license during that period.

Table 3: Pre-industrial development and distance from Fresnes-sur-Escaut

	(1) Tobit Urban Population in 1700	(2) OLS Literacy in 1686-1690	(3) Probit University in 1700
Distance to Fresnes	-0.008	-0.025	-0.0001
	[0.005]	[0.022]	[0.003]
Latitude	-11.94	0.762	-0.264
	[23.70]	[83.33]	[11.81]
Land Suitability	0.807	13.78**	0.926
	[1.646]	[5.333]	[0.705]
Average Temperature	9.107**	-40.08**	2.077
	[3.484]	[17.31]	[1.923]
σ	2.687***		
	[0.269]		
Pseudo R^2	0.071		0.073
Adjusted R^2		0.414	
Left-censored observations	44		
Uncensored observations	45		
Observations	89	76	89

Note: The dependent variable is in logarithm. Aerial distance is measured in kilometers. Literacy in 1686-1690 is captured by the share of grooms who signed their marriage license in that period. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** at the 5%-level, * at the 10%-level.

cities in France after Paris), Rouen (a major harbor in the north-west where the steam engine was introduced in 1796), Mulhouse (a major city in the east where the steam engine was introduced in 1812), and Bordeaux (a major harbor in the south-west) are uncorrelated with the adoption of the steam engine, lending credence to the unique role of Fresnes-sur-Escaut and the introduction of the first steam engine in this location in the diffusion of the steam engine across France.[14]

Second, the distance from Fresnes-sur-Escaut is uncorrelated with economic development across France in the pre-industrial period. Unlike the highly significant negative relationship between the distance from Fresnes-sur-Escaut and the intensity of the use of the steam engine in 1860-1865, Table 3 and Figure 5 establish that the distance from Fresnes-sur-Escaut was uncorrelated with urban development and human capital formation in the pre-industrial era. In particular, Column 1 in Table 3 shows that urbanization rates in 1700 are uncorrelated with the distance from Fresnes-sur-Escaut. Column 2 establishes that literacy rates in the pre-industrial period, as captured by the share of grooms who could sign their marriage license in 1686-1690, are uncorrelated with the distance from Fresnes-sur-Escaut. Finally, Column 3 demonstrates that there is no significant relationship between the presence of a university in 1700 and the distance from Fresnes-sur-Escaut.[15]

Third, it appears that the Nord department had neither superior human capital characteristics nor higher standard of living in comparison to the average department in France. An imperfect

[14] As reported in Table B.1, the use of an alternative measure of distances based on the time needed for a surface travel between any pair of locations (Özak, 2010) does not affect the qualitative results.

[15] It should be noted that these pre-industrial measures of development are highly correlated with income per-capita in the post-industrialized period. For instance, the urban population in 1700 is positively correlated with all our measures of GDP per capita in 1860 (0.570), 1901 (0.293), 1930 (0.551) and 2001-2005 (0.517).

measure of literacy (i.e., grooms who could sign their wedding contract over the 1686-1690 period) prior to the introduction of the first steam engine in 1732, suggests that if anything, Nord's literacy rate was below the French average. Specifically, only 10.45% of men in Nord could sign their wedding contract over the 1686-1690 period while the average for the rest of France was 26.10% (with a standard deviation of 14.86%) (Furet and Ozouf, 1977). Furthermore, using height as an indicator for the standard of living suggests that the standard living in Flanders, the province of the French kingdom prior to 1789 which contained Fresnes-sur-Escaut, was nearly identical to that of the rest of France (Komlos, 2005).[16] As depicted in Figure G.10 in the Appendix, variations in the average height of French army soldiers from Flanders over the 1700-65 period were not different from those of the soldiers from other parts of France.

3.1.2 Temperature Shocks and the Transition from Agriculture to Industry

The second component of the identification strategy exploits contemporaneous regional variations in temperature deviations from their historical trend to capture exogenous sources of variation in the profitability of agriculture and therefore in the pace of industrialization as well as in the demand for steam engine technologies across regions. In particular, it exploits regional variations in the squared deviations of fall temperatures in the 1856-1859 period from the average fall temperature over the 1831-1855 period to capture the changes in the profitability of agriculture production in the eve of the industrial survey, in the 1860-1865 period, on the adoption of steam engines across department.[17]

Let $\tilde{T}_{i,1856-1859,(25)}$ be the squared deviation of fall temperatures in the 1856-1859 period in department i from its average fall temperatures over the preceding 25-year period, 1831-1855.

$$\tilde{T}_{i,1856-1859,(25)} \equiv [\mu_{i,1856-1859} - \mu_{i,1831-1855}]^2 \tag{1}$$

where $\mu_{i,1856-1859}$ is the average fall temperature over the 1856-1859 period and $\mu_{i,1831-1855}$ is the average fall temperature in the 1831-1855 baseline period.

Panel A of Figure 6 displays the average fall temperature in 1856-1859 across the French departments while Panel B of Figure 6 depicts the squared deviation in average fall temperature in the 1856-1859 period, using 1831-1855 as the baseline period, i.e., the $\tilde{T}_{i,1856-1859,(25)}$ variable.

Table 4 suggests that, accounting for geographic and institutional characteristics, the horse power of steam engines across French departments in 1860-1865 is negatively associated with the

[16] Concerns regarding selection bias suggest that the height of soldiers may not always be representative of the height of the general population (see, e.g., Weir, 1997; Baten, 2000) but there is no reason to think that this selection bias would be more or less intense in Flanders than in the rest of France.

[17] Winter wheat, which is the dominating crop in France, is planted in early September and is therefore particularly sensitive to climatic conditions in fall. As established in Table B.2, other seasons do not have a significant effect on the adoption of steam engines.

Table 4: The determinants of the diffusion and adoption of the steam engine

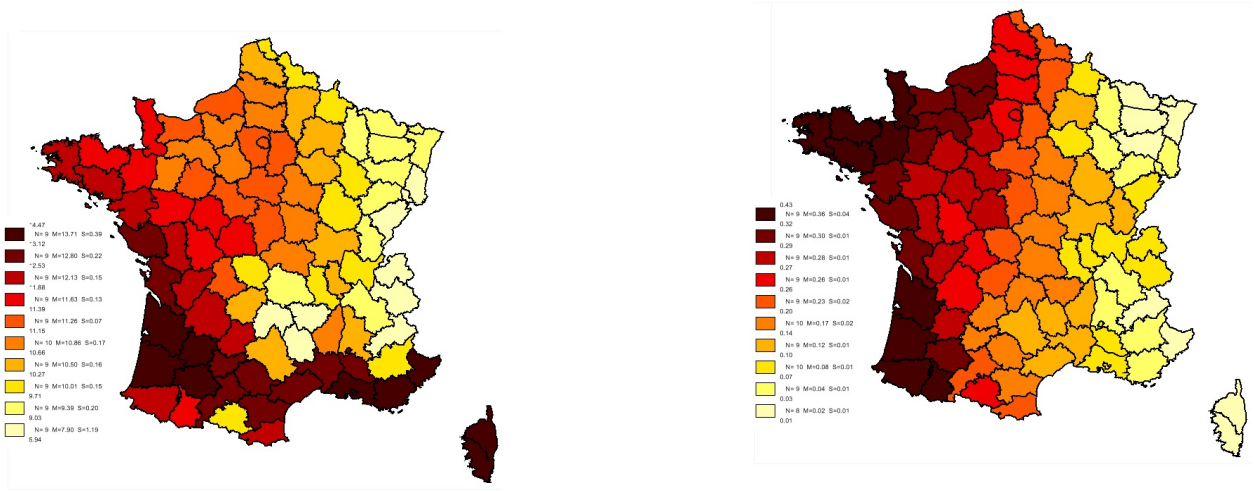
	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) OLS	(6) OLS
	Horse Power of Steam Engines					
Distance to Fresnes				-0.0073***	-0.0087***	-0.0069**
				[0.0026]	[0.0024]	[0.0028]
Squared Deviation Average Temperature in Fall 1856-1859	-6.782***			-4.484**		
(Baseline Fall 1831-1855)	[1.651]			[1.995]		
Squared Deviation Average Temperature in Fall 1856-1859		-6.418***			-3.828*	
(Baseline Fall 1841-1855)		[1.787]			[2.012]	
Squared Deviation Average Temperature in Fall 1856-1859			-13.73***			-8.883**
(Baseline Fall 1806-1855)			[3.300]			[4.332]
Paris and Suburbs	0.0617	-0.0179	0.186	0.390	0.406	0.463
	[0.615]	[0.612]	[0.620]	[0.627]	[0.630]	[0.626]
Latitude	19.95**	17.48*	26.32***	5.736	1.511	10.95
	[9.166]	[9.658]	[9.249]	[10.77]	[10.37]	[11.79]
Land Suitability	-0.906	-0.837	-0.894	-1.010*	-0.989*	-0.971*
	[0.545]	[0.550]	[0.549]	[0.557]	[0.562]	[0.566]
Average Rainfall (Fall 1845-1859)	0.0013	0.0007	0.0007	0.0006	0.0002	0.0002
	[0.0021]	[0.0021]	[0.0020]	[0.0021]	[0.0020]	[0.0020]
Average Temperature	3.506***	3.315***	3.344***	3.441***	3.315***	3.275***
	[0.929]	[0.959]	[0.919]	[0.945]	[0.964]	[0.946]
Rivers and Tributaries	0.604**	0.674**	0.585**	0.553**	0.585**	0.550**
	[0.268]	[0.274]	[0.267]	[0.264]	[0.266]	[0.265]
Share of Carboniferous Area	0.703	0.923	0.701	0.548	0.649	0.546
	[1.085]	[1.117]	[1.099]	[1.125]	[1.157]	[1.143]
Maritime Department	0.574	0.507	0.596	0.417	0.347	0.417
	[0.382]	[0.395]	[0.390]	[0.387]	[0.398]	[0.401]
Border Department	0.219	0.174	0.0446	-0.213	-0.323	-0.308
	[0.431]	[0.440]	[0.434]	[0.422]	[0.430]	[0.425]
Distance to Paris	-0.0021	-0.0024	-0.0006	0.0038	0.0047	0.0045
	[0.0024]	[0.0027]	[0.0023]	[0.0030]	[0.0032]	[0.0030]
Urban Population in 1700	0.163**	0.178**	0.171**	0.151*	0.157*	0.159*
	[0.0810]	[0.0814]	[0.0812]	[0.0804]	[0.0802]	[0.0806]
Adjusted R2	0.638	0.623	0.638	0.649	0.643	0.646
Observations	89	89	89	89	89	89

Note: The dependent variable is in logarithm. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** indicates significance at the 5%-level, * indicates significance at the 10%-level.

squared deviation in fall temperature in 1856-1859 period, where the historical trend is computed over the 1831-1855 period (Column (1)), the 1841-1855 period (Column (2)) and the 1806-1855 period (Column (3)). Moreover, this negative association remains significant once we account for the Distance from Fresnes (Columns (4)-(6)).

Tables B.2 and B.3 in the Appendix provide falsification tests in support of the causal impact of the squared deviation of fall temperature in 1856-1859 period from the 1831-1855 baseline period. Table B.2 shows that temperature deviations in the spring, summer and winter of 1856-1859 do not have a significant impact of the adoption of steam engines in 1860-1865 beyond the one captured by temperature deviations in the fall. It also shows that the squared deviation of rainfall in fall 1856-1859 has no impact. More importantly, Table B.3 shows that temperature deviations in other time intervals before the 1860-1865 industrial survey (i.e., 1844-1847, 1848-1851 and 1852-1855) or afterwards (i.e., 1866-1869 and 1870-1873) are not correlated with the horse power of steam engines in 1860-1865.

Since temperature deviations from their historical trend are likely to be associated with reduc-



A. Average Temperature in Fall 1856-1859

B. Squared Deviation from Average Fall Temperature in 1856-1859 (Baseline 1831-1855)

Figure 6: Average Temperature in Fall 1856-1859 and their Deviation from Historical Trend

tions in crop yields, and consequently higher crop prices, temperature deviations are likely to delay the transition to industry. Indeed, Table B.4 in the Appendix demonstrates that the effect of temperature deviations on steam engine adoption is operating through the profitability of agricultural production as captured by wheat prices. Columns (1) and (2) establish that average temperature deviations in the fall of 1856-1859 are associated with higher wheat prices in the fall of 1856-1859, relative to the 1831-1855 baseline level. Column (4) suggests that higher wheat prices are indeed associated with a lesser adoption of the steam engine and Column (5) demonstrates that the effect of temperature deviations on the adoption of steam engines is partly mediated through the rise in wheat prices.

3.1.3 Determinants of the Adoption of the Steam Engine

Accounting for the confounding effects of geographical, institutional and pre-industrial characteristics, Column (4) in Table 4 reports the significant negative relationship between the horse power of steam engines and the instrumental variables: (i) the distance from Fresnes and (ii) the squared deviation of fall temperatures in the 1856-1859 period from their historical trend over the 1831-1855 period. In particular, Column (4) of Table 4 shows that accounting for confounding geographical and institutional characteristics, pre-industrial development, distances from major economic centers as well as temperature deviations from their historical trend, a 100-km increase in the distance from Fresnes-sur-Escaut is associated with a 0.73 decrease in the log of horse power of steam engines in a department. unit increase in the squared deviation of temperatures in the period 1856-1859 from

the average temperature over the 1831-1855 period is associated with a 4.48-point decrease in the log of horse power of steam engines in a department. In particular, if the distance of a department away from Fresnes-sur-Escaut was to increase from the 40th (426 km) to the 60th percentile (559 km) of the distance distribution, this department would experience an aggregate drop of 275 in the horse power of steam engines (relative to a sample mean of 1839.35 hp).

Moreover, regional variations in temperature deviations from their historical trend is associated with regional variation in the profitability of agriculture (as reflected by wheat prices), and in the adoption of steam engines. In particular, conditional on the distance from Fresnes-sur-Escaut, a one-unit increase in the squared deviation of temperatures in the period 1856-1859 from the average temperature over the 1831-1855 period is associated with a 4.48-point decrease in the log of horse power of steam engines in a department. As such, in comparison to a department at the 40th percentile of the squared temperature deviation (i.e., 0.14), a department with a 60th percentile of the squared temperature deviation (i.e., 0.25), will be expected to experience a drop of 13.9 in the horse power of steam engines.

These estimated effects suggest that the diffusion of the steam engine as well the transition from agriculture to industry contributed to the adoption of steams engines. Nevertheless, the qualitative results remain unchanged if either one of the two instruments are used separately as shown by Tables B.5 and B.6 in the Appendix.

Finally, the highly significant negative effect of (i) the distance from Fresnes-sur-Escaut to the administrative center of each department and of (ii) the deviation of fall temperature in 1856-1859 from their baseline level on the horse power of steam engines in each department in 1860-1865 is robust to the inclusion of an additional set of confounding geographical, demographic and institutional characteristics, as well as to the forces of pre-industrial development, which as discussed in section 4.2, may have contributed to the relationship between industrialization and economic development. As established in Table B.7 in the Appendix, these confounding factors, which could be largely viewed as endogenous to the adoption of the steam engine and are thus not considered as part of the baseline analysis, do not affect the qualitative results.

3.2 Empirical Model

The effect of early industrialization on the entire subsequent process of development is estimated using 2SLS. The second stage provides a cross-section estimate of the relationship between the total horse power of steam engines in each department in 1860-1865 to measures of income per capita, human capital formation and other economic outcomes at different points in time;

$$Y_{it} = \alpha + \beta E_i + \boldsymbol{X_i'}\omega + \varepsilon_{it}, \tag{2}$$

where Y_{it} represents one measure of economic outcomes in department i in year t, E_i is the log of total horse power of steam engines in department i in 1860-1865, $\boldsymbol{X_i'}$ is a vector of geographical, institutional and pre-industrial economic characteristics of department i and ϵ_{it} is an i.i.d. error term for department i in year t.[18]

In the first stage, E_i, the log of total horse power of steam engines in department i in 1860-1865 is instrumented by D_i, the aerial distance (in kilometers) between the administrative center of department i and Fresnes-sur-Escaut, as well as by $\tilde{T}_{i,1856-1859,(25)}$, the squared deviation of fall temperatures in the 1856-1859 period in department i from the average fall temperatures over the preceding 25-year period, 1831-1855;

$$E_i = \delta_1 D_i + \delta_2 \tilde{T}_{i,1856-1859,(25)} + \boldsymbol{X_i'}\delta_3 + \mu_i, \tag{3}$$

where $\boldsymbol{X_i'}$ is the same vector of geographical, institutional and pre-industrial economic characteristics of department i used in the second stage, and μ_i is an error term for department i.

4 Industrialization and the Evolution of Income per Capita

4.1 Baseline Regressions

The study examines the effect of the intensity in the use of steam engines in the 1860-1865 period on the evolution of income per capita in the process of development. As established in Tables 5 and 6, and depicted in Figure 7, consistently with the proposed hypothesis, industrialization was conducive for economic development in the short-run and in the medium-run but had a detrimental effect on standards of living in the long-run.[19] In particular, the horse power of steam engines in industrial production in the 1860-1865 period had a positive and significant impact on income per capita in 1860, 1901 and 1930 but a negative and significant effect on income per capita during the 2001-2005 period.

The relationship between industrialization and income per capita in the short-run and in the medium-run is presented in Table 5 and in the first five Columns of Table 6. As shown in Columns (1) and (6) in Table 5 and in Column (1) in Table 6, unconditionally, the horse power of steam engines in industrial production in the 1860-1865 period had a highly significant positive association with income per capita in 1860, 1901 and 1930. Moreover, this relationship remains positive, although somewhat smaller and less significant, once one progressively accounts for the

[18] The early industrial survey of 1839-1847 is not comparable to the 1860-1865 survey since it does not account for the horse power of steam engine (Chanut et al., 2000).

[19] Given data limitation on income per capita across departments in the post-industrial survey period (as elaborated in section 2), the immediate effect of industrialization on income per capita is captured by its impact in 1860, its short-run effect by its impact in 1901, its medium-run effect by its impact in 1930, while its long-run effect is captured by its impact on the average level of income per capita across departments over the 2001-2005 period.

Table 5: Industrialization and income per capita, 1860 & 1901

	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) IV	(6) OLS	(7) OLS	(8) OLS	(9) OLS	(10) IV
	GDP per capita, 1860					GDP per capita, 1901				
Horse Power of Steam Engines	0.0806***	0.0489**	0.0465**	0.0335**	0.102***	0.0628***	0.0510**	0.0483*	0.0406	0.231***
	[0.0160]	[0.0191]	[0.0178]	[0.0157]	[0.0366]	[0.0161]	[0.0253]	[0.0246]	[0.0265]	[0.0796]
Latitude		1.614*	-2.559*	-2.100	-3.884***		-0.247	-4.302	-3.891	-8.752**
		[0.822]	[1.446]	[1.331]	[1.413]		[1.505]	[3.615]	[3.685]	[3.686]
Land Suitability		0.174*	0.130	0.0976	0.0968		0.382**	0.258*	0.240	0.224
		[0.0991]	[0.103]	[0.0774]	[0.0907]		[0.178]	[0.145]	[0.144]	[0.181]
Average Rainfall (Fall 1845-1859)		0.00005	0.0002	0.0001	0.0002		0.0001	0.0001	0.00001	0.0003
		[0.0003]	[0.0003]	[0.0003]	[0.0003]		[0.0004]	[0.0005]	[0.0005]	[0.0005]
Average Temperature		0.328**	0.236	0.253	0.174		-0.257	-0.197	-0.180	-0.359
		[0.164]	[0.178]	[0.154]	[0.165]		[0.326]	[0.373]	[0.380]	[0.401]
Rivers and Tributaries			0.0303	0.00642	-0.0533			0.0298	0.0186	-0.138
			[0.0441]	[0.0414]	[0.0507]			[0.0691]	[0.0722]	[0.114]
Share of Carboniferous Area			-0.119	-0.0844	-0.102			-0.350	-0.339	-0.333
			[0.242]	[0.212]	[0.212]			[0.259]	[0.245]	[0.327]
Maritime Department			0.0909	0.0352	0.0373			0.0403	0.00587	0.0151
			[0.0566]	[0.0567]	[0.0607]			[0.114]	[0.128]	[0.153]
Border Department			0.0434	0.0534	0.0624			0.0580	0.0636	0.113
			[0.0503]	[0.0512]	[0.0591]			[0.123]	[0.128]	[0.158]
Distance to Paris			-0.0012***	-0.0010***	-0.0012***			-0.0012	-0.0010	-0.0015*
			[0.0004]	[0.0004]	[0.0004]			[0.0009]	[0.0009]	[0.0009]
Paris and Suburbs			0.136	0.114	0.0944			-0.0634	-0.0717	-0.125
			[0.129]	[0.108]	[0.0968]			[0.149]	[0.163]	[0.187]
Urban Population in 1700				0.0463***	0.0323**				0.0249	-0.0181
				[0.0142]	[0.0154]				[0.0271]	[0.0342]
Adjusted R2	0.307	0.452	0.541	0.603		0.083	0.127	0.136	0.137	
Observations	87	87	87	87	87	85	85	85	85	85
	First stage: the instrumented variable is Horse Power of Steam Engines									
Distance to Fresnes					-0.0073***					-0.0073***
					[0.0026]					[0.0027]
Squared Temperature Deviations (1856-1859)					-4.350*					-3.986*
					[2.246]					[2.337]
F-stat (1st stage)					12.963					12.134
J-stat (p-value)					0.255					0.644

Note: All regressions include a dummy variable for the three departments which had no steam engine in 1860-1865. The *Alsace-Lorraine* variable is omitted from the regressions since the Alsace-Lorraine region was not part of France between 1871 and 1914. Aerial distances are measured in kilometers. Other explanatory variables, except the dummies, and the dependent variables are in logarithm. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** at the 5%-level, * at the 10%-level.

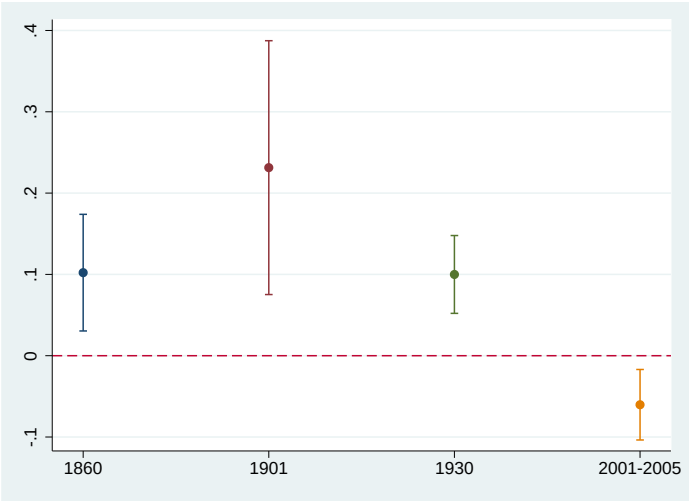


Figure 7: The effect of the horse power of steam engines in 1860-1865 on GDP per capita

Note: This figure displays the estimated coefficients of *Horse Power of Steam Engines* in the IV regressions in Columns 5 and 10 of Tables 5 and 6. Intervals reflect 95%-confidence levels.

Table 6: Industrialization and income per capita, 1930 & 2001-2005

	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) IV	(6) OLS	(7) OLS	(8) OLS	(9) OLS	(10) IV
	GDP per capita, 1930					GDP per capita, 2001-2005				
Horse Power of Steam Engines	0.0667***	0.0710***	0.0579***	0.0458***	0.0999***	0.0227*	0.0242*	0.0152	0.00225	-0.0603***
	[0.0154]	[0.0157]	[0.0122]	[0.0118]	[0.0244]	[0.0124]	[0.0131]	[0.0109]	[0.00801]	[0.0221]
Latitude		-1.335**	-2.310**	-1.737	-2.982**		-0.377	-0.440	0.203	1.705*
		[0.604]	[1.110]	[1.052]	[1.218]		[0.472]	[0.895]	[0.877]	[1.029]
Land Suitability		0.301***	0.262***	0.228***	0.223***		0.0185	-0.0211	-0.0549	-0.0551
		[0.0573]	[0.0713]	[0.0598]	[0.0659]		[0.0519]	[0.0689]	[0.0629]	[0.0770]
Average Rainfall (Fall 1845-1859)		-0.0002	-0.0001	-0.0003	-0.0002		-0.0002	-0.0002	-0.0004**	-0.0004**
		[0.0003]	[0.0002]	[0.0002]	[0.0002]		[0.0002]	[0.0002]	[0.0002]	[0.0002]
Average Temperature		-0.313***	-0.233**	-0.207**	-0.256**		-0.0765	-0.0900	-0.0581	0.0195
		[0.104]	[0.107]	[0.102]	[0.113]		[0.120]	[0.114]	[0.112]	[0.123]
Rivers and Tributaries			0.0950***	0.0734***	0.0278			0.0518*	0.0315	0.0817**
			[0.0290]	[0.0268]	[0.0293]			[0.0279]	[0.0258]	[0.0321]
Share of Carboniferous Area			-0.0213	0.0130	0.00112			-0.159	-0.111	-0.0807
			[0.175]	[0.142]	[0.141]			[0.137]	[0.104]	[0.130]
Maritime Department			0.0718	0.0141	0.0103			0.0403	-0.0205	-0.0169
			[0.0504]	[0.0541]	[0.0595]			[0.0405]	[0.0435]	[0.0506]
Border Department			0.126***	0.140***	0.151***			0.0137	0.0301	0.0253
			[0.0426]	[0.0404]	[0.0492]			[0.0492]	[0.0406]	[0.0419]
Distance to Paris			-0.0004	-0.0002	-0.0003			0.00004	0.0003	0.0004
			[0.0003]	[0.0003]	[0.0003]			[0.0003]	[0.0002]	[0.0002]
Paris and Suburbs			0.267*	0.248**	0.236***			0.342	0.325**	0.346**
			[0.159]	[0.105]	[0.0824]			[0.220]	[0.161]	[0.170]
Alsace-Lorraine			0.0842	0.0455	0.00222			0.0319	-0.0352	0.0230
			[0.0783]	[0.0700]	[0.0729]			[0.0735]	[0.0810]	[0.0939]
Urban Population in 1700				0.0443***	0.0336***				0.0468***	0.0594***
				[0.0113]	[0.0110]				[0.0112]	[0.0126]
Adjusted R2	0.338	0.442	0.567	0.665		0.045	0.022	0.177	0.391	
Observations	87	87	87	87	87	89	89	89	89	89
	First stage: the instrumented variable is Horse Power of Steam Engines									
Distance to Fresnes					-0.0075***					-0.0075***
					[0.0027]					[0.0026]
Squared Temperature Deviations (1856-1859)					-4.152*					-4.254**
					[2.313]					[2.092]
F-stat (1st stage)					12.708					13.644
J-stat (p-value)					0.842					0.101

Note: All regressions include a dummy variable for the three departments which had no steam engine in 1860-1865. Aerial distances are measured in kilometers. Other explanatory variables, except the dummies, and the dependent variables are in logarithm. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** at the 5%-level, * at the 10%-level.

confounding effects of exogenous geographical factors (Columns (2) and (7) in Table 5 and Column (2) in Table 6), institutional factors (Columns (3) and (8) in Table 5 and Column (3) in Table 6) and pre-industrial characteristics (Columns (4) and (9) in Table 5 and Column (4) in Table 6). Finally, mitigating the effect of omitted variables on the observed relationship, the IV estimation in Columns (5), (10) and (11) in Table 5 suggests that the horse power of steam engines in 1860-1865 had a positive and significant impact on income per capita in 1860 and 1901, accounting for the confounding effects of geographical, institutional, and demographic characteristics. We also note that the effect of industrialization in 1860-1865 on GDP per capita in 1930 is still positive and significant in Column (5) of Table 6 but that this effect is not significant anymore (although still positive) when we include GDP per capita in 1860 as an additional control variable in Column (6). A one-percent increase in the total horse power of steam engines in a department in 1860-1865 increased GDP per capita by 0.102 percent in 1860, 0.231 in 1901 and 0.099 percent in 1930. As such, if a department had increased its total horse power of steam engines in 1860-1865 from the 40th percentile (380 hp) to the 60th percentile (762 hp) of the distribution, it would have experienced an increase in GDP per capita of 10.25 percent in 1860, 23.22 percent in 1901 and

10.04 percent in 1930.

The relationship between industrialization and income per capita in the long-run is presented in the last six columns of Table 6. As shown in Column (7), unconditionally, the horse power of steam engines in industrial production in 1860-1865 has a significant positive association with the average level of income per capita across departments over the 2001-2005 period. Moreover, this relationship remains positive, although smaller and ultimately insignificant, once one progressively accounts for the confounding effects of exogenous geographical factors (Column (8) in Table 6), institutional factors (Column (9) in Table 6) and pre-industrial characteristics (Column (10) in Table 6). However, once the effect of omitted variables is accounted for, the IV estimation in Column (11) in Table 6, suggests that the horse power of steam engines in 1860-1865 had a negative and significant impact on the average level of income per capita across departments over the 2001-2005 period. A one-percent increase in the total horse power of steam engines in 1860-1865 decreased GDP per capita in 2001-2005 by 0.060 percent. In other words, if a department had experienced an increase in its horse power in 1860-1865 from the 40th percentile (380 hp) to the 60th percentile (762 hp) of the distribution, this increase would have led to a 6.06 percent decrease in GDP per capita in 2001-2005.

It is important to note that the IV estimation reverses the OLS estimates of the relationship between industrialization and the long-run level of income per capita from a positive to a negative one. This reversal suggests that factors which fostered industrial development, rather than industrialization per se, contributed to the positive association between industrialization and long-run development. In particular, once one accounts for the effect of these omitted factors, industrialization has an adverse effect on the standard of living in the long-run. In contrast, in earlier periods (i.e., 1860, 1901, and 1930) when industrialization contributed to economic development, the net effect of industrialization could have been obscured by these omitted characteristics (e.g., state capacity) that while being instrumental for industrialization, were associated with the protection of the agricultural sector, reducing income per capita and thus lowering its estimated association with industrialization. Consequently, once the net effect of industrialization is accounted for, the IV coefficient is significantly larger.

In particular, as discussed in Section 2.3, the regressions in Tables 5 and 6 account for a large number of confounding geographical and institutional factors. First, the climatic and soil characteristics of each department (i.e., land suitability, average temperature, average rainfall, and latitude) could have affected natural land productivity and therefore the feasibility and profitability of the transition to the industrial stage of development, as well as the evolution of aggregate productivity in each department. Indeed, as predicted, land suitability had a significantly negative association with income per capita in 1901 and 1930 in the IV regressions (Column (10) in Table 5 and Column (5) in Table 6), suggesting that more productive land had an adverse effect on the incentive to adopt the industrial technology. Moreover, the latitude of each department had a

positive and significant relationship with income per capita in 1901 and 1930 (Columns (7) to (10) in Table 5 and Columns (2) to (5) in Table 6), capturing characteristics of northern departments which were conducive to economic prosperity. Moreover, the lack of statistical significance of the geographical variables on GDP per capita in 2000-2005 (Column (10) in Table 6) is in line with the idea that geographic characteristics do not have much of a role in the modern growth regime which is characterized by human capital accumulation (Galor, 2011).

Second, the location of departments (i.e., latitude, border departments, maritime departments, departments at a greater distance from the concentration of political power in Paris, and those that were temporarily under German domination) could have affected the diffusion of the steam engine and the diffusion of development. However, most of these factors appear orthogonal to the evolution of income per capita, except for the dummy variable for Paris and its suburbs that is significantly associated with income per capita in 1930 and in the 2001-2005 period (Columns (3) to (5) and (8) to (10) in Table 6).

Third, the regressions account for the potentially confounding effects of the level of development in the pre-industrial period, as captured by the degree of urbanization in each department in 1700. The findings suggest that pre-industrial development (and the characteristics that may have brought this early prosperity) had a persistent positive and significant effect on later stages of development, as captured by the level of income per capita in 1930 and 2001-2005 (Columns (4), (5), (6), (10), (11) & (12) in Table 6), but no robust impact on the early phases of industrialization, as captured by income per capita in 1860 and 1901 (Columns (4), (5), (9), (10) & (11) in Table 5).

Finally, as established in Table B.8 in the Appendix, the association between intensity of the steam engines and income per capita in 1861, 1901, 1930 and 2001-2005 is not affected by spatial correlation.

4.2 Robustness Analysis

This section examines the robustness of the baseline analysis to the inclusion of an additional set of confounding geographical, demographic, political and institutional characteristics, as well as for the forces of pre-industrial development, which may have contributed to the relationship between industrialization and economic development. The analysis focuses on the potential impact of these confounding factors on the IV regressions in Tables 5 and 6, where the dependent variables are income per capita in 1860 and 2001-2005. As will become apparent, some of these confounding factors could be viewed as "bad controls", i.e., as endogenous to the adoption of the steam engine, and they are thus not part of the baseline analysis.

4.2.1 Population Density

The empirical analysis accounts for a wide range of exogenous confounding geographical and institutional characteristics, as well as for pre-industrial development, which may have contributed to the relationship between industrialization and economic development. Nevertheless, in light of the evidence that steam engines were more likely to be located in urban centers (Rosenberg and Trajtenberg, 2004), it appears plausible that the adoption of the steam engine was influenced by the contemporaneous but potentially endogenous level of population density at the time.

Reassuringly, as established in Table B.9 in the Appendix, the inclusion of population density in each French department in 1801, 1831 and 1861 has no qualitative impact on the estimated effects of industrialization or on the statistical significance of these effects. Accounting for the confounding effects of exogenous geographical, institutional, and pre-industrial characteristics, the horse power of steam engines in industrial production in the 1860-1865 period had a positive and significant impact on income per capita in 1860, and a negative and significant impact on income per capita in the years 2001-2010.

4.2.2 Distance from London

In light of the earlier use of the steam engine in England and the intensive trade relationship between France and England, the diffusion of the steam engine in France as well as the process of development could have been affected by geographic proximity to England (proxied by the aerial distance between London and the administrative center of each department). As reported in Table B.10 in the Appendix, accounting for the aerial distance from England has largely no qualitative impact on the results. In particular, accounting for the confounding effects of exogenous geographical, institutional, and pre-industrial characteristics, industrialization had a positive and significant effect on income per capita in 1860, but a negative and significant impact on income per capita in 2001-2005.

4.2.3 Human Capital

Considering evidence about capital-skill complementarity as well as the comparative advantage of educated individuals in adopting new technologies (Nelson and Phelps, 1966; Jovanovic and Rousseau, 2005), the diffusion of the steam engine could have been affected by the level of human capital in each department. Using data on the presence of a university in 1700 (Bosker et al., 2013), the percentage of French army conscripts who could at least read in 1827-1829 and 1831-1835 (which could be endogenous the process of industrialization) and on the percentage of grooms who could sign their marriage license in 1686-1690, 1786-1790 and 1816-1820 (Furet and Ozouf, 1977), it appears in Tables B.11, B.12 and B.13 that these measures of human capital have no qualitative

impact on the estimated effects of industrialization. In particular, accounting for the confounding effects of exogenous geographical, institutional, and pre-industrial characteristics, industrialization had a positive and significant impact on income per capita in 1860, but a negative and significant impact on income per capita in 2001-2005.

4.2.4 Share of Jews and Protestants in the Population

In light of the evidence about the importance of the Jewish and the Protestant population for entrepreneurial activities (e.g., Weber (1930), Becker and Woessmann (2009) and Andersen et al. (2017)), the adoption of the steam engine in France as well as the process of development could have been affected by the variations in the share of these religious minorities across departments. As shown in Table B.14 in the Appendix, accounting for the shares of Jews and Protestants in the French population in 1861 (i.e., when the industrial survey was conducted) has no qualitative impact on the effect of industrialization on income per capita in 1860 and 2001-2005.

4.2.5 Migrations

Internal as well as international migration in response to the differential impact of industrialization on income per capita across departments could have mitigated the effect of industrialization on income per capita that would have been observed in the absence of internal and external migration. However, we find in Columns (1) and (2) of Table B.15 no significant correlation between the horse power of steam engines in 1860-1865 and the share of natives in the population of each department in 1901 and 2010.[20] In fact, accounting for the share of the native population in each department in 1901 and 2001-2005 does not substantially affect the negative effect of industrialization on income per capita in the 2001-2005 period becomes highly significant. Moreover, since migration flows are likely to be towards more prosperous departments, a higher percentage of natives in the departmental population is indicative of a less attractive migration destination, and indeed in both time periods higher percentage of native population is associated with lower income per capita (Columns (2) and (4)), although the relationship is not significant in the modern period.

In addition, we consider in Tables B.16 and B.17 different proxies for migration as we focus on the population of each department and that of the department's *chef-lieu*, i.e., its administrative capital, in 1860, 1901, 1931 and 2010, especially as migration might not only be across, but also within departments. We find in Columns (1)-(4) of Tables B.16 and B.17 that there is no significant correlation between the horse power of steam engines in 1860-1865 and the population of the department and of the *chef-lieu*. Moreover, after accounting for these population variables, we still find that the horse power of steam engines in 1860-1865 has a significant and negative effect on income per capita in 1860, but a negative and significant impact on income per capita in 2001-2005.

[20] The 1860 and 1931 censuses do not provide information on the native population in each department.

4.2.6 The Early Use of Raw Material

As was shown in the baseline regressions in Tables 5 and 6, the statistical impact of industrialization remains intact when one accounts for the share of carboniferous area in each department (Fernihough and O'Rourke, 2014). Nonetheless,the diffusion of the steam engine across French departments as well as the process of development could have been affected by the early use of raw material required for industrialization. Our regressions reported in Tables B.18 and B.19 however show that this is not the case. First, as established in Table B.18, accounting for the number of iron forges in 1789 and 1811 in each department (Woronoff, 1997), the effect of industrialization on income per capita in the process of development remains nearly intact, economically and statistically. Second, as shown in Table B.19, accounting for the area covered by coal mines in 1837 in each department, the effect of industrialization on income per capita in the process of development remains qualitatively intact.

4.2.7 Economic Integration

The diffusion of the steam engine across French departments as well as the process of development could have been affected by the degree of geographical and economic integration of each department into the French economy. First, as reported in Table B.20, the degree of market integration of each department in the 1790s, as captured by the number of firms which were located in one department but sold their products outside that department (Daudin, 2010), has no qualitative impact on the effect of industrialization on income per capita in the process of development. Second, as reported in Table B.21, accounting for the presence of railroad connection in 1860 (Caron, 1997),[21] the effect of industrialization on income per capita in the process of development remains nearly intact, economically and statistically.

4.2.8 Industrial Concentration and Firm Size

The degree of industrial concentration in each department could have affected the diffusion of the steam engine across French departments as well as the process of development. Nevertheless, as reported in Table B.22, accounting for the degree of industrial concentration in the 1860-1865 period, proxied by the Herfindahl index of the horse power for the 16 different industries listed in the 1860-1865 industrial survey (textile, mines, metallurgy, metal objects, leather, wood, ceramics, chemistry, construction, lighting, furniture, clothing, food, transportation, sciences & arts, and luxury goods), the effect of industrialization on income per capita in the process of development

[21] The early network was built around seven lines in order to connect Paris to the main economic centers of the country (Caron, 1997).

remains nearly intact, economically and statistically.[22] Moreover, as shown in Table B.23, the economic and statistical impact of industrialization on income per capita remains nearly intact when one accounts for the Herfindahl index based on industry-specific employment shares. In addition, we account for the possibility that the size of the firms in 1860-1865, as proxied by the number of employees per firm in each department, would depress income per capita in the long-run because large firms are less likely to adopt new technologies and could become an impediment to entrepreneurship. The results in Table B.24 however show that accounting for the number of employees per firm does not modify the statistical and economic impact of industrialization on income per capita in the short- and in the long-run.

4.3 Industrialization, Employment and Inequality

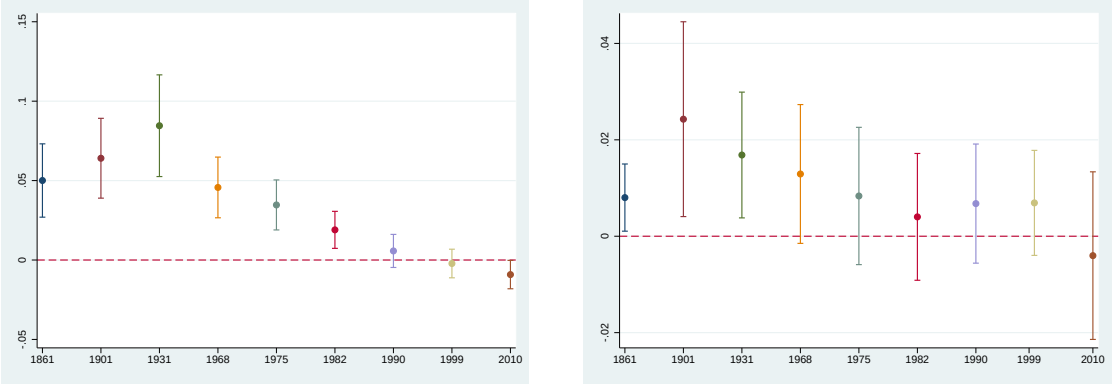
This section explores the effect of industrialization on the evolution of sectoral employment from 1861 to 2010 and on contemporary levels of inequality.

4.3.1 Industrialization and the Evolution of Sectoral Employment

The effect of the intensity in the use of the steam engine on the evolution of income per capita corresponds to its effect on the share of employment in the industrial sector. As established in the IV regressions in Columns (3), (6), and (9) of Table C.1 in the Appendix, and as depicted in panel A of Figure 8, an intensive use of the steam engine in 1860-1865 had a highly significant positive effect on the share of employment in the industrial sector in 1861, 1901, and 1930. Moreover, as shown in the IV regressions in Column (3), (6), and (9) of Table C.2 in the Appendix, this effect remains positive and highly significant in 1968, 1975, and 1982. However, as established in the IV regressions in Column (12), (15), and (18) of Table C.2 in the Appendix, this effect dissipates in 1990 and 1999 and it becomes significantly negative in 2010. Furthermore, as established in the corresponding IV regressions in Tables C.3 and C.4 in the Appendix, and as depicted in panel B of Figure 8, an intensive use of the steam engine in 1860-1865 had an insignificant effect on the share of employment in the service sector over the entire period.

As in the income regressions in Table 6, the IV estimate in Column (18) of Tables C.2 and C.4 in the Appendix reverses the OLS estimates of the association between industrialization and the share of employment in the industrial and service sectors in 2010, from a positive to a negative one, although the effect does not become significant. These weak reversals provide additional evidence that the factors which fostered industrial development, rather than industrialization per se, contributed to the positive association between the past intensive use of steam engines and

[22] The Herfindahl index of industry concentration is defined as, $H_d = \sum_{i=1}^{16} \left(E_{i,d}/E_d\right)^2$, where H_d is the Herfindahl concentration index for department d, $E_{i,d}$ is the horse power of the steam engines in the firms in sector i of department d and E_d is the horse power of the steam engines in the firms of department d.



Panel A. The industrial sector.

Panel B. The service sector.

Figure 8: The effect of the horse power of steam engines in 1860-1865 on sectoral employment.

Note: Panel A: the estimated coefficients of *Horse Power of Steam Engines* on the share of the workforce in the industrial sector in the IV regressions in Tables C.1 and C.2. Panel B: the estimated coefficients of *Horse Power of Steam Engines* on the share of the workforce in the service sector in the IV regressions Tables C.3 and C.4. Intervals reflect 95%-confidence levels.

current employment in the industrial and the service sectors.

4.3.2 The Effect of Industrialization on Contemporary Unemployment and Inequality

The study finds that industrialization has contributed to the level of unemployment and to the degree of inequality across departments in France in the long-run.[23] Accounting for the confounding effects of geographical, institutional and pre-industrial characteristics, the IV estimate in Column (3) of Table 7 suggests that the prevalence of steam power in 1860-1865 had a highly significant positive effect on the average rate of unemployment in the 2003-2005 period.

Moreover, as suggested by Column (6) of Table 7, the intensity in the use of steam engines in 1860-1865 had a positive and highly significant effect on the average Gini inequality index in the 2001-2005 period.

[23] As elaborated in section 2, data on these variables are only available for the past decade.

Table 7: Industrialization, unemployment and inequality

	(1) OLS	(2) OLS	(3) IV	(4) OLS	(5) OLS	(6) IV
	Unemployment rate 2003-2005 average			Gini coefficient 2001-2005 average		
Horse Power of Steam Engines	0.0205*	0.0187	0.0929***	0.00474	0.00677**	0.0406***
	[0.0114]	[0.0125]	[0.0327]	[0.0045]	[0.0030]	[0.0094]
Latitude		-1.675	-3.500**		-0.598**	-1.410***
		[1.221]	[1.476]		[0.267]	[0.452]
Land Suitability		0.152**	0.135		0.0641***	0.0642**
		[0.0639]	[0.0848]		[0.0160]	[0.0291]
Average Rainfall (Fall 1845-1859)		-0.00002	0.0001		-0.00004	0.000003
		[0.0002]	[0.0003]		[0.00005]	0.00009]
Average Temperature		0.0916	-0.0688		-0.0482	-0.0902*
		[0.167]	[0.217]		[0.0359]	[0.0495]
Rivers and Tributaries		0.0735*	0.00636		0.0125	-0.0146
		[0.0392]	[0.0481]		[0.0089]	[0.0140]
Share of Carboniferous Area		0.00472	-0.108		0.0261	0.00967
		[0.114]	[0.152]		[0.0337]	[0.0521]
Maritime Department		0.161***	0.141**		0.0333**	0.0314
		[0.0553]	[0.0642]		[0.0142]	[0.0207]
Border Department		0.181***	0.190**		0.0349**	0.0375*
		[0.0638]	[0.0738]		[0.0174]	[0.0198]
Distance to Paris		-0.0002	-0.0003		0.00002	-0.00005
		[0.0003]	[0.0003]		[0.00007]	[0.0001]
Paris and Suburbs		-0.0573	-0.0655		0.0826**	0.0713***
		[0.0580]	[0.0432]		[0.0378]	[0.0256]
Alsace-Lorraine		-0.0548	-0.144*		-0.0178	-0.0494
		[0.0931]	[0.0827]		[0.0256]	[0.0316]
Urban Population in 1700		0.0151	-0.0017		0.0095***	0.0027
		[0.0107]	[0.0134]		[0.0031]	[0.0043]
Adjusted R2	0.037	0.355		0.001	0.470	
Observations	89	89	89	89	89	89
	First stage: the instrumented variable is Horse Power of Steam Engines					
Distance to Fresnes			-0.0073***			-0.00750***
			[0.00273]			[0.00263]
Squared Temperature Deviations (1856-1859)			-5.576**			-4.254**
			[2.232]			[2.092]
F-stat (1st stage)			14.008			13.644
J-stat (p-value)			0.066			0.236

Note: All regressions include a dummy variable for the three departments which had no steam engine in 1860-1865. Aerial distances are measured in kilometers. Other explanatory variables, except the dummies, and the dependent variables are in logarithm. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** at the 5%-level, * at the 10%-level.

5 Mechanisms

This section explores potential mechanisms that could have led to the detrimental effect of industrialization on the standard of living in the long-run. First, the study examines the adverse effect of industrialization on the level and composition of human capital in each department and thus on the skill-intensity of its production process in the long-run. Second, it explores the contribution of industrialization to unionization and wage rates and thus the incentive of modern industries to locate in regions where labor markets are more competitive and reflect the marginal productivity of workers. Third, the analysis examines the effect of on trade protection on the decline in competitiveness of each department in the long-run.

5.1 Industrialization and the Long-Run Level Composition of Human Capital

This section explores whether the detrimental effect of industrialization on the standard of living in the long-run could be attributed to the effect of industrialization on the evolution of human capital

formation. In particular, the study explores the potential adverse effect of industrialization on the level and composition of human capital in each department and thus on the skill-intensity of its production process in the long-run.

The analysis demonstrates that, while intensive industrialization had a significantly positive effect on human capital formation in the short-run, it had a significantly negative effect in the level and the composition of human capital in long-run.[24] Hence, despite the fact that industrialization had no effect on the share of employment in the service sector in the long-run, it had a detrimental effect on skilled-intensive occupations. Thus, the adverse effect of industrialization on the level of income per capita in the long-run could be partly attributed to the adverse effect of industrialization on the level and the composition of human capital formation in the long-run. This impact would be in line with the idea that the characteristics which drove economic growth during the 19th century and 20th century are not the same: physical capital accumulation drove growth in the 19th century while human capital formation drove growth after WWI (Galor and Moav, 2004). As such, regions with relatively lower levels of human capital would experience a relative economic decline.

5.1.1 Industrialization and the Evolution of Human Capital

This subsection examines the effect of industrialization on the time path of human capital formation. As reported in Column (3) of Table 8, the horse power of steam engines in industrial production in 1860-1865 had a highly significant positive effect on the literacy of the French army conscripts in the years 1874-1883. However, due to the establishment of 1881-1882 education laws which made primarily schooling compulsory and free until the age of 13, the effect is quantitatively smaller in the years 1894-1903 but still statistically significant (Column (6)).

In contrast, as reported in Columns (3)-(4) and (7)-(8) of Table 9, the horse power of steam engines in industrial production in 1860-1865 had a highly significant negative effect on the shares of men age 15-17 and 18-24, respectively, who attended school in 2010. In particular, given that school is mandatory in France until age 16, these regressions indicate that a smaller fraction of men age 15-17 remain in high-school, and a smaller fraction of men age 18-24 are present in institutions of higher learning, in departments which utilized the steam engine more intensively. [25]

[24] The positive effect of industrialization on human capital formation is prevalent over the phase of industrialization in the late 19th century (Galor and Moav, 2006).

[25] Similar results are found for school enrollment rates of women age 15-17 and 18-24 in 2010, as reported in Table D.1 in the Appendix.

Table 8: Industrialization and the literacy of conscripts, 1874-1883 & 1894-1903

	(1) OLS	(2) OLS	(3) IV	(4) OLS	(5) OLS	(6) IV
	Share of Literate Individuals Among Conscripts, 1874-1883 average			Share of Literate Individuals Among Conscripts, 1894-1903 average		
Horse Power of Steam Engines	0.0120*	0.0135*	0.0582***	0.0069**	0.0096***	0.0224***
	[0.0063]	[0.0075]	[0.0187]	[0.0027]	[0.0034]	[0.0057]
Latitude		-0.411	-1.760**		-0.595**	-0.981***
		[0.789]	[0.881]		[0.266]	[0.269]
Land Suitability		0.103***	0.106***		0.0493***	0.0503***
		[0.0358]	[0.0401]		[0.0134]	[0.0171]
Average Rainfall (Fall 1845-1859)		0.00003	0.00010		-0.00004	-0.00002
		[0.00013]	[0.00016]		[0.00004]	[0.00005]
Average Temperature		-0.253***	-0.323***		-0.128***	-0.148***
		[0.0639]	[0.0771]		[0.0254]	[0.0289]
Rivers and Tributaries		-0.00118	-0.0404		-0.0116	-0.0229**
		[0.0209]	[0.0270]		[0.00814]	[0.0105]
Share of Carboniferous Area		-0.179*	-0.200*		-0.0678*	-0.0737**
		[0.102]	[0.106]		[0.0362]	[0.0348]
Maritime Department		-0.0506*	-0.0438		-0.0203	-0.0184
		[0.0287]	[0.0339]		[0.0128]	[0.0141]
Border Department		0.0328	0.0320		-0.00696	-0.00721
		[0.0253]	[0.0321]		[0.0109]	[0.0124]
Distance to Paris		0.00001	-0.0002		-0.00005	-0.0001
		[0.0002]	[0.0002]		[0.00007]	[0.00007]
Paris and Suburbs		0.0866***	0.0670		0.0167	0.0111
		[0.0325]	[0.0421]		[0.0134]	[0.0161]
Urban Population in 1700		0.00049	-0.0093		0.0023	-0.00057
		[0.0065]	[0.0079]		[0.0027]	[0.0026]
Adjusted R2	0.016	0.351		0.052	0.384	
Observations	87	87	87	87	87	87
	First stage: the instrumented variable is Horse Power of Steam Engines					
Distance to Fresnes			-0.0069**			-0.0069**
			[0.00262]			[0.00262]
Squared Temperature Deviations (1856-1859)			-4.569**			-4.569**
			[2.111]			[2.111]
F-stat (1st stage)			13.274			13.274
J-stat (p-value)			0.912			0.012

Note: All regressions include a dummy variable for the three departments which had no steam engine in 1860-1865. Aerial distances are measured in kilometers. Other explanatory variables, except the dummies, are in logarithm. *** indicates significance at the 1%-level, ** indicates significance at the 5%-level, * indicates significance at the 10%-level.

Table 9: Industrialization and male school enrollment in 2010

	(1) OLS	(2) OLS	(3) IV	(4) OLS	(5) OLS	(6) IV
	School Enrollment of Men Age 15-17 in 2010			School Enrollment of Men Age 18-24 in 2010		
Horse Power of Steam Engines	-0.0237	-0.0557	-0.929***	0.462	-0.634	-3.351***
	[0.0780]	[0.0689]	[0.260]	[0.410]	[0.501]	[1.139]
Latitude		24.66***	45.29***		42.76	108.0*
		[7.789]	[12.15]		[46.38]	[56.32]
Land Suitability		-0.933**	-1.043		-0.517	-0.526
		[0.410]	[0.667]		[2.468]	[2.859]
Average Rainfall (Fall 1845-1859)			-0.0027		-0.0046	-0.0080
			[0.0026]		[0.0126]	[0.0152]
Average Temperature		-0.169	1.238		0.240	3.611
		[0.978]	[1.285]		[5.776]	[6.460]
Rivers and Tributaries		0.0343	0.710*		2.130	4.308**
		[0.232]	[0.364]		[1.368]	[1.713]
Share of Carboniferous Area		-0.215	-0.0972		10.96***	12.28***
		[0.709]	[1.204]		[3.695]	[4.435]
Maritime Department		-0.725*	-0.739		0.608	0.761
		[0.375]	[0.545]		[2.030]	[2.331]
Border Department		-0.779	-0.878		2.031	1.823
		[0.475]	[0.538]		[2.244]	[2.271]
Distance to Paris		0.0062***	0.0084***		0.0149	0.0205
		[0.00189]	[0.00262]		[0.0115]	[0.0127]
Paris and Suburbs		1.155***	1.456***		9.482***	10.39***
		[0.334]	[0.549]		[1.808]	[1.871]
Alsace-Lorraine		-0.558	0.184		-2.577	-0.0477
		[0.611]	[1.031]		[3.372]	[4.183]
Urban Population in 1700		0.0262	0.209**		2.798***	3.345***
		[0.0699]	[0.103]		[0.389]	[0.452]
Adjusted R2	-0.020	0.117		0.008	0.412	
Observations	89	89	89	89	89	89
	First stage: the instrumented variable is Horse Power of Steam Engines					
Distance to Fresnes			-0.0075***			-0.0075***
			[0.0026]			[0.0026]
Squared Temperature Deviations (1856-1859)			-4.254**			-4.254**
			[2.092]			[2.092]
F-stat (1st stage)			13.644			13.644
J-stat (p-value)			0.123			0.874

Note: All regressions include a dummy variable for the three departments which had no steam engine in 1860-1865. Aerial distances are measured in kilometers. Other explanatory variables, except the dummies, are in logarithm. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** at the 5%-level, * at the 10%-level.

Table 10: Long-run effects of industrialization on human capital: male high-school and college graduates, 1968-2010

	(1) OLS	(2) OLS	(3) IV	(4) OLS	(5) OLS	(6) IV	(7) OLS	(8) OLS	(9) IV
	Share of Men Age 25 and above with a Secondary or Post-Secondary Degree, 1968			Share of Men Age 25 and above with a Secondary or Post-Secondary Degree, 1975			Share of Men Age 25 and above with a Secondary or Post-Secondary Degree, 1982		
Horse Power of Steam Engines	0.0032*	0.0015	-0.0022	0.0037	0.0013	-0.0038	0.0029	0.00003	-0.0071*
	[0.0018]	[0.0012]	[0.0026]	[0.0023]	[0.0015]	[0.0032]	[0.0024]	[0.0017]	[0.0041]
Latitude		-0.111	-0.0229		-0.102	0.0181		0.0483	0.219
		[0.122]	[0.132]		[0.167]	[0.178]		[0.214]	[0.229]
Land Suitability		0.0067	0.0067		0.0050	0.0050		0.0039	0.0039
		[0.0089]	[0.0091]		[0.0110]	[0.0112]		[0.0121]	[0.0128]
Average Rainfall (Fall 1845-1859)		-0.00005*	-0.00005**		-0.00007**	-0.00008**		-0.00008*	-0.00008*
		[0.00003]	[0.00003]		[0.00004]	[0.00004]		[0.00004]	[0.00004]
Average Temperature		-0.0237	-0.0192		-0.0254	-0.0192		-0.0312	-0.0223
		[0.0143]	[0.0138]		[0.0179]	[0.0180]		[0.0205]	[0.0210]
Rivers and Tributaries		0.00722**	0.0102***		0.00958**	0.0136***		0.0105**	0.0162***
Share of Carboniferous Area		-0.0162	-0.0144		-0.0271	-0.0247		-0.0280	-0.0245
		[0.0143]	[0.0142]		[0.0174]	[0.0176]		[0.0198]	[0.0205]
		[0.00312]	[0.00360]		[0.00427]	[0.00488]		[0.00493]	[0.00584]
Maritime Department		0.0027	0.0030		0.0060	0.0062		0.0036	0.0040
		[0.0059]	[0.0059]		[0.0075]	[0.0074]		[0.0083]	[0.0086]
Border Department		0.0115**	0.0112**		0.0146**	0.0142**		0.0111	0.0105
		[0.0052]	[0.0047]		[0.0064]	[0.0058]		[0.0078]	[0.0071]
Distance to Paris		0.000005	0.000006*		0.000007	0.000008*		0.0001**	0.0001**
		[0.00003]	[0.00003]		[0.00004]	[0.00004]		[0.00006]	[0.00005]
Paris and Suburbs		0.0694***	0.0706***		0.0963***	0.0980***		0.111***	0.114***
		[0.0137]	[0.0135]		[0.0138]	[0.0137]		[0.0119]	[0.0123]
Alsace-Lorraine		0.0246**	0.0280**		0.0230	0.0277*		0.0184	0.0250
		[0.0113]	[0.0109]		[0.0153]	[0.0149]		[0.0170]	[0.0172]
Urban Population in 1700		0.0064***	0.0072***		0.0084***	0.0094***		0.0092***	0.0107***
		[0.00124]	[0.00129]		[0.00154]	[0.00159]		[0.00167]	[0.00180]
Adjusted R2	0.030	0.642		0.018	0.653		-0.004	0.624	
Observations	89	89	89	89	89	89	89	89	89
			First stage: the instrumented variable is Horse Power of Steam Engines						
Distance to Fresnes			-0.0075***			-0.0075***			-0.0075***
			[0.0026]			[0.0026]			[0.0026]
Squared Temperature Deviations (1856-1859)			-4.254**			-4.254**			-4.254**
			[2.092]			[2.092]			[2.092]
F-stat (1st stage)			13.644			13.644			13.644
J-stat (p-value)			0.492			0.239			0.158

	(10) OLS	(11) OLS	(12) (13) IV	(14) OLS	(15) OLS	(16) IV	(17) OLS	(18) OLS	IV
	Share of Men Age 25 and above with a Secondary or Post-Secondary Degree, 1990			Share of Men Age 25 and above with a Secondary or Post-Secondary Degree, 1999			Share of Men Age 25 and above with a Secondary or Post-Secondary Degree, 2010		
Horse Power of Steam Engines	0.0024	-0.00006	-0.010*	0.0027	0.0001	-0.0121*	0.0014	-0.0011	-0.0189**
	[0.0029]	[0.0020]	[0.0053]	[0.0035]	[0.0023]	[0.0063]	[0.0038]	[0.0026]	[0.0081]
Average Rainfall, Fall 1845-1859		-0.00009*	-0.0001*		-0.0001*	-0.0001*		-0.00009	-0.0001
		[0.00005]	[0.00005]		[0.00006]	[0.00007]		[0.00007]	[0.00008]
Average Temperature		-0.0262	-0.0140		-0.0179	-0.00272		-0.0194	0.0027
		[0.0276]	[0.0287]		[0.0320]	[0.0343]		[0.0407]	[0.0440]
Latitude		0.104	0.342		0.199	0.493		0.300	0.728*
		[0.271]	[0.294]		[0.312]	[0.339]		[0.353]	[0.393]
Land Suitability		0.00171	0.00168		-0.00356	-0.00360		-0.0113	-0.0114
		[0.0159]	[0.0170]		[0.0168]	[0.0183]		[0.0199]	[0.0229]
Share of Carboniferous Area		-0.0278	-0.0230		-0.0249	-0.0190		-0.0137	-0.00498
		[0.0246]	[0.0265]		[0.0254]	[0.0284]		[0.0303]	[0.0355]
Rivers and Tributaries		0.0107*	0.0187**		0.0100	0.0198**		0.0125	0.0268**
		[0.00610]	[0.00746]		[0.00710]	[0.00870]		[0.00839]	[0.0110]
Maritime Department		0.0035	0.0041		0.00062	0.0013		0.0050	0.0060
		[0.0102]	[0.0108]		[0.0116]	[0.0125]		[0.0137]	[0.0156]
Border Department		0.0115	0.0107		0.0143	0.0133		0.0150	0.0136
		[0.0103]	[0.0097]		[0.0120]	[0.0116]		[0.0155]	[0.0156]
Distance to Paris		0.0002**	0.0002***		0.0002***	0.0003***		0.0003***	0.0003***
		[0.00007]	[0.00007]		[0.00008]	[0.00008]		[0.00009]	[0.00009]
Paris and Suburbs		0.142***	0.145***		0.167***	0.171***		0.184***	0.190***
		[0.0164]	[0.0175]		[0.0226]	[0.0244]		[0.0216]	[0.0252]
Alsace-Lorraine		0.0073	0.0165		-0.0034	0.0080		-0.0181	-0.00153
		[0.0210]	[0.0216]		[0.0223]	[0.0235]		[0.0224]	[0.0278]
Urban Population in 1700		0.0118***	0.0138***		0.0151***	0.0175***		0.0179***	0.0215***
		[0.0022]	[0.0025]		[0.0026]	[0.0030]		[0.0031]	[0.0037]
Adjusted R2	-0.014	0.617		-0.015	0.630		-0.020	0.607	
Observations	89	89	89	89	89	89	89	89	89
			First stage: the instrumented variable is Horse Power of Steam Engines						
Distance to Fresnes			-0.0075***			-0.0075***			-0.0075***
			[0.0026]			[0.0026]			[0.0026]
Squared Temperature Deviations (1856-1859)			-4.254**			-4.254**			-4.254**
			[2.092]			[2.092]			[2.092]
F-stat (1st stage)			13.644			13.644			13.644
J-stat (p-value)			0.169			0.197			0.321

Note: All regressions include a dummy variable for the three departments which had no steam engine in 1860-1865. Aerial distances are measured in kilometers. Other explanatory variables, except the dummies, and the dependent variables are in logarithm. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** at the 5%-level, * at the 10%-level.

Table 11: Industrialization and human capital formation: the role of public expenditure on education

	(1) OLS	(2) IV	(3) IV	(4) OLS	(5) IV	(6) IV
	Department Spending on Primary Schooling 1874-1882, per Inhabitant	Share of Literate Individuals Among Conscripts, 1874-1883 average		Department Spending on Secondary Schooling 2010, per Inhabitant	School Enrollment of Men Age 15-17 in 2010	
Horse Power of Steam Engines	0.0213	0.0582***	0.0582***	-0.0065	-0.929***	-0.852***
	[0.0281]	[0.0187]	[0.0193]	[0.0329]	[0.260]	[0.255]
Department Spending on Primary Schooling 1874-1882, per Inhabitant			0.0607*			
			[0.0351]			
Department Spending on Secondary Schooling 2010, per Inhabitant						-0.0066
						[0.327]
Latitude	0.395	-1.760**	-1.840**	1.639	45.29***	44.56***
	[2.102]	[0.881]	[0.832]	[2.914]	[12.15]	[12.01]
Land Suitability	0.523***	0.106***	0.0753*	-0.111	-1.043	-1.088*
	[0.132]	[0.0401]	[0.0440]	[0.164]	[0.667]	[0.622]
Rivers and Tributaries	0.104	-0.0404	-0.0482*	0.0232	0.710*	0.642*
	[0.0657]	[0.0270]	[0.0262]	[0.0981]	[0.364]	[0.353]
Share of Carboniferous Area	-0.583**	-0.200*	-0.166	-0.767**	-0.0972	0.178
	[0.273]	[0.106]	[0.109]	[0.356]	[1.204]	[1.228]
Paris and Suburbs	0.278	0.0670	0.0493	0.0903	1.456***	1.540***
	[0.216]	[0.0421]	[0.0379]	[0.237]	[0.549]	[0.514]
Average Rainfall (Fall 1845-1859)	0.0006	0.0001	0.00007	0.00009	-0.0027	-0.0026
	[0.0004]	[0.0002]	[0.0002]	[0.0008]	[0.0026]	[0.0025]
Average Temperature	-0.213	-0.323***	-0.314***	-0.185	1.238	1.433
	[0.273]	[0.0771]	[0.0801]	[0.379]	[1.285]	[1.242]
Maritime Department	0.0748	-0.0438	-0.0476	0.169	-0.739	-0.745
	[0.106]	[0.0339]	[0.0337]	[0.110]	[0.545]	[0.524]
Border Department	-0.249**	0.0320	0.0464	-0.140	-0.878	-0.746
	[0.120]	[0.0321]	[0.0357]	[0.169]	[0.538]	[0.553]
Distance to Paris	-0.0004	-0.0002	-0.0001	0.0003	0.0084***	0.0087***
	[0.0006]	[0.0002]	[0.0002]	[0.0008]	[0.0026]	[0.0025]
Alsace-Lorraine				-0.172	0.184	-0.0266
				[0.282]	[1.031]	[0.968]
Urban Population in 1700	0.0267	-0.0093	-0.0112	0.0071	0.209**	0.193*
	[0.0294]	[0.00790]	[0.00774]	[0.0313]	[0.103]	[0.101]
Adjusted R2	0.537			-0.013		
Observations	86	87	86	88	89	88
		First stage: the instrumented variable is Horse Power of Steam Engines				
Distance to Fresnes		-0.0069**	-0.0070**		-0.0075***	-0.0077***
		[0.0026]	[0.0028]		[0.0026]	[0.0028]
Squared Temperature Deviations (1856-1859)		-4.569**	-4.284*		-4.254**	-4.480*
		[2.111]	[2.159]		[2.092]	[2.435]
F-stat		13.274	12.341		13.644	12.407
J-stat (p-value)		0.912	0.998		0.123	0.050

Note: All regressions include a dummy variable for the three departments which had no steam engine in 1860-1865. Aerial distances are measured in kilometers. Other explanatory variables, except the dummies, and the dependent variables are in logarithm. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** at the 5%-level, * at the 10%-level.

Moreover, as reported in the IV regressions in Columns (3)-(4), (7)-(8), (11)-(12), (15)-(16), (19)-(20) and (23)-(24) in Table 10, the horse power of steam engines in industrial production in 1860-1865 had a progressively larger adverse effect on the share of men age 25 and above who had at least high-school degree in 1968, 1975, 1982, 1990, 1999 and 2010. These adverse effects are statistically significant in 1968, 1990, 1999 and 2010.[26]

As was the case in the income regressions in columns (7)-(12) in Table 6, the IV estimation in Table 10 reverses the OLS estimates of the relationship between industrialization and education attainment from a positive to a negative one. This reversal suggests that factors which fostered industrial development, rather than industrialization per se, contributed to the positive association between industrialization and education. In particular, once one accounts for the effect of these omitted factors, industrialization has an adverse effect on education in the long-run.

Basic literacy skills were a sufficient condition for obtaining a job as a worker in a factory in industrial areas for at least a hundred years but are not sufficient nowadays where work in the industrial sector pertains to engineering and therefore requires high levels of human capital. In other words, most individuals who now grow up in those regions experience an environment which devalues human capital accumulation. Indeed, consistent with this viewpoint, Table D.3 in

[26]Similar results are found for school enrollment rates of women as well, as reported in Table D.2 in the Appendix.

Table 12: Industrialization and income per capita: the role of public expenditure on education

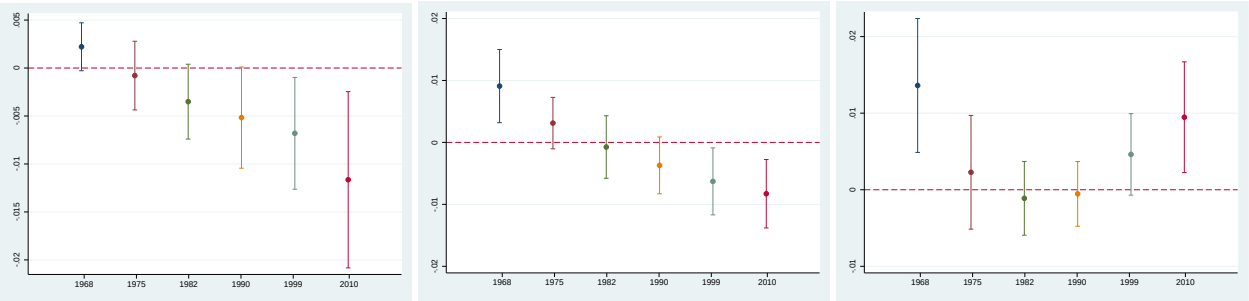
	(1) OLS	(2) IV	(3) IV	(4) IV	(5) IV	(6) IV	(7) IV
	Department Spending on Primary Schooling 1874-1882, per Inhabitant	GDP per capita 1860		Department Spending on Secondary Secondary Schooling 2010, per Inhabitant	GDP per capita 2001-2005		
Horse Power of Steam Engines By Dpt	0.0213	0.102***	0.100***	-0.006	-0.0603***	-0.0596***	-0.0659***
	[0.0281]	[0.0366]	[0.0385]	[0.0329]	[0.0221]	[0.0231]	[0.0240]
Department Spending on Primary Schooling 1874-1882, per Inhabitant			0.159**			0.0275	
			[0.0694]			[0.0470]	
Department Spending on Secondary Schooling 2010, per Inhabitant							0.0276
							[0.0309]
Rivers and Tributaries	0.104	-0.0533	-0.0694	0.0232	0.0817**	0.0701**	0.0859**
	[0.0657]	[0.0507]	[0.0480]	[0.0981]	[0.0321]	[0.0322]	[0.0339]
Share of Carboniferous Area	-0.583**	-0.102	-0.0220	-0.767**	-0.0807	-0.0961	-0.0676
	[0.273]	[0.212]	[0.211]	[0.356]	[0.130]	[0.132]	[0.144]
Paris and Suburbs	0.278	0.0944	0.0457	0.0903	0.346**	0.340**	0.342**
	[0.216]	[0.0968]	[0.0935]	[0.237]	[0.170]	[0.173]	[0.172]
Average Rainfall (Fall 1845-1859)	0.0006	0.0002	0.0001	0.0001	-0.0004**	-0.0005**	-0.0005**
	[0.0004]	[0.0003]	[0.0003]	[0.0008]	[0.0002]	[0.0002]	[0.0002]
Average Temperature	-0.213	0.174	0.203	-0.185	0.0195	0.0303	0.0219
	[0.273]	[0.165]	[0.174]	[0.379]	[0.123]	[0.124]	[0.130]
Latitude	0.395	-3.884***	-3.917**	1.639	1.705*	1.845*	1.761
	[2.102]	[1.413]	[1.548]	[2.914]	[1.029]	[1.052]	[1.078]
Land Suitability	0.523***	0.0968	0.0118	-0.111	-0.0551	-0.0767	-0.0506
	[0.132]	[0.0907]	[0.0991]	[0.164]	[0.0770]	[0.0821]	[0.0790]
Maritime Department	0.0748	0.0373	0.0214	0.169	-0.0169	-0.0304	-0.0212
	[0.106]	[0.0607]	[0.0661]	[0.110]	[0.0506]	[0.0506]	[0.0516]
Border Department	-0.249**	0.0624	0.100	-0.140	0.0253	0.0291	0.0244
	[0.120]	[0.0591]	[0.0649]	[0.169]	[0.0419]	[0.0419]	[0.0468]
Distance to Paris	-0.0004	-0.0012***	-0.0011***	0.0003	0.0004	0.0004*	0.0004
	[0.00058]	[0.00035]	[0.0004]	[0.0008]	[0.00025]	[0.00025]	[0.00025]
Alsace-Lorraine				-0.172	0.0230		0.0379
				[0.282]	[0.0939]		[0.0956]
Urban Population in 1700	0.0267	0.0323**	0.0278*	0.00705	0.0594***	0.0616***	0.0604***
	[0.0294]	[0.0154]	[0.0160]	[0.0313]	[0.0126]	[0.0133]	[0.0130]
Adjusted R2	0.537			-0.013			
Observations	86	87	85	88	89	86	88
		First stage: the instrumented variable is Horse Power of Steam Engines					
Distance to Fresnes		-0.0073***	-0.0071**		-0.0075***	-0.0070**	-0.0077***
		[0.0026]	[0.0028]		[0.0026]	[0.0028]	[0.0028]
Squared Temperature Deviations (1856-1859)		-4.350*	-4.025*		-4.254**	-4.284*	-4.480*
		[2.246]	[2.324]		[2.092]	[2.159]	[2.435]
F-stat		12.963	11.557		13.644	12.341	12.407
J-stat (p-value)		0.255	0.277		0.101	0.091	0.129

Note: Aerial distances are measured in kilometers. Other explanatory variables, except the dummies, and the dependent variables are in logarithm. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** at the 5%-level, * at the 10%-level.

the Appendix shows that early industrialization is associated with a higher share of individuals who express no interest in science in a survey carried out in 2001 (Centre de recherches politiques de Sciences Po, Enquête science 2001).[27] Furthermore, we note in Tables 11 and 12 that the departmental governments' spending on education per capita in the late 19th century and at the turn of the 21st century does not affect the positive and significant effect of industrialization on the literacy rate of French army conscripts and on GDP per capita in the late 19th century, or its negative and significant impact on school enrollment and on GDP per capita in 2001-2005.

[27] The reduced significance of the first-stage estimates in Column (3) of Table D.3 is a consequence of the small sample size.

5.1.2 Industrialization in the Long-Run and the Composition of Human Capital



A. Executives in workforce. B. Intermediary professionals in workforce. C. Employees in workforce.

Figure 9: The effect of the horse power of steam engines in 1860-1865 on the share of executives, intermediary professionals and employees in the workforce (age 25-54) after WWII

Note: This figure displays the estimated coefficients of *Horse Power of Steam Engines* in the IV regressions in Tables C.5 - C.7. Intervals reflect 90%-confidence levels.

This subsection explores the effect of industrialization on the long-run composition of human capital as reflected by the share of executives, middle management professions, and employees (i.e., individuals with high, medium, and low levels of human capital) in the labor force. It demonstrates that it had a detrimental effect on employment in skilled-intensive occupations, although industrialization had no effect on the share of employment in the service sector in the long-run (Panel B of Figure 5).

As depicted in Panels A–C of Figure 9 based on the IV regressions in Tables C.5–C.7 in the Appendix, the horse power of steam engines in industrial production in 1860-1865 had a negative effect on the share of executives and other intellectual professions among individuals age 25-54 which was significant at the 10-% level in 1999 and at the 5%-level in 2010. Its effect on the share of middle management professions among individuals age 25-54 was positive at the 10-% level in 1968 but negative and significant at the 10-% level in 1999 and 5-% level in 2010. In contrast, the effect on the share of employees is positive and significant at the 5-% level in 1968, positive and insignificant in 1975, negative and significant in 1982 and in 1990, positive and insignificant in 1999 and finally, positive but significant at the 5-% level in 2010.[28]

5.2 The Contribution of Industrialization to Unionization and Wages

The adverse effect of industrialization on income per capita in the long-run may reflect the adverse effect of industrialization on the competitiveness of the labor market in the long-run. In particular, the growth of the industrial sector may have led to the establishment of labor unions, which deterred new industries from locating in regions characterized by higher wages and possibly lower productivity.[29] Hence, unionization is potentially endogenous to the adoption of the steam engine

[28] The control group is made of farmers, artisans and other self-employed individuals.

[29] Unions were given a legal existence in France in 1884. It is worth noting that in France, unlike in the USA for instance, labor regulations are identical throughout the country. Nevertheless, unions could have negotiated higher salaries in specific firms.

Table 13: Industrialization and GDP per capita in 2001-2005: the union channel

	(1)	(2)	(3)
	OLS IV	IV	
	Share of Unionized Workers, 1930	GDP per capita, 2001-2005	
Horse Power of Steam Engines	0.00334	-0.0603***	-0.0582***
	[0.0440]	[0.0221]	[0.0213]
Share of Unionized Workers, 1930			0.0991**
			[0.0437]
Alsace-Lorraine	-0.00133	0.0230	0.0209
	[0.348]	[0.0939]	[0.0965]
Urban Population in 1700	0.0584**	0.0594***	0.0531***
	[0.0259]	[0.0126]	[0.0114]
Share of Carboniferous Area	-0.471	-0.0807	-0.0353
	[0.382]	[0.130]	[0.131]
Rivers and Tributaries	0.106	0.0817**	0.0692**
	[0.123]	[0.0321]	[0.0310]
Paris and Suburbs	-1.153***	0.346**	0.459***
	[0.289]	[0.170]	[0.170]
noengine	0.0366	-0.322***	-0.315***
	[0.269]	[0.113]	[0.105]
Average Rainfall (Fall 1845-1859)	-0.001*	-0.0004**	-0.0003*
	[0.0006]	[0.0002]	[0.0002]
Average Temperature	0.140	0.0195	0.00263
	[0.424]	[0.123]	[0.118]
Latitude	-6.872**	1.705*	2.327**
	[3.065]	[1.029]	[1.065]
Land Suitability	0.0718	-0.0551	-0.0622
	[0.188]	[0.0770]	[0.0782]
Maritime Department	-0.00778	-0.0169	-0.0163
	[0.172]	[0.0506]	[0.0503]
Border Department	-0.0518	0.0253	0.0306
	[0.168]	[0.0419]	[0.0451]
Distance to Paris	-0.0018**	0.0004	0.0006**
	[0.0008]	[0.0002]	[0.0002]
Adjusted R2	0.208		
Observations	89	89	89
First stage: the instrumented variable is Horse Power of Steam Engines			
Distance to Fresnes		-0.0075***	-0.0075***
		[0.0026]	[0.0026]
Squared Temperature Deviations (1856-1859)		-4.254**	-4.254**
		[2.092]	[2.102]
F-stat (1st stage)		13.644	13.673
J-stat (p-value)		0.101	0.126

Note: All regressions include a dummy variable for the three departments which had no steam engine in 1860-1865. Aerial distances are measured in kilometers. Other explanatory variables, except the dummies, and the dependent variables are in logarithm. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** at the 5%-level, * at the 10%-level.

and we treat it as a "bad controls"to account for its impact on income per capita.

Indeed, as reported in Column (1) of Table 13, the degree of industrialization in the year 1860-1865 is positively correlated (though insignificantly) with the share of unionized workers in the workforce in 1930. However, in Columns (2) and (3), the degree of unionization is in fact positively related to the level income per capita in the long-run.

Similarly, in Column (1) of Table 14, the relation between industrialization in 1860-1865 and the average male wage in each department in 1901 is positive and statistically significant. Nevertheless, the average adult wage in 1901 is positively related to income per capita in the long-run in Columns (2) and (3).

Table 14: Industrialization and GDP per capita in 2001-2005: the wage channel

	(1) OLS	(2) IV	(3) IV
	Average adult wage, 1901	GDP per capita, 2001-2005	
Horse Power of Steam Engines	0.00467	-0.0603***	-0.0712***
	[0.0134]	[0.0221]	[0.0249]
Average Adult Wage, 1901			0.268*
			[0.145]
Share of Carboniferous Area	-0.0771	-0.0807	-0.0849
	[0.127]	[0.130]	[0.128]
Rivers and Tributaries	0.0816**	0.0817**	0.0592*
	[0.0341]	[0.0321]	[0.0353]
Paris and Suburbs	0.303***	0.346**	0.274*
	[0.0942]	[0.170]	[0.150]
Average Rainfall (Fall 1845-1859)	-0.0002	-0.0004**	-0.0004*
	[0.0002]	[0.0002]	[0.0002]
Average Temperature	-0.156	0.0195	0.0787
	[0.148]	[0.123]	[0.140]
Latitude	-0.875	1.705*	2.338**
	[1.169]	[1.029]	[1.131]
Land Suitability	0.163**	-0.0551	-0.105
	[0.0794]	[0.0770]	[0.0763]
Maritime Department	0.0597	-0.0169	-0.0424
	[0.0594]	[0.0506]	[0.0537]
Border Department	0.114***	0.0253	-0.009
	[0.0359]	[0.0419]	[0.0450]
Distance to Paris	-0.0003	0.0004	0.0005**
	[0.0003]	[0.0002]	[0.0003]
Alsace-Lorraine		0.0230	
		[0.0939]	
Urban Population in 1700	0.0251**	0.0594***	0.0574***
	[0.0110]	[0.0126]	[0.0118]
Adjusted R2	0.523		
Observations	85	89	85
First stage: the instrumented variable is Horse Power of Steam Engines			
Distance to Fresnes		-0.00750***	-0.00778***
		[0.00263]	[0.00263]
Squared Temperature Deviations (1856-1859)		-4.254**	-4.257*
		[2.092]	[2.366]
F-stat		13.644	14.259
J-stat (p-value)		0.101	0.193

Note: All regressions include a dummy variable for the three departments which had no steam engine in 1860-1865. Aerial distances are measured in kilometers. Other explanatory variables, except the dummies, and the dependent variables are in logarithm. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** at the 5%-level, * at the 10%-level.

5.3 Trade Protection and Competitiveness in the Long-Run

This section explores whether the detrimental effect of industrialization on the standard of living in the long-run could be attributed to the adverse effect of trade protection on the competitiveness of each department in the long-run.

In light of the departmental variation in the composition of the 16 sectors that constituted the industrial sector in 1860-1865, the imposition of tariffs on import by the national government could have affected each department differentially. In particular, the degree of competitiveness in the most advanced industrial sectors could have diminished and may have thus led to their economic decline in the long-run. As such, tariffs could be viewed as endogenous to the adoption of the steam engine and to account for their effects, we treat them as potential "bad controls".

Nevertheless, in Table 15, we find that tariff rates in the years 1865, 1901 and 1919 (Dormois, 2006, 2009) had a negative but mostly insignificant association with income per capita in 2001-2005.[30] Thus, the adverse effect of industrialization on income per capita in the long-run cannot

[30] As reported in the rest of Table 15 and in Table E.1 in the Appendix, there is no significant relationship between

Table 15: Industrial and GDP per capita in 1930 & 2001-2005, accounting for sectoral tariff protection

	(1) IV	(2) IV	(3) IV	(4) IV	(5) IV	(6) IV	(7) IV	(8) IV
	GDP per capita, 1930				GDP per capita, 2001-2005 average			
Horse Power of Steam Engines By Dpt	0.0999***	0.0979***	0.0969***	0.0995***	-0.0603***	-0.0631***	-0.0691***	-0.0606***
	[0.0244]	[0.0240]	[0.0241]	[0.0246]	[0.0221]	[0.0234]	[0.0236]	[0.0221]
Weighted tariffs across sectors, 1865		0.0487				-0.0211		
		[0.0591]				[0.0771]		
Weighted tariffs across sectors, 1901			0.0214				-0.114*	
			[0.0535]				[0.0617]	
Weighted tariffs across sectors, 1919				-0.108				-0.0276
				[0.0981]				[0.0973]
Average Temperature	-0.256**	-0.193*	-0.195*	-0.160	0.0195	0.0473	0.0130	0.0624
	[0.113]	[0.115]	[0.117]	[0.138]	[0.123]	[0.139]	[0.135]	[0.146]
Latitude	-2.982**	-2.864**	-2.955**	-3.217***	1.705*	1.668	1.677	1.635
	[1.218]	[1.173]	[1.166]	[1.166]	[1.029]	[1.075]	[1.088]	[1.072]
Rivers and Tributaries	0.0278	0.0294	0.0277	0.0234	0.0817**	0.0828**	0.0833**	0.0817**
	[0.0293]	[0.0293]	[0.0294]	[0.0307]	[0.0321]	[0.0339]	[0.0337]	[0.0330]
Share of Carboniferous Area	0.00112	-0.0142	0.0139	0.0559	-0.0807	-0.0521	-0.0392	-0.0574
	[0.141]	[0.168]	[0.148]	[0.141]	[0.130]	[0.134]	[0.133]	[0.137]
Paris and Suburbs	0.236***	0.225**	0.235***	0.245***	0.346**	0.349**	0.350**	0.346**
	[0.0824]	[0.0893]	[0.0847]	[0.0788]	[0.170]	[0.172]	[0.160]	[0.170]
Average Rainfall (Fall 1845-1859)	-0.0002	-0.0003	-0.0003	-0.0003	-0.0004**	-0.0005*	-0.0005*	-0.0005*
	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[0.0003]	[0.0002]
Land Suitability	0.223***	0.206***	0.224***	0.231***	-0.0551	-0.0360	-0.0233	-0.0456
	[0.0659]	[0.0749]	[0.0664]	[0.0664]	[0.0770]	[0.0853]	[0.0786]	[0.0849]
Maritime Department	0.0103	0.000358	0.00159	0.00563	-0.0169	-0.0181	-0.00311	-0.0199
	[0.0595]	[0.0575]	[0.0564]	[0.0580]	[0.0506]	[0.0511]	[0.0498]	[0.0509]
Border Department	0.151***	0.154***	0.163***	0.182***	0.0253	0.0346	0.0402	0.0351
	[0.0492]	[0.0525]	[0.0497]	[0.0542]	[0.0419]	[0.0432]	[0.0434]	[0.0464]
Distance to Paris	-0.0003	-0.0002	-0.0002	-0.0003	0.0004	0.0004	0.0003	0.0004
	[0.0003]	[0.0003]	[0.0003]	[0.0003]	[0.0002]	[0.0003]	[0.0003]	[0.0003]
Alsace-Lorraine	0.00222	-0.00843	-0.00494	-0.0365	0.0230	0.0272	0.0213	0.0207
	[0.0729]	[0.0712]	[0.0708]	[0.0848]	[0.0939]	[0.0966]	[0.109]	[0.0925]
Urban Population in 1700	0.0336***	0.0331***	0.0341***	0.0332***	0.0594***	0.0602***	0.0643***	0.0589***
	[0.0110]	[0.0118]	[0.0117]	[0.0110]	[0.0126]	[0.0135]	[0.0136]	[0.0126]
Observations	87	84	84	84	89	86	86	86
	First stage: the instrumented variable is Horse Power of Steam Engines							
Distance to Fresnes	-0.00753***	-0.00736**	-0.00748**	-0.00737***	-0.00750***	-0.00736***	-0.00749***	-0.00734***
	[0.00270]	[0.00280]	[0.00283]	[0.00274]	[0.00263]	[0.00277]	[0.00279]	[0.00268]
Squared Temperature Deviations (1856-1859)	-4.152*	-4.367*	-4.289*	-4.326*	-4.254**	-4.455*	-4.348*	-4.441**
	[2.313]	[2.430]	[2.488]	[2.399]	[2.092]	[2.324]	[2.383]	[2.211]
F-stat (1st stage)	12.708	12.401	12.599	12.321	13.644	13.043	13.151	13.080
J-stat (p-value)	0.842	0.756	0.732	0.760	0.101	0.157	0.300	0.112

Note: All regressions include a dummy variable for the three departments which had no steam engine in 1860-1865. Aerial distances are measured in kilometers. Other explanatory variables, except the dummies, and the dependent variables are in logarithm. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** at the 5%-level, * at the 10%-level.

be attributed to the effect of industrialization on trade protection.

5.4 World War I and World War II

World War I and World War II, and the associated destruction of physical capital, may have affected disproportionately industrial centers, potentially leading to their decline in the long-run. Nevertheless, accounting for the destruction of physical and human capital does not affect the qualitative results.

While the physical destruction in industrial intensive departments was indeed larger, it had no impact on the adverse effect of industrialization and income per capita in 2001-2005. In particular, accounting for the number of buildings destroyed in each department in WWI and WWII, the destruction of physical capital in both wars has no qualitative impact on the effect of industrialization

tariff and income per capita in the years 1860, 1901, and 1930 and the tariff rate in the past has neither an economic impact nor a statistical one on the effect of industrialization on income per capita in 1860, 1901 and 1930.

Table 16: Industrialization and income per capita, accounting for the number of military casualties in the World Wars

	(1) OLS	(2) OLS	(3) IV	(4) IV	(5) IV	(6) IV	(7) IV
	WWI deaths	WWII deaths	GDP per capita, 1930		GDP per capita, 2001-2005		
Horse Power of Steam Engines	0.0893***	0.0959***	0.0999***	0.0930***	-0.0603***	-0.0321**	-0.0509***
	[0.0264]	[0.0315]	[0.0244]	[0.0209]	[0.0221]	[0.0157]	[0.0186]
WWI Deaths				-0.0787		0.192***	
				[0.0607]		[0.0465]	
WWII Deaths							0.0868
							[0.0551]
Latitude	7.420***	14.68***	-2.982**	-2.084*	1.705*	-0.741	0.00425
	[2.080]	[2.800]	[1.218]	[1.157]	[1.029]	[0.831]	[1.279]
Land Suitability	-0.288**	-0.347*	0.223***	0.201***	-0.0551	-0.00863	-0.0250
	[0.127]	[0.179]	[0.0659]	[0.0620]	[0.0770]	[0.0664]	[0.0740]
Average Rainfall (Fall 1845-1859)	0.0003	0.0004	-0.0002	-0.0002	-0.0004**	-0.0005***	-0.0005***
	[0.0005]	[0.0008]	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[0.0002]
Average Temperature	0.543*	1.188***	-0.256**	-0.193**	0.0195	-0.135	-0.106
	[0.304]	[0.414]	[0.113]	[0.0930]	[0.123]	[0.0991]	[0.117]
Rivers and Tributaries	0.0731	0.0085	0.0278	0.0456*	0.0817**	0.0231	0.0667**
	[0.0713]	[0.124]	[0.0293]	[0.0268]	[0.0321]	[0.0247]	[0.0302]
Share of Carboniferous Area	0.712***	1.150**	0.00112	0.0738	-0.0807	-0.263**	-0.189
	[0.265]	[0.513]	[0.141]	[0.151]	[0.130]	[0.104]	[0.122]
Maritime Department	0.261***	0.298**	0.0103	0.0337	-0.0169	-0.0763*	-0.0438
	[0.0926]	[0.121]	[0.0595]	[0.0626]	[0.0506]	[0.0414]	[0.0467]
Border Department	0.0127	0.356*	0.151***	0.154***	0.0253	0.0250	-0.00422
	[0.117]	[0.200]	[0.0492]	[0.0439]	[0.0419]	[0.0360]	[0.0356]
Distance to Paris	0.0007	0.0018**	-0.0003	-0.000179	0.0004	0.0002	0.0002
	[0.0006]	[0.0009]	[0.0003]	[0.0003]	[0.0002]	[0.0002]	[0.0003]
Paris and Suburbs	0.603*	0.946**	0.236***	0.289***	0.346**	0.215**	0.258*
	[0.355]	[0.407]	[0.0824]	[0.101]	[0.170]	[0.0877]	[0.135]
Alsace-Lorraine		-0.540***	0.00222		0.0230		0.0533
		[0.160]	[0.0729]		[0.0939]		[0.0844]
Urban Population in 1700	0.0407	0.104**	0.0336***	0.0391***	0.0594***	0.0447***	0.0468***
	[0.0255]	[0.0426]	[0.0110]	[0.0111]	[0.0126]	[0.0090]	[0.0107]
Adjusted R2	0.634	0.525					
Observations	86	89	87	85	89	86	89
	First stage: the instrumented variable is Horse Power of Steam Engines						
Distance to Fresnes			-0.0075***	-0.0059**	-0.0075***	-0.0057**	-0.0074***
			[0.0027]	[0.0026]	[0.0026]	[0.0026]	[0.0026]
Squared Temperature Deviations (1856-1859)			-4.152*	-6.091***	-4.254**	-6.439***	-4.794**
			[2.313]	[2.015]	[2.092]	[1.806]	[1.977]
F-stat (1st stage)			12.708	15.522	13.644	17.629	14.741
J-stat (p-value)			0.842	0.613	0.101	0.037	0.078

Note: All regressions include a dummy variable for the three departments which had no steam engine in 1860-1865. Aerial distances are measured in kilometers. Other explanatory variables, except the dummies, and the dependent variables are in logarithm. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** at the 5%-level, * at the 10%-level.

on income per capita in 1930 and 2001-2005 (Table F.1 in the Appendix) as well as on the share of employment in the industrial sector (Table F.2 in the Appendix). Interestingly, the number of buildings destroyed during WWII is even found to be positively and significantly correlated with GDP per capita in 2001-2005 in Table F.1 and with the share of the workforce in industry in 1990, 1999 and 2010 in Table F.2. This result suggests that the public spending which was geared towards the regions that suffered from more devastation during WWII, mitigated the negative effect of industrialization in the long-run. Similarly, the destruction of human capital (measured by the number of soldiers from each department who died in each war) has no qualitative impact on the effect of industrialization on income per capita in the long-run (Table 16) and on the share of employment in the industrial sector (Table F.3 in the Appendix).

6 Concluding Remarks

This research explores the long-run effect of industrialization on the process of development. In contrast to conventional wisdom that views industrial development as a catalyst for economic growth, highlighting its persistent effect on economic prosperity, the study establishes that while the adoption of industrial technology was initially conducive for economic development, it has had

a detrimental effect on standards of living in the long-run.

The study exploits exogenous source of regional variation in the adoption of steam engines during the French industrial revolution to establish that regions which industrialized more intensively experienced an increase in literacy rates more swiftly and generated higher income per capita in the subsequent decades. Nevertheless, industrialization had an adverse effect on income per capita, employment and equality by the turn of the 21^{st} century.

The research explores potential mechanisms that could have led to the detrimental effect of industrialization on the standard of living in the long-run. First, the study examines the adverse effect of industrialization on the level and composition human capital and thus on the skill-intensity of the production process in the long-run. Second, it explores the contribution of industrialization to unionization and wage rates and thus the incentive of modern industries to locate in regions where labor markets are more competitive. Third, the analysis examines the effect of on trade protection on the decline in competitiveness of each department in the long-run. Fourth, it examines the effect of intensive industrialization on destruction during WWI and WWII and its persistent effect on economic development. The findings suggest that the adverse effect of industrialization on income per capita in the long-run reflects neither greater unionization rates and higher wages nor trade protection, but rather underinvestment in human capital, beyond basic literacy skills, and lower employment in skilled-intensive occupations.

The study thus suggests that the characteristics that permitted the onset of industrialization, rather than the adoption of industrial technology *per se*, may have been the source of prosperity among the currently developed economies that experienced an early industrialization. Moreover this study, which highlights the existence of an intertemporal trade-off associated with industrialization, may have policy implications for developing countries. It suggests that these economies may benefit from the allocation of resources towards human capital formation rather than towards the promotion of industrial development.

References

Acemoglu, Daron, Simon Johnson and James A. Robinson (2001), 'The colonial origins of comparative development: An empirical investigation', *The American Economic Review* **91**(5), 1369–1401.

Alesina, Alberto, Paola Giuliano and Nathan Nunn (2013), 'On the origins of gender roles: women and the plough', *Quarterly Journal of Economics* **128**(2), 469–530.

Andersen, Thomas B., Carl-Johan Dalgaard and Pablo Selaya (2016), 'Climate and the emergence of global income difference', *Review of Economic Studies* **83**, 1334–1363.

Andersen, Thomas B., Jeanet Bentzen, Carl-Johan Dalgaard and Paul Sharp (2017), 'Pre-reformation roots of the Protestant ethic', *Economic Journal* **forthcoming**.

Annuaire Statistique De La France (1878-1939), Imprimerie Nationale, Paris.

Ashraf, Qamrul and Oded Galor (2013), 'The out of Africa hypothesis, human genetic diversity, and comparative economic development', *American Economic Review* **103**(1), 1–46.

Ballot, Charles (1923), *L'Introduction du Machinisme dans l'Industrie Française*, Slatkine Reprints (1978), Geneva.

Baten, Jörg (2000), 'Heights and real wages in the 18th and 19th centuries: an international overview', *Economic History Yearbook* **41**(41), 61–76.

Becker, Sascha O. and Ludger Woessmann (2009), 'Was Weber wrong? a human capital theory of Protestant economic history', *The Quarterly Journal of Economics* **124**(2), 531–596.

Bosker, Maarten, Eltjo Buringh and Jan Luiten van Zanden (2013), 'From Baghdad to London: unravelling urban development in Europe and the Arab world 800-1800', *Review of Economics and Statistics* **95**(4), 1418–1437.

Bresnahan, Timothy F. and Manuel Trajtenberg (1995), 'General purpose technologies: engines of growth?', *Journal of Econometrics* **65**(1), 83–108.

Caron, François (1997), *Histoire des chemins de fer en France: 1740-1883*, Fayard, Paris.

Caruana-Galizia, Paul (2013), 'Estimating French regional income: departmental per capita gross value added, 1872-1911', *Research in Economic History* **29**, 71–95.

Cervellati, Matteo and Uwe Sunde (2005), 'Human capital formation, life expectancy, and the process of development', *American Economic Review* **95**(5), 1653–1672.

Chanut, Jean-Marie, Jean Heffer, Jacques Mairesse and Gilles Postel-Vinay (2000), *L'Industrie française au milieu du 19e siècle. Les enquêtes de la Statistique Générale de la France*, EHESS, Paris.

Combes, Pierre-Philippe, Miren Lafourcade, Jacques-François Thisse and Jean-Claude Toutain (2011), 'The rise and fall of spatial inequalities in France: a long-run perspective', *Explorations in Economic History* **48**, 243–271.

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

Crouzet, François (2003), 'The historiography of French economic growth in the nineteenth century', *Economic History Review* **62**(2), 215–242.

Daudin, Guillaume (2010), 'Domestic trade and market size in late eighteenth-century France', *Journal of Economic History* **70**(3), 716–743.

Dickinson, Henry Winram (1939), *A short history of the steam engine*, Cambridge University Press, Cambridge, UK.

Diebolt, Claude and Louis Fontvieille (2001), 'Dynamic forces in educational development: a long-run com-

parative view of France and Germany in the 19th and 20th centuries', *Compare: A Journal of Comparative and International Education* **31**(3), 295–309.

Diebolt, Claude, Magali Jaoul and Gilles San Martino (2005), 'Le mythe de Ferry: une analyse cliométrique', *Revue d'économie politique* **115**(4), 471–497.

Dormois, Jean-Pierre (2006), The impact of late-nineteenth century tariffs on the productivity of european industries (1870-1930), *in* J.-P.Dormois and P.Lains, eds, 'Classical trade protectionism, 1815-1914', Routledge, London, UK, pp. 160–192.

Dormois, Jean-Pierre (2009), *La Défense du travail national: les effets du protectionnisme sur l'industrie en Europe*, Presses universitaires Paris Sorbonne, Paris.

Forest de Bélidor, Bernard (1737), *Architecture hydraulique, ou l'art de conduire, d'élever et de ménager les eaux pour les différens besoins de la vie*, Libraire de l'Artillerie et du Génie, Paris, France.

France, Direction de la Documentation Française (1995), *Restaurer, réformer, agir : la France en 1945*, Textes rassemblés par Patrice Liquière, La Documentation Française, Paris, France.

France. Ministère du travail et de la prévoyance sociale (1911), *Statistique générale. Salaires et coût de l'existence: à diverses époques, jusqu'en 1910*, Imprimerie Nationale, Paris.

Furet, François and Jacques Ozouf (1977), *Lire et écrire. L'alphabétisation des Français de Calvin à Jules Ferry*, Editions de Minuit, Paris, France.

Galor, Oded (2011), *Unified Growth Theory*, Princeton University Press, Princeton, NJ.

Galor, Oded and Omer Moav (2004), 'From physical to human capital accumulation: inequality and the process of development', *Review of Economic Studies* **71**(4), 1001–1026.

Galor, Oded and Omer Moav (2006), 'Das Human-Kapital: a theory of the demise of class structure', *Review of Economic Studies* **73**, 85–117.

Galor, Oded and Ömer Özak (2016), 'The agricultural origins of time preference', *American Economic Review* **106**(10), 30643103.

Grantham, George (1997), 'The French cliometric revolution: a survey of cliometric contributions to French economic history', *European Review of Economic History* **1**, 353–405.

Grew, Raymond and Patrick J. Harrigan (1991), *School, State, and Society: The Growth of Elementary Schooling in Nineteenth-Century France–A Quantitative Analysis*, University of Michigan Press, Ann Arbor, MI.

Jovanovic, Boyan and Peter L. Rousseau (2005), General purpose technologies, *in* P.Aghion and S.Durlauf, eds, 'Handbook of Economic Growth', Elsevier North-Holland, Amsterdam, pp. 1181–1224.

Kanefsky, John and John Robey (1980), 'Steam engines in 18th-century Britain: a quantitative assessment', *Technology and Culture* **21**(2), 161–186.

Komlos, John (2005), 'Height of French soldiers, 1716-1784', *ICPSR - Computer File* **04363-v1**.

Léon, Pierre (1976), L'affermissement du phénomène d'industrialisation, *in* F.Braudel and E.Labrousse, eds, 'Histoire économique et sociale de la France, vol. 3', PUF, Paris, pp. 475–616.

Lepetit, Bernard (1994), *The Pre-Industrial Urban System: France, 1740-1840*, Cambridge University Press, Cambridge, UK.

Lévy-Leboyer, Maurice and François Bourguignon (1990), *The French Economy in the Nineteenth Century*, Cambridge University Press, Cambridge, UK.

Lord, John (1923), *Capital and steam power, 1750-1800*, P.S. King, London, UK.

Luterbacher, Jürg, Daniel Dietrich, Elena Xoplaki, Martin Grosjean and Heinz Wanner (2004), 'European

seasonal and annual temperature variability, trends, and extremes since 1500', *Science* **303**(5663), 1499–1503.

Luterbacher, Jürg, Daniel Dietrich, Elena Xoplaki, Martin Grosjean and Heinz Wanner (2006), 'European seasonal temperature reconstructions', *IGBP PAGES/World Data Center for Paleoclimatology Data Contribution Series No. 2006-060, NOAA/NCDC Paleoclimatology Program* .

Michel, Edmond (1926), 'La situation financière et l'achèvement de la reconstitution des régions devastées au 31 décembre 1925', *Journal de la société statistique de Paris* **67**, 248–277.

Michel, Edmond (1932), *Les dommages de guerre de la France et leur réparation*, Berger-Levrault, Paris, France.

Mokyr, Joel (1990), *The Lever of Riches*, Oxford University Press, Oxford, U.K.

Mokyr, Joel (2016), *A culture of growth: the origins of the modern economy*, Princeton University Press, Princeton, New Jersey.

Nelson, Richard R. and Edmund S. Phelps (1966), 'Heights and human welfare: Recent developments and new directions', *American Economic Review* **56**(1-2), 69–75.

Nuvolari, Alessandro, Bart Verspagen and Nick von Tunzelmann (2011), 'Steam engines in 18th-century Britain: a quantitative assessment', *Cliometrica* **21**(5), 291–321.

Özak, Omer (2010), The voyage of homo-oeconomicus: some economic measures of distance. Brown University Mimeo.

Pauling, Andreas, Jürg Luterbacher, Carlo Casty and Heiz Wanner (2006), 'Five hundred years of gridded high-resolution precipitation reconstructions over Europe and the connection to large-scale circulation', *Climate Dynamics* **26**, 387–405.

Ramankutty, Navin, Jonathan A. Foley, John Norman and Kevin McSweeney (2002), 'The global distribution of cultivable lands: current patterns and sensitivity to possible climate change', *Global Ecology and Biogeography* **11**(5), 377 392.

Rosenberg, Nathan and Manuel Trajtenberg (2004), 'A general purpose technology at work: the Corliss steam engine in the late nineteenth-century United States', *Journal of Economic History* **64**(1), 1–39.

Sée, Henri (1925), *La vie économique de la France sous la Monarchie Censitaire (1815-1848)*, Librairie Félix Alcan, Paris.

Weber, Max (1930), *The Protestant Ethic and the Spirit of Capitalism*, Allen and Unwin, London, U.K.

Weir, David R. (1997), Health and welfare during industrialization, *in* R.Steckel and R.Floud, eds, 'Health and welfare during industrialization', University of Chicago Press, Chicago, Ill., pp. 161–200.

Woronoff, Denis (1997), Les forges, 1811, *in* G.Béaur and P.Minard, eds, 'Atlas de la révolution française: Economie, Vol. 10', Editions de l'école des hautes études en sciences sociales, Paris, pp. 99–100.

Online Appendix

Appendix A. Descriptive Statistics

Table A.1: Descriptive statistics

	Obs	Mean	Std. Dev.	Min	Max
Dependent Variables					
Income					
GDP per capita, 1860	87	498.18	144.20	273	1105
GDP per capita, 1901	85	862.91	270.96	255.30	1816.40
GDP per capita, 1930	87	6464.61	1500.21	4033.47	14109.92
GDP per capita, 2001-2011 average	89	23.39	4.71	17.87	56.00
Unemployment, Gini Coefficient and 25th Percentile of the Income Distribution, Post 2000					
Unemployment rate, 2003-2005 average	89	8.36	1.60	5.15	12.8
Gini coefficient, 2001-2005 average	89	0.36	0.02	0.33	0.43
Workforce, Pre-WWII					
Share of Workforce in Industry, 1861	89	0.28	0.11	0.10	0.63
Share of Workforce in Industry, 1901	87	0.27	0.10	0.10	0.57
Share of Workforce in Industry, 1930	89	0.33	0.13	0.12	0.66
Share of Workforce in Services, 1861	89	0.04	0.02	0.02	0.16
Share of Workforce in Services, 1901	87	0.24	0.08	0.12	0.53
Share of Workforce in Services, 1930	89	0.21	0.06	0.12	0.47
Workforce, Post-WWII					
Share of Workforce in Industry, 1968	89	0.37	0.09	0.18	0.55
Share of Workforce in Industry, 1975	89	0.36	0.08	0.18	0.55
Share of Workforce in Industry, 1982	89	0.34	0.07	0.20	0.49
Share of Workforce in Industry, 1990	89	0.31	0.06	0.15	0.44
Share of Workforce in Industry, 1999	89	0.26	0.06	0.14	0.36
Share of Workforce in Industry, 2010	89	0.23	0.03	0.14	0.33
Share of Workforce in Services, 1968	89	0.40	0.07	0.28	0.60
Share of Workforce in Services, 1975	89	0.46	0.07	0.33	0.65
Share of Workforce in Services, 1982	89	0.53	0.07	0.40	0.71
Share of Workforce in Services, 1990	89	0.60	0.07	0.47	0.76
Share of Workforce in Services, 1999	89	0.68	0.06	0.57	0.85
Share of Workforce in Services, 2010	89	0.53	0.09	0.37	0.86
Share of Executives in Workforce (age 25-54), 1968	89	0.041	0.013	0.02	0.114
Share of Executives in Workforce (age 25-54), 1975	89	0.066	0.02	0.034	0.143
Share of Executives in Workforce (age 25-54), 1982	89	0.073	0.022	0.043	0.17
Share of Executives in Workforce (age 25-54), 1990	89	0.093	0.028	0.059	0.229
Share of Executives in Workforce (age 25-54), 1999	89	0.095	0.029	0.062	0.249
Share of Executives in Workforce (age 25-54), 2010	89	0.114	0.04	0.07	0.319
Share of Intermediary Professionals in Workforce (age 25-54), 1968	89	0.153	0.032	0.083	0.299
Share of Intermediary Professionals in Workforce (age 25-54), 1975	89	0.218	0.034	0.147	0.315
Share of Intermediary Professionals in Workforce (age 25-54), 1982	89	0.237	0.026	0.18	0.312
Share of Intermediary Professionals in Workforce (age 25-54), 1990	89	0.263	0.022	0.224	0.321
Share of Intermediary Professionals in Workforce (age 25-54), 1999	89	0.297	0.021	0.257	0.36
Share of Intermediary Professionals in Workforce (age 25-54), 2010	89	0.283	0.022	0.244	0.369
Share of Employees in Workforce (age 25-54), 1968	89	0.041	0.013	0.02	0.114
Share of Employees in Workforce (age 25-54), 1975	89	0.066	0.02	0.034	0.143
Share of Employees in Workforce (age 25-54), 1982	89	0.073	0.022	0.043	0.17
Share of Employees in Workforce (age 25-54), 1990	89	0.093	0.028	0.059	0.229
Share of Employees in Workforce (age 25-54), 1999	89	0.095	0.029	0.062	0.249
Share of Employees in Workforce (age 25-54), 2010	89	0.114	0.04	0.07	0.319
Education Measures, Pre-WWI					
Average Share of Literate Individuals Among Conscripts, 1874-1883 Average	87	0.82	0.10	0.53	0.97
Average Share of Literate Individuals Among Conscripts, 1894-1903 Average	87	0.94	0.04	0.82	0.99
Education Measures, Post-WWII					
Share of Men Age 25 and Above with a Secondary or Post-Secondary Degree, 1968	89	0.09	0.02	0.06	0.19
Share of Men Age 25 and Above with a Secondary or Post-Secondary Degree, 1975	89	0.12	0.03	0.07	0.24
Share of Men Age 25 and Above with a Secondary or Post-Secondary Degree, 1982	89	0.16	0.03	0.10	0.28
Share of Men Age 25 and Above with a Secondary or Post-Secondary Degree, 1990	89	0.20	0.04	0.14	0.36
Share of Men Age 25 and Above with a Secondary or Post-Secondary Degree, 1999	89	0.25	0.05	0.18	0.46
Share of Men Age 25 and Above with a Secondary or Post-Secondary Degree, 2010	89	0.36	0.06	0.27	0.58
Share of Women Age 25 and Above with a Secondary or Post-Secondary Degree, 1968	89	0.05	0.02	0.03	0.13
Share of Women Age 25 and Above with a Secondary or Post-Secondary Degree, 1975	89	0.10	0.03	0.06	0.21
Share of Women Age 25 and Above with a Secondary or Post-Secondary Degree, 1982	89	0.14	0.03	0.09	0.25
Share of Women Age 25 and Above with a Secondary or Post-Secondary Degree, 1990	89	0.19	0.04	0.13	0.36
Share of Women Age 25 and Above with a Secondary or Post-Secondary Degree, 1999	89	0.28	0.05	0.20	0.49
Share of Women Age 25 and Above with a Secondary or Post-Secondary Degree, 2010	89	0.41	0.06	0.31	0.62
School Enrollment of Men Age 15-17 in 2010	89	95.55	1.03	93.10	97.70
School Enrollment of Women Age 15-17 in 2010	89	96.68	0.88	94.40	98.10
School Enrollment of Men Age 18-24 in 2010	89	44.25	7.11	30.80	61.50
School Enrollment of Women Age 18-24 in 2010	89	48.02	8.35	35.90	66.90
Share of Individuals who Express No Interest in Science, 2001					
Share of Individuals who Express No Interest in Science, 2001	66	0.09	0.09	0	0.44
Department (Public) Spending on Education, per Inhabitant					
Department Spending on Primary Schooling 1874-1882 (in French francs), per Inhabitant	86	0.23	0.11	0.05	0.67
Department Spending on Secondary Schooling 2010 (in euros), per Inhabitant	88	59.18	26.16	16.31	188.12
Explanatory Variables					
Horse Power of Steam Engines	89	1839.35	3855.33	0	27638
Average Rainfall (Fall 1845-1859)	89	202.03	96.09	122.74	552.05
Average Temperature	89	10.45	1.69	4.42	13.73
Latitude	89	0.74	0.19	0.21	0.98
Land Suitability	89	46.49	2.15	41.86	50.49
Maritime Department	89	0.27	0.45	0	1
Share of Carboniferous Area in Department	89	0.100	0.157	0	0.709
Rivers and Tributaries	89	0.562	0.499	0	1
Border Department	89	0.24	0.43	0	1
Distance to Paris	89	365.88	188.95	1	918.86
Paris and Suburbs	89	0.03	0.18	0	1
Alsace-Lorraine	89	0.03	0.18	0	1
Urban Population in 1700 (thousand of inhabitants)	89	20.79	57.78	0	510
Instrumental Variables					
Distance to Fresnes sur Escaut	89	496.60	221.88	42.88	1027.22
Squared Temperature Deviations (1856-1859)	89	0.19	0.11	0.01	0.43

Table A.2: Descriptive statistics: variables for robustness analysis.

	Obs	Mean	Std. Dev.	Min	Max
Steam Engines, 1839-1847 & 1897					
Number of Steam Engines 1839-1847	85	29.2	66.14303	0	565
Number of Steam Engines 1897	86	796.7558	939.8229	15	5805
Horse Power of Steam Engines 1897	86	15331.73	27717.8	195	186564
Number of Employees per Firm, 1861-1865 Number of Employees per Firm, 1861-1865	89	14.93	12.04	1.43	58.54
Distance from French cities - aerial distance					
Distance from Marseille	89	472.93	215.91	1	902.67
Distance from Lyon	89	330.99	152.35	1	723.27
Distance from Rouen	89	420.42	210.31	1	1025.71
Distance from Mulhouse	89	453.74	187.57	36.61	853.41
Distance from Bordeaux	89	408.59	176.16	1	820.3
Distance from French cities - weeks of travel					
Distance from Fresnes (weeks of travel)	89	0.480	0.187	0.045	0.895
Distance from Paris (weeks of travel)	89	0.404	0.180	0.003	0.925
Distance from Marseille (weeks of travel)	89	0.422	0.226	0.029	0.960
Distance from Lyon (weeks of travel)	89	0.497	0.233	0.041	0.999
Distance from Mulhouse (weeks of travel)	89	0.626	0.295	0.012	1.126
Distance from Rouen (weeks of travel)	89	0.2	0.218	0.022	1.037
Distance from Bordeaux (weeks of travel)	89	0.532	0.273	0.002	1.125
Distance to London					
Distance to London (km)	89	636.23	229.93	242.93	1261.78
Education before 1840					
Grooms who Signed their Marriage License, 1686-1690	76	25.90	14.87	6.27	64.25
Grooms who Signed their Marriage License, 1786-1790	79	42.35	23.94	5.24	92.18
Grooms who Signed their Marriage License, 1816-1820	78	50.61	22.14	13.35	96.28
Percentage of conscripts who could read, 1827-1829	89	15.11	14.90	0.90	61.70
Percentage of conscripts who could read, 1831-1835	89	18.68	16.01	1.60	71.30
University in 1700	89	0.18	0.39	0	1
The early use of raw material					
Area covered by mines in department	89	0.008	0.015	0.00009	0.086
Iron forges in 1789	89	2.15	8.76	0	52.00
Iron forges in 1811	89	2.53	11.09	0	79.00
Presence of iron forges in 1789	89	0.10	0.30	0	1
Presence of iron forges in 1811	89	0.10	0.30	0	1
Economic integration					
Market integration during the French Revolution	86	132.71	106.95	21.00	732.00
Railroad connection to Paris in 1860	89	0.73	0.45	0	1
Population density					
Population density 1801	85	0.74	1.55	0.19	13.17
Population density 1831	86	0.91	2.18	0.22	19.50
Population density 1861	89	1.20	4.32	0.21	40.74
Religious minorities					
Jews in population, 1861	89	0.002	0.005	0	0.04
Protestants in population, 1861	89	0.021	0.053	0.00003	0.31
Share of the native population					
Share of the native population in each department, 1901	87	0.85	0.09	0.47	0.98
Share of the native population in each department, 2010	89	0.57	0.11	0.25	0.78
World War I and World War II					
Destroyed Buildings WWI	86	10802.81	38701.6	0	280175
Destroyed Buildings WWII	86	13530.36	24260.73	0	122285
WWI deaths	86	14677.21	10247.99	4226	80591
WWII deaths	89	1568.236	1659.00	18	13218
Soldier deaths in World Wars					
Soldier deaths in World War I	89	14245.46	10339.62	893	80591
Soldier deaths in World War II	89	1568.24	1659.00	18	13218
Share of unionized workers in workforce					
Share of unionized workers in workforce, 1930	89	0.17	0.07	0.02	0.37
Average adult wage, 1901 (in French Francs)					
Average male wage, 1901	85	3.15	0.63	2.15	6.02
Industrial concentration and firm size					
Concentration index – Horse Power by Sector	85	0.40	0.20	0.12	1
Concentration Index - Share of Employees in Industry	89	0.314	0.162	0.110	0.822
Number of Employees per Firm 1861-1865	89	14.93	12.04	1.43	58.54
Weighted tariffs across sectors					
Weighted tariffs across sectors, 1865	86	4.18	1.40	0.29	8.79
Weighted tariffs across sectors, 1901	86	8.40	2.57	3.30	15.29
Weighted tariffs across sectors, 1919	86	4.17	0.88	2.36	5.95
Weather shocks					
Squared Temperature Deviations (Spring 1856-1859) (Baseline Spring 1831-1855)	89	0.14	0.09	0.03	0.34
Squared Temperature Deviations (Summer 1856-1859) (Baseline Summer 1831-1855)	89	0.89	0.31	0.07	1.32
Squared Temperature Deviations (Summer 1856-1859) (Baseline Summer 1831-1855)	87	0.08	0.14	0.00	0.67
Squared Temperature Deviations (1844-1847) (Baseline Fall 1819-1843)	89	0.01	0.014	1.48e-07	0.0730017
Squared Temperature Deviations (1848-1851) (Baseline Fall 1823-1847)	89	0.61	0.13	0.41	1.045829
Squared Temperature Deviations (1852-1855) (Baseline Fall 1827-1851)	89	0.08	0.05	0.01	0.2034184
Squared Temperature Deviations (1866-1869) (Baseline Fall 1841-1865)	89	0.01	0.01	9.26e-07	.069093
Squared Rainfall Deviations (1856-1859) (Baseline Fall 1831-1855)	89	0.02	0.03	1.03e-06	0.12
Squared Deviation Average Rainfall in Fall 1856-1859 (Baseline Fall 1831-1855)	89	1123.94	821.55	5.23	3113.8
Wheat prices					
Wheat Prices Fall 1856-1859	86	0.04	0.04	-0.07	0.14

Table A.3: Descriptive statistics: horse power of steam engines and workers per industrial sector.

	Obs	Mean	Std. Dev.	Min	Max
Horse Power of Steam Engines per Industrial Sector					
Ceramics	89	13.56	44.92	0	304
Chemistry	89	54.11	222.78	0	2008
Clothing	89	6.34	24.46	0	215
Construction	89	20.69	40.22	0	223
Food	89	274.16	769.05	0	5744
Furniture	89	14.24	66.09	0	448
Leather	89	11.85	31.60	0	266
Lighting	89	10.16	66.84	0	629
Luxury Goods	89	6.31	44.12	0	411
Metal Objects	89	102.19	279.32	0	2063
Metallurgy	89	377.10	901.76	0	5085
Mines	89	314.98	1229.07	0	10325
Sciences & Arts	89	56.42	130.69	0	988
Textile	89	540.62	1679.96	0	12057
Transportation	89	9.51	43.12	0	382
Wood	89	27.25	67.56	0	565
Horse Power of Steam Engines 1860-1865	89	1839.35	3855.33	0	27638
Number of Workers per Industrial Sector					
Ceramics	89	582.35	1066.79	0	5763
Chemistry	89	282.09	746.59	0	5933
Clothing	89	1091.40	4303.00	0	38777
Construction	89	756.43	702.96	0	4232
Food	89	2025.03	3623.52	42	30079
Furniture	89	191.40	1632.74	0	15415
Leather	89	276.29	863.57	0	8040
Lighting	89	80.66	377.58	0	3552
Luxury Goods	89	230.98	1584.69	0	14855
Metal Objects	89	1172.34	2770.68	0	21263
Metallurgy	89	1246.40	1841.94	0	8394
Mines	89	1253.65	2433.45	0	15442
Sciences & Arts	89	847.64	2601.94	0	20502
Textile	89	8004.17	13922.15	0	76726
Transportation	89	373.45	1754.09	0	15623
Wood	89	188.81	395.50	0	3132
Number of Workers	89	18603.10	28178.16	1027	198488

Appendix B. Additional Robustness Analysis

Table B.1: The determinants of the diffusion of the steam engine: distances from Fresnes-sur-Escaut and other major French cities by foot measured in travel weeks

	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) OLS	(6) OLS	(7) OLS
	Horse Power of Steam Engines						
Distance from Fresnes (weeks of travel)	-5.910***	-7.771***	-5.715***	-6.144***	-6.069***	-5.857***	-5.627***
	[0.944]	[1.543]	[0.910]	[1.004]	[1.017]	[1.050]	[1.052]
Distance from Paris (weeks of travel)		2.366					
		[1.598]					
Distance from Marseille (weeks of travel)			0.879				
			[0.765]				
Distance from Lyon (weeks of travel)				0.644			
				[0.772]			
Distance from Rouen (weeks of travel)					0.271		
					[0.886]		
Distance from Mulhouse (weeks of travel)						-0.0941	
						[0.663]	
Distance from Bordeaux (weeks of travel)							0.540
							[0.748]
Adjusted R^2	0.295	0.302	0.297	0.292	0.288	0.287	0.292
Observations	89	89	89	89	89	89	89

Note: The dependent variable is in logarithm. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** at the 5%-level, * at the 10%-level.

Table B.2: Weather shocks and the adoption of the steam engine

	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) OLS
	Horse Power of Steam Engines				
Squared Temperature Deviations (1856-1859) (Baseline Fall 1831-1855)	-6.950***	-5.639***	-8.131***	-6.986***	-6.364***
	[1.690]	[1.825]	[2.175]	[2.581]	[1.629]
Squared Temperature Deviations (Spring 1856-1859) (Baseline Spring 1831-1855)	2.147			3.314	
	[3.529]			[3.402]	
Squared Temperature Deviations (Summer 1856-1859) (Baseline Summer 1831-1855)		-1.740		-1.528	
		[1.093]		[1.176]	
Squared Temperature Deviations (Winter 1856-1859) (Baseline Winter 1831-1855)			-1.774	-1.182	
			[1.220]	[1.316]	
Squared Rainfall Deviations (1856-1859) (Baseline Fall 1831-1855)					0.0003
					[0.0002]
Latitude	24.38**	22.09**	23.30**	31.05***	17.56*
	[11.14]	[9.402]	[9.532]	[11.63]	[9.387]
Land Suitability	-0.943*	-1.221**	-1.140**	-1.406**	-1.044*
	[0.559]	[0.573]	[0.553]	[0.577]	[0.571]
Average Rainfall (Fall 1845-1859)	0.0007	0.0016	0.0014	0.0007	-0.0002
	[0.0021]	[0.0022]	[0.0021]	[0.0022]	[0.0024]
Average Temperature	3.500***	4.690***	4.003***	5.012***	3.725***
	[0.936]	[1.261]	[1.268]	[1.535]	[0.968]
Rivers and Tributaries	0.612**	0.664**	0.494*	0.583**	0.628**
	[0.264]	[0.272]	[0.277]	[0.291]	[0.278]
Share of Carboniferous Area	0.613	1.046	0.665	0.856	0.712
	[1.134]	[1.093]	[1.076]	[1.146]	[1.067]
Maritime Department	0.543	0.339	0.464	0.235	0.556
	[0.394]	[0.385]	[0.397]	[0.416]	[0.384]
Border Department	0.136	0.260	0.379	0.232	0.140
	[0.459]	[0.422]	[0.422]	[0.431]	[0.425]
Distance to Paris	-0.002	-0.004	-0.002	-0.003	-0.002
	[0.0025]	[0.0029]	[0.0025]	[0.0031]	[0.0024]
Paris and Suburbs	0.0833	-0.406	0.0109	-0.354	0.159
	[0.621]	[0.683]	[0.637]	[0.701]	[0.619]
Urban Population in 1700	0.164**	0.164**	0.164*	0.166**	0.151*
	[0.0815]	[0.0784]	[0.0824]	[0.0807]	[0.0837]
Adjusted R2	0.635	0.643	0.637	0.636	0.639
Observations	89	89	87	87	89

Note: The dependent variable is in logarithm. All regressions include a dummy variable for the three departments which had no steam engine in 1860-1865. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** indicates significance at the 5%-level, * indicates significance at the 10%-level.

Table B.3: Weather shocks and adoption of the steam engine: Robustness Checks

	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) OLS
	Horse Power of Steam Engines				
Squared Temperature Deviations (1856-1859) (Baseline Fall 1831-1855)	-7.054***	-6.897***	-6.634***	-7.332***	-6.484**
	[1.695]	[1.620]	[1.647]	[1.716]	[2.497]
Squared Temperature Deviations (1844-1847) (Baseline Fall 1819-1843)	7.899				
	[9.428]				
Squared Temperature Deviations (1848-1851) (Baseline Fall 1823-1847)		2.588			
		[1.614]			
Squared Temperature Deviations (1852-1855) (Baseline Fall 1827-1851)			-3.642		
			[12.99]		
Squared Temperature Deviations (1866-1869) (Baseline Fall 1841-1865)				11.37	
				[11.55]	
Squared Temperature Deviations (1870-1873) (Baseline Fall 1845-1869)					-1.571
					[10.49]
Latitude	16.22	27.29**	16.83	20.96**	20.97*
	[10.35]	[10.40]	[15.50]	[8.993]	[11.75]
Land Suitability	-0.924*	-0.858	-0.926	-0.859	-0.895
	[0.552]	[0.541]	[0.567]	[0.535]	[0.560]
Average Rainfall (Fall 1845-1859)	0.0014	0.0014	0.0016	0.0015	0.0013
	[0.0021]	[0.0022]	[0.0024]	[0.0021]	[0.0021]
Average Temperature	3.689***	4.476***	3.478***	3.549***	3.480***
	[0.965]	[0.958]	[0.948]	[0.953]	[0.947]
Rivers and Tributaries	0.633**	0.583**	0.590**	0.621**	0.597**
	[0.270]	[0.267]	[0.268]	[0.275]	[0.271]
Share of Carboniferous Area	0.677	1.087	0.563	0.915	0.718
	[1.081]	[1.174]	[1.084]	[1.133]	[1.124]
Maritime Department	0.562	0.562	0.574	0.653	0.581
	[0.382]	[0.366]	[0.387]	[0.406]	[0.390]
Border Department	0.312	0.446	0.301	0.0749	0.206
	[0.445]	[0.425]	[0.526]	[0.411]	[0.441]
Paris and Suburbs	-0.0411	0.0264	0.0919	0.0919	0.0940
	[0.626]	[0.620]	[0.638]	[0.625]	[0.678]
Distance to Paris	-0.003	-0.0017	-0.0021	-0.0023	-0.0018
	[0.0028]	[0.0024]	[0.0024]	[0.0024]	[0.0031]
Urban Population in 1700	0.167**	0.140*	0.157*	0.160*	0.163**
	[0.0805]	[0.0833]	[0.0918]	[0.0824]	[0.0815]
Adjusted R2	0.635	0.643	0.634	0.637	0.633
Observations	89	89	89	89	89

Note: The dependent variable is in logarithm. All regressions include a dummy variable for the three departments which had no steam engine in 1860-1865. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** indicates significance at the 5%-level, * indicates significance at the 10%-level.

Table B.4: Weather shocks and adoption of the steam engine: Mechanism

	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) OLS
	Wheat Prices Fall 1856-1859 Baseline Fall 1831-1855			Horse Power of Steam Engines	
Distance to Fresnes			-0.0075***	-0.0116***	-0.0082***
			[0.0026]	[0.0025]	[0.0026]
Squared Temperature Deviations (1856-1859)	0.0998**	0.112**	-4.254**		-3.233
	[0.0408]	[0.0485]	[2.092]		[2.002]
Wheat Prices (Fall 1856-1859)				-10.79**	-9.306*
				[4.636]	[4.818]
Latitude		0.115	3.611	-2.386	2.990
		[0.227]	[11.97]	[11.19]	[11.68]
Land Suitability		-0.0200	-0.928	-0.967	-1.134
		[0.0145]	[0.612]	[0.737]	[0.716]
Average Rainfall (Fall 1845-1859)		0.0003***	0.00060	0.00192	0.00254
		[0.00005]	[0.0021]	[0.0021]	[0.0022]
Average Temperature		0.0081	3.243***	2.982*	3.647**
		[0.0407]	[1.061]	[1.608]	[1.556]
Rivers and Tributaries		0.0059	0.553**	0.594**	0.549*
		[0.0087]	[0.264]	[0.270]	[0.275]
Share of Carboniferous Area		-0.0114	0.566	0.313	0.452
		[0.0226]	[1.136]	[1.135]	[1.090]
Maritime Department		-0.0284**	0.470	-0.0493	0.226
		[0.0123]	[0.417]	[0.496]	[0.498]
Border Department		0.0084	-0.278	-0.525	-0.242
		[0.0127]	[0.417]	[0.505]	[0.430]
Distance to Paris		0.00004	0.004	0.0084***	0.0044
		[0.00006]	[0.0030]	[0.0030]	[0.0032]
Paris and Suburbs		-0.0433**	0.385	0.190	0.0337
		[0.0186]	[0.637]	[0.551]	[0.574]
Alsace-Lorraine		-0.007	0.411	0.653	0.371
		[0.035]	[0.862]	[0.845]	[0.834]
Urban Population in 1700		-0.0040	0.145*	0.105	0.104
		[0.00255]	[0.0836]	[0.0857]	[0.0869]
Adjusted R2	0.048	0.418	0.646	0.654	0.659
Observations	86	86	89	86	86

Note: The dependent variable is in logarithm. All regressions include a dummy variable for the three departments which had no steam engine in 1860-1865. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** indicates significance at the 5%-level, * indicates significance at the 10%-level.

Table B.5: Industrialization and income per capita 1860, 1901, 1930 & 2001-2005: Robustness check - temperature shock as sole IV

	(1) IV GDP per capita, 1860	(2) IV GDP per capita, 1901	(3) IV GDP per capita, 1930	(4) IV GDP per capita, 2001-2005
Horse Power of Steam Engines	0.0811**	0.211**	0.0968***	-0.0400*
	[0.0410]	[0.100]	[0.0313]	[0.0217]
Latitude	-3.338**	-8.230**	-2.910**	1.217
	[1.588]	[3.643]	[1.345]	[0.943]
Land Suitability	0.0971	0.226	0.224***	-0.0551
	[0.0829]	[0.173]	[0.0649]	[0.0690]
Average Rainfall (Fall 1845-1859)	0.0001	0.0003	-0.0002	-0.0004**
	[0.0003]	[0.0005]	[0.0002]	[0.0002]
Average Temperature	0.198	-0.340	-0.253**	-0.006
	[0.163]	[0.395]	[0.116]	[0.114]
Rivers and Tributaries	-0.0350	-0.121	0.0305	0.0654**
	[0.0506]	[0.127]	[0.0314]	[0.0292]
Share of Carboniferous Area	-0.0965	-0.334	0.0018	-0.0906
	[0.202]	[0.308]	[0.140]	[0.115]
Maritime Department	0.0367	0.0141	0.0105	-0.0181
	[0.0570]	[0.147]	[0.0584]	[0.0459]
Border Department	0.0596	0.108	0.151***	0.0268
	[0.0538]	[0.152]	[0.0483]	[0.0383]
Distance to Paris	-0.0012***	-0.0015*	-0.0003	0.0003
	[0.0004]	[0.0008]	[0.0003]	[0.0002]
Paris and Suburbs	0.100	-0.119	0.236***	0.339**
	[0.0968]	[0.181]	[0.0835]	[0.162]
Alsace-Lorraine			0.0047	0.0041
			[0.0703]	[0.0838]
Urban Population in 1700	0.0366**	-0.0134	0.0342***	0.0553***
	[0.0155]	[0.0349]	[0.0117]	[0.0120]
Observations	87	85	87	89
	First stage: the instrumented variable is Horse Power of Steam Engines			
Squared Temperature Deviations (1856-1859)	-6.739***	-6.440***	-6.698***	-6.691***
	[1.852]	[1.920]	[1.910]	[1.738]
F-stat (1st stage)	13.245	11.249	12.302	14.825

Note: All regressions include a dummy variable for the three departments which had no steam engine in 1860-1865. Aerial distances are measured in kilometers. Other explanatory variables, except the dummies, and the dependent variables are in logarithm. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** at the 5%-level, * at the 10%-level.

Table B.6: Industrialization and income per capita 1860, 1901, 1930 & 2001-2005 Robustness check - Distance to Fresnes-sur-Escaut as sole IV

	(1) IV GDP per capita, 1860	(2) IV GDP per capita, 1901	(3) IV GDP per capita, 1930	(4) IV GDP per capita, 2001-2005
Horse Power of Steam Engines	0.124***	0.250***	0.103***	-0.0816***
	[0.0401]	[0.0766]	[0.0258]	[0.0263]
Paris and Suburbs	0.0881	-0.131	0.235***	0.353**
	[0.0982]	[0.194]	[0.0814]	[0.179]
Latitude	-4.463***	-9.239**	-3.050***	2.215*
	[1.387]	[3.995]	[1.183]	[1.255]
Land Suitability	0.0966	0.223	0.223***	-0.0552
	[0.1000]	[0.189]	[0.0670]	[0.0864]
Average Rainfall (Fall 1845-1859)	0.0002	0.0003	-0.0002	-0.0005*
	[0.0003]	[0.0006]	[0.0002]	[0.0002]
Average Temperature	0.149	-0.377	-0.259**	0.0459
	[0.172]	[0.411]	[0.111]	[0.135]
Rivers and Tributaries	-0.0727	-0.153	0.0254	0.0987***
	[0.0569]	[0.111]	[0.0324]	[0.0377]
Share of Carboniferous Area	-0.108	-0.332	0.0005	-0.0704
	[0.226]	[0.346]	[0.142]	[0.148]
Maritime Department	0.0380	0.0160	0.0101	-0.0157
	[0.0654]	[0.158]	[0.0605]	[0.0565]
Border Department	0.0653	0.118	0.152***	0.0237
	[0.0661]	[0.164]	[0.0504]	[0.0473]
Distance to Paris	-0.0013***	-0.0016*	-0.0003	0.0004
	[0.0003]	[0.0009]	[0.0003]	[0.0003]
Alsace-Lorraine			-0.0001	0.0428
			[0.0775]	[0.107]
Urban Population in 1700	0.0278*	-0.0224	0.0330***	0.0637***
	[0.0162]	[0.0358]	[0.0111]	[0.0139]
Observations	87	85	87	89
First stage: the instrumented variable is Horse Power of Steam Engines				
Distance to Fresnes	-0.0117***	-0.0113***	-0.0117***	-0.0121***
	[0.0024]	[0.0024]	[0.0024]	[0.0024]
F-stat (1st stage)	23.866	22.512	23.608	24.635

Note: All regressions include a dummy variable for the three departments which had no steam engine in 1860-1865. Aerial distances are measured in kilometers. Other explanatory variables, except the dummies, and the dependent variables are in logarithm. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** at the 5%-level, * at the 10%-level.

Table B.7: The determinants of the diffusion of the steam engine: robustness analysis

	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) OLS	(6) OLS	(7) OLS	(8) OLS	(9) OLS	(10) OLS	(11) OLS	(12) OLS	(13) OLS	(14) OLS	(15) OLS
	Horse Power of Steam Engines														
Distance to Fresnes	-0.0075***	-0.0075***	-0.0068**	-0.0071***	-0.0072***	-0.0077***	-0.0077***	-0.0065**	-0.0072**	-0.0061**	-0.0084***	-0.0097***	-0.0075***	-0.0075***	-0.0087***
	[0.0026]	[0.0027]	[0.0027]	[0.0027]	[0.0026]	[0.0028]	[0.0028]	[0.0029]	[0.0027]	[0.0028]	[0.0029]	[0.0030]	[0.0027]	[0.0027]	[0.0031]
Squared Deviation Average Temperature in Fall 1856-1859 (Baseline Fall 1831-1855	-4.254**	-4.351	-4.849**	-4.592**	-4.332**	-4.161*	-4.140*	-4.340**	-4.145*	-5.210**	-3.781*	-2.903	-4.240*	-4.226**	-3.505
	[2.092]	[2.710]	[2.129]	[2.094]	[2.129]	[2.150]	[2.150]	[2.006]	[2.206]	[2.289]	[2.175]	[2.311]	[2.138]	[2.103]	[2.337]
Latitude	3.611	2.965	4.713	2.911	2.991	3.220	3.141	5.425	6.458	-3.591	0.102	-5.977	3.441	3.711	2.618
	[11.97]	[14.79]	[12.20]	[12.09]	[12.07]	[12.30]	[12.29]	[11.04]	[12.02]	[13.86]	[13.89]	[13.17]	[12.28]	[12.07]	[12.06]
Land Suitability	-0.928	-0.938	-0.866	-0.949	-0.940	-0.927	-0.930	-1.165*	-0.895	-0.806	-0.986	-0.999	-0.931	-0.965	-0.925
	[0.612]	[0.630]	[0.641]	[0.658]	[0.614]	[0.621]	[0.621]	[0.596]	[0.632]	[0.632]	[0.633]	[0.634]	[0.616]	[0.612]	[0.620]
Average Rainfall (Fall 1845-1859)	0.0006	0.0006	0.0015	0.0004	0.0007	0.0006	0.0006	0.0009	0.0004	-0.0002	0.0004	0.0007	0.0006	0.0007	0.0007
	[0.0021]	[0.0021]	[0.0021]	[0.0021]	[0.0021]	[0.0021]	[0.0021]	[0.0020]	[0.0021]	[0.0020]	[0.0022]	[0.0022]	[0.0021]	[0.0021]	[0.0022]
Average Temperature	3.243***	3.266***	3.239**	3.407**	3.137***	3.255***	3.266***	3.815***	3.211***	3.314***	2.932***	2.486**	3.237***	3.288***	2.845***
	[1.061]	[1.076]	[1.507]	[1.508]	[1.044]	[1.091]	[1.092]	[1.114]	[0.996]	[1.022]	[1.086]	[1.050]	[1.077]	[1.075]	[1.036]
Maritime Department	0.470	0.465	0.497	0.541	0.492	0.464	0.463	0.260	0.365	0.515	0.445	0.369	0.473	0.470	0.474
	[0.417]	[0.431]	[0.472]	[0.476]	[0.423]	[0.423]	[0.422]	[0.385]	[0.419]	[0.414]	[0.416]	[0.419]	[0.419]	[0.412]	[0.429]
Border Department	-0.278	-0.270	-0.246	-0.264	-0.288	-0.273	-0.268	-0.0151	-0.302	-0.159	-0.276	-0.362	-0.282	-0.245	-0.431
	[0.417]	[0.416]	[0.430]	[0.432]	[0.414]	[0.438]	[0.436]	[0.422]	[0.413]	[0.406]	[0.423]	[0.410]	[0.420]	[0.416]	[0.375]
Rivers and Tributaries	0.553**	0.554**	0.560**	0.524*	0.561**	0.573*	0.575**	0.375	0.548*	0.517*	0.475*	0.425*	0.550**	0.540**	0.494*
	[0.264]	[0.263]	[0.271]	[0.275]	[0.268]	[0.288]	[0.288]	[0.270]	[0.275]	[0.260]	[0.273]	[0.250]	[0.272]	[0.267]	[0.262]
Share of Carboniferous Area	0.566	0.561	0.559	0.454	0.394	0.587	0.584	1.210	0.386	-0.0306	0.644	0.871	0.567	0.566	0.806
	[1.136]	[1.151]	[1.131]	[1.135]	[1.121]	[1.134]	[1.134]	[1.186]	[1.175]	[1.291]	[1.172]	[1.156]	[1.144]	[1.141]	[1.237]
Distance to Paris	0.004	0.004	0.003	0.003	0.003	0.004	0.004	0.003	0.004	0.001	0.004	0.005	0.004	0.003	0.005
	[0.00303]	[0.00323]	[0.00325]	[0.00331]	[0.00318]	[0.00315]	[0.00312]	[0.00331]	[0.00318]	[0.00350]	[0.00309]	[0.00326]	[0.00304]	[0.00298]	[0.00350]
Urban Population in 1700	0.145*	0.144	0.129	0.119	0.109	0.143*	0.143*	-0.00402	0.169*	0.165**	0.139	0.114	0.143*	0.143*	0.141
	[0.0836]	[0.0882]	[0.0916]	[0.0939]	[0.0935]	[0.0848]	[0.0850]	[0.110]	[0.0989]	[0.0824]	[0.0866]	[0.0840]	[0.0844]	[0.0836]	[0.0847]
Paris and Suburbs	0.385	0.393	0.0979	0.0181	-0.162	0.364	0.362	0.839	0.430	1.451	0.620	0.575	0.372	0.369	0.489
	[0.637]	[0.651]	[0.611]	[0.627]	[0.631]	[0.660]	[0.659]	[0.633]	[0.883]	[1.073]	[0.782]	[0.723]	[0.633]	[0.637]	[0.650]
Alsace-Lorraine	0.411	0.408	0.345	0.368	0.378	0.400	0.395	0.349	1.679**	0.341	0.379	0.484	0.307	0.211	0.390
	[0.862]	[0.872]	[0.866]	[0.837]	[0.821]	[0.875]	[0.875]	[0.832]	[0.815]	[0.917]	[0.833]	[0.742]	[1.356]	[0.905]	[0.856]
London		-0.000194													
		[0.00261]													
Population Density 1801			0.441												
			[0.469]												
Population Density 1831				0.495											
				[0.438]											
Population Density 1861					0.538										
					[0.353]										
Iron Forges in 1789						0.0131									
						[0.458]									
Presence of Iron Forges in 1789						-0.139									
						[1.345]									
Iron Forges in 1811							0.0568								
							[0.420]								
Persistence of Iron Forges in 1811							-0.260								
							[1.274]								
Market Integration During the French Revolution								0.751**							
								[0.294]							
Share of the native population in each department 1901									0.0107						
									[2.685]						
Share of the native population in each department 2010										3.559					
										[2.847]					
Percentage of Conscripts who Could Read 1827-1829											-0.0110				
											[0.0170]				
Percentage of Conscripts who Could Read 1831-1835												-0.0243			
												[0.0165]			
Jews in Population 1861													4.405		
													[62.76]		
Protestants in Population 1861														1.471	
														[2.595]	
Railroad Connection to Paris in 1860															0.362
															[0.464]
Adjusted R2	0.646	0.641	0.642	0.640	0.651	0.636	0.636	0.683	0.644	0.656	0.644	0.657	0.641	0.642	0.645
Observations	89	89	85	86	89	89	89	86	87	89	89	89	89	89	89

Note: All regressions include a dummy variable for the three departments which had no steam engine in 1860-1865. Aerial distances are measured in kilometers. Other explanatory variables, except the dummies, are in logarithm.

Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** at the 5%-level, * at the 10%-level.

Table B.8: LM tests of spatial correlation: GDP per capita in 1860, 1901, 1930 and 2001-2005

	GDP per capita, 1860	GDP per capita, 1901	GDP per capita, 1930	GDP per capita, 2001-2005
Spatial error LM test	0.249	0.067	0.403	0.038
p-value	0.618	0.795	0.525	0.846
Spatial lag LM test	0.134	1.648	0.391	2.601
p-value	0.714	0.199	0.532	0.107

Note: This Table reports test for spatial correlation in our main regressions on the impact of steam engines on GDP per capita in Columns (4) and (9) in Tables 5 and 6 by implementing spatial LM tests on the residuals of the OLS regressions with control variables. The results suggest that there is no statistical evidence of spatial autocorrelation in the residuals.

Table B.9: Industrialization and income per capita, accounting for population density in the 19^{th} century

	(1) IV	(2) IV	(3) IV	(4) IV	(5) IV	(6) IV	(7) IV	(8) IV	(9) IV	(10) IV	(11) IV	(12) IV	(13)	(14)	(15)	(16)
	GDP per capita, 1860					GDP per capita, 1901				GDP per capita, 1930			GDP per capita, 2001-2005 average			
Horse Power of Steam Engines	0.102***	0.0874**	0.0874**	0.101***	0.231***	0.192**	0.194**	0.236***	0.0999***	0.0934***	0.0927***	0.0970***	-0.0603***	-0.0482**	-0.0506**	-0.0633***
	[0.0366]	[0.0354]	[0.0363]	[0.0378]	[0.0796]	[0.0757]	[0.0763]	[0.0822]	[0.0244]	[0.0243]	[0.0244]	[0.0249]	[0.0221]	[0.0201]	[0.0207]	[0.0227]
Population Density 1801		0.0312				-0.0670				0.0706**				0.172***		
		[0.0428]				[0.0802]				[0.0343]				[0.0641]		
Population Density 1831			0.0312				-0.0632				0.0674**				0.165***	
			[0.0423]				[0.0772]				[0.0324]				[0.0555]	
Population Density 1861				0.0154				-0.111				0.0635**				0.177***
				[0.0401]				[0.0784]				[0.0283]				[0.0437]
Average Rainfall (Fall 1845-1859)	0.0002	0.0003	0.0002	0.0002	0.0003	0.0006	0.0005	0.0003	-0.0002	-0.0001	-0.0001	-0.0002	-0.0004**	-0.0004*	-0.0005**	-0.0004*
	[0.0003]	[0.0003]	[0.0003]	[0.0003]	[0.0005]	[0.0006]	[0.0005]	[0.0005]	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[0.0002]
Average Temperature	0.174	0.0255	0.0467	0.171	-0.359	-0.693	-0.686	-0.335	-0.256**	-0.271**	-0.258*	-0.270**	0.0195	0.138	0.167	-0.0112
	[0.165]	[0.189]	[0.188]	[0.164]	[0.401]	[0.424]	[0.424]	[0.401]	[0.113]	[0.133]	[0.133]	[0.111]	[0.123]	[0.137]	[0.139]	[0.115]
Latitude	-3.884***	-3.665***	-3.764***	-3.908***	-8.752**	-7.938**	-7.975**	-8.556**	-2.982**	-2.797**	-2.864**	-3.075***	1.705*	1.512	1.400	1.353
	[1.413]	[1.354]	[1.325]	[1.372]	[3.686]	[3.400]	[3.390]	[3.692]	[1.218]	[1.246]	[1.211]	[1.176]	[1.029]	[0.931]	[0.936]	[1.054]
Land Suitability	0.0968	0.117	0.108	0.0969	0.224	0.255	0.252	0.225	0.223***	0.216***	0.211***	0.223***	-0.0551	-0.0735	-0.0839	-0.0611
	[0.0907]	[0.0797]	[0.0797]	[0.0901]	[0.181]	[0.156]	[0.156]	[0.183]	[0.0659]	[0.0674]	[0.0674]	[0.0641]	[0.0770]	[0.0651]	[0.0654]	[0.0759]
Rivers and Tributaries	-0.0533	-0.0229	-0.0267	-0.0522	-0.138	-0.0667	-0.0694	-0.144	0.0278	0.0451	0.0434	0.0320	0.0817**	0.0703**	0.0677**	0.0860***
	[0.0507]	[0.0523]	[0.0521]	[0.0516]	[0.114]	[0.115]	[0.113]	[0.117]	[0.0293]	[0.0296]	[0.0295]	[0.0297]	[0.0321]	[0.0320]	[0.0321]	[0.0323]
Share of Carboniferous Area	-0.102	-0.115	-0.123	-0.107	-0.333	-0.366	-0.363	-0.296	0.00112	0.00102	-0.00734	-0.0209	-0.0807	-0.0779	-0.0934	-0.138
	[0.212]	[0.207]	[0.208]	[0.212]	[0.327]	[0.287]	[0.288]	[0.330]	[0.141]	[0.133]	[0.132]	[0.132]	[0.130]	[0.112]	[0.112]	[0.119]
Maritime Department	0.0373	0.0469	0.0523	0.0382	0.0151	0.0366	0.0375	0.00976	0.0103	-0.00322	0.000675	0.0129	-0.0169	-0.0467	-0.0387	-0.0110
	[0.0607]	[0.0630]	[0.0623]	[0.0602]	[0.153]	[0.149]	[0.149]	[0.154]	[0.0595]	[0.0663]	[0.0650]	[0.0582]	[0.0506]	[0.0471]	[0.0483]	[0.0483]
Border Department	0.0624	0.0605	0.0614	0.0608	0.113	0.114	0.115	0.122	0.151***	0.144***	0.144***	0.146***	0.0253	0.0150	0.0150	0.0155
	[0.0591]	[0.0555]	[0.0554]	[0.0596]	[0.158]	[0.147]	[0.147]	[0.159]	[0.0492]	[0.0495]	[0.0489]	[0.0489]	[0.0419]	[0.0380]	[0.0394]	[0.0424]
Paris and Suburbs	0.0944	0.0798	0.0751	0.0789	-0.125	-0.0710	-0.0679	-0.0140	0.236***	0.177***	0.171***	0.172***	0.346**	0.216***	0.203***	0.171***
	[0.0968]	[0.101]	[0.101]	[0.106]	[0.187]	[0.177]	[0.181]	[0.197]	[0.0824]	[0.0484]	[0.0459]	[0.0446]	[0.170]	[0.0774]	[0.0726]	[0.0664]
Distance to Paris	-0.0012***	-0.0012***	-0.0012***	-0.0012***	-0.0015*	-0.0015*	-0.0015*	-0.0015*	-0.0003	-0.0003	-0.0003	-0.0003	0.0004	0.0004*	0.0004	0.0003
	[0.0003]	[0.0003]	[0.0003]	[0.0003]	[0.0009]	[0.0008]	[0.0008]	[0.0009]	[0.0003]	[0.0003]	[0.0003]	[0.0003]	[0.0002]	[0.0002]	[0.0002]	[0.0002]
Alsace-Lorraine									0.00222	-0.00710	-0.00624	-0.0051	0.0230	0.0065	0.0083	0.0164
									[0.0729]	[0.0694]	[0.0704]	[0.0746]	[0.0939]	[0.0790]	[0.0764]	[0.0784]
Urban Population in 1700	0.0323**	0.0328**	0.0321**	0.0314**	-0.0181	-0.0101	-0.0100	-0.0110	0.0336***	0.0333***	0.0326***	0.0298***	0.0594***	0.0535***	0.0521***	0.0481***
	[0.0154]	[0.0145]	[0.0143]	[0.0148]	[0.0342]	[0.0311]	[0.0312]	[0.0341]	[0.0110]	[0.0103]	[0.0101]	[0.0101]	[0.0126]	[0.0098]	[0.0098]	[0.0103]
Observations	87	83	84	87	85	81	82	85	87	83	84	87	89	85	86	89
	First stage: the instrumented variable is Horse Power of Steam Engines															
Distance to Fresnes	-0.0073***	-0.0066**	-0.0069**	-0.0071***	-0.0073***	-0.0065**	-0.0069**	-0.0070**	-0.0075***	-0.0068**	-0.0071**	-0.0072***	-0.0075***	-0.0068**	-0.0071***	-0.0072***
	[0.0026]	[0.0027]	[0.0027]	[0.0026]	[0.0027]	[0.0028]	[0.0027]	[0.0027]	[0.0027]	[0.0028]	[0.0027]	[0.0027]	[0.0026]	[0.0027]	[0.0027]	[0.0026]
Squared Temperature Deviations (1856-1859)	-4.350*	-4.978**	-4.659**	-4.272*	-3.986*	-4.693*	-4.352*	-3.962*	-4.152*	-4.845**	-4.510*	-4.116*	-4.254**	-4.849**	-4.592**	-4.332**
	[2.246]	[2.307]	[2.273]	[2.253]	[2.337]	[2.410]	[2.366]	[2.344]	[2.313]	[2.389]	[2.347]	[2.325]	[2.092]	[2.129]	[2.094]	[2.129]
F-stat (1st stage)	12.963	11.442	11.561	12.949	12.134	10.809	10.983	12.174	12.708	11.289	11.422	12.739	13.644	12.164	12.338	13.714
J-stat (p-value)	0.255	0.263	0.246	0.254	0.644	0.599	0.587	0.629	0.842	0.650	0.627	0.864	0.101	0.099	0.119	0.077

Note: All regressions include a dummy variable for the three departments which had no steam engine in 1860-1865. Aerial distances are measured in kilometers. Other explanatory variables, except the dummies, and the dependent variables are in logarithm. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** at the 5%-level, * at the 10%-level.

Table B.10: Industrialization and income per capita, accounting for the distance to London

	(1) IV	(2) IV	(3) IV	(4) IV	(5) IV	(6) IV	(7) IV	(8) IV
	GDP per capita, 1860		GDP per capita, 1901		GDP per capita, 1930		GDP per capita, 2001-2005	
Horse Power of Steam Engines	0.102***	0.0670	0.231***	0.256**	0.0999***	0.0768***	-0.0576**	-0.0924**
	[0.0366]	[0.0417]	[0.0796]	[0.108]	[0.0244]	[0.0267]	[0.0225]	[0.0407]
London		0.0005		-0.0003		0.0003		0.0005
		[0.00046]		[0.0009]		[0.0002]		[0.0004]
Land Suitability	0.0968	0.0859	0.224	0.231	0.223***	0.217***	-0.0491	-0.0610
	[0.0907]	[0.0832]	[0.181]	[0.192]	[0.0659]	[0.0600]	[0.0737]	[0.0875]
Latitude	-3.884***	-1.872	-8.752**	-10.16*	-2.982**	-1.680	1.663	3.665
	[1.413]	[2.220]	[3.686]	[5.971]	[1.218]	[1.299]	[1.047]	[2.366]
Average Rainfall (Fall 1845-1859)	0.0002	0.0002	0.0003	0.0003	-0.0002	-0.0002	-0.000475**	-0.0004
	[0.0003]	[0.0003]	[0.0005]	[0.0006]	[0.0002]	[0.0002]	[0.0002]	[0.0003]
Average Temperature	0.174	0.248	-0.359	-0.408	-0.256**	-0.210**	0.0106	0.0843
	[0.165]	[0.164]	[0.401]	[0.429]	[0.113]	[0.100]	[0.122]	[0.175]
Rivers and Tributaries	-0.0533	-0.0354	-0.138	-0.150	0.0278	0.0394	0.0876***	0.104**
	[0.0507]	[0.0497]	[0.114]	[0.122]	[0.0293]	[0.0275]	[0.0322]	[0.0429]
Share of Carboniferous Area	-0.102	-0.0645	-0.333	-0.351	0.00112	0.0255	-0.0558	-0.0182
	[0.212]	[0.198]	[0.327]	[0.350]	[0.141]	[0.128]	[0.132]	[0.165]
Maritime Department	0.0373	0.0697	0.0151	-0.00436	0.0103	0.0325	-0.00987	0.0242
	[0.0607]	[0.0685]	[0.153]	[0.173]	[0.0595]	[0.0603]	[0.0515]	[0.0691]
Border Department	0.0624	0.0444	0.113	0.127	0.151***	0.139***	0.0272	0.00884
	[0.0591]	[0.0435]	[0.158]	[0.179]	[0.0492]	[0.0412]	[0.0428]	[0.0521]
Distance to Paris	-0.0012***	-0.0015***	-0.0015*	-0.0014	-0.0003	-0.0004	0.00042*	0.00016
	[0.0003]	[0.0005]	[0.0009]	[0.0010]	[0.0003]	[0.0003]	[0.0003]	[0.0004]
Paris and Suburbs	0.0944	0.0818	-0.125	-0.118	0.236***	0.227***	0.401**	0.388**
	[0.0968]	[0.0969]	[0.187]	[0.196]	[0.0824]	[0.0857]	[0.160]	[0.171]
Alsace-Lorraine					0.0022	0.0083	0.0147	0.0308
					[0.0729]	[0.0577]	[0.0905]	[0.115]
Urban Population in 1700	0.0323**	0.0402***	-0.0181	-0.0242	0.0336***	0.0387***	0.0622***	0.0701***
	[0.0154]	[0.0138]	[0.0342]	[0.0408]	[0.0110]	[0.0105]	[0.0126]	[0.0167]
Observations	87	87	85	85	87	87	89	89
	First stage: the instrumented variable is Horse Power of Steam Engines							
Distance to Fresnes	-0.0073***	-0.0074***	-0.0073***	-0.0072**	-0.0075***	-0.0076***	-0.0075***	-0.0075***
	[0.0026]	[0.0026]	[0.0027]	[0.0028]	[0.0027]	[0.0027]	[0.0026]	[0.0027]
Squared Temperature Deviations (1856-1859)	-4.350*	-4.440	-3.986*	-3.686	-4.152*	-4.214	-4.254**	-4.351
	[2.246]	[3.005]	[2.337]	[3.079]	[2.313]	[3.017]	[2.092]	[2.710]
F-stat (1st stage)	12.963	7.083	12.134	5.760	12.708	6.862	13.644	7.392
J-stat (p-value)	0.255	0.106	0.644	0.714	0.842	0.575	0.117	0.322

Note: All regressions include a dummy variable for the three departments which had no steam engine in 1860-1865. Aerial distances are measured in kilometers. Other explanatory variables, except the dummies, and the dependent variables are in logarithm. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** at the 5%-level, * at the 10%-level.

Table B.11: Industrialization and income per capita, accounting for the number of universities in 1700

	(1) IV	(2) IV	(3) IV	(4) IV	(5) IV	(6) IV	(7) IV	(8) IV
	GDP per capita, 1860		GDP per capita, 1901		GDP per capita, 1930		GDP per capita, 2001-2005	
Horse Power of Steam Engines	0.102***	0.104***	0.231***	0.234***	0.0999***	0.102***	-0.0603***	-0.0556**
	[0.0366]	[0.0358]	[0.0796]	[0.0793]	[0.0244]	[0.0243]	[0.0221]	[0.0225]
University in 1700		0.173**		0.107		0.128***		0.0999
		[0.0720]		[0.173]		[0.0409]		[0.0782]
Latitude	-3.884***	-4.125***	-8.752**	-8.859**	-2.982**	-3.036**	1.705*	1.630
	[1.413]	[1.352]	[3.686]	[3.721]	[1.218]	[1.192]	[1.029]	[1.000]
Land Suitability	0.0968	0.0562	0.224	0.196	0.223***	0.190***	-0.0551	-0.0837
	[0.0907]	[0.0901]	[0.181]	[0.182]	[0.0659]	[0.0582]	[0.0770]	[0.0833]
Average Rainfall (Fall 1845-1859)	0.0002	0.0002	0.0003	0.0003	-0.0002	-0.0002	-0.000446**	-0.000423*
	[0.00028]	[0.00028]	[0.0005]	[0.0005]	[0.0002]	[0.0002]	[0.0002]	[0.0002]
Average Temperature	0.174	0.208	-0.359	-0.331	-0.256**	-0.222**	0.0195	0.0536
	[0.165]	[0.164]	[0.401]	[0.392]	[0.113]	[0.107]	[0.123]	[0.128]
Rivers and Tributaries	-0.0533	-0.0533	-0.138	-0.137	0.0278	0.0285	0.0817**	0.0789**
	[0.0507]	[0.0503]	[0.114]	[0.117]	[0.0293]	[0.0311]	[0.0321]	[0.0315]
Share of Carboniferous Area	-0.102	-0.202	-0.333	-0.390	0.00112	-0.0717	-0.0807	-0.130
	[0.212]	[0.212]	[0.327]	[0.328]	[0.141]	[0.129]	[0.130]	[0.129]
Paris and Suburbs	0.0944	-0.0664	-0.125	-0.224	0.236***	0.119**	0.346**	0.258**
	[0.0968]	[0.122]	[0.187]	[0.260]	[0.0824]	[0.0518]	[0.170]	[0.104]
Maritime Department	0.0373	0.0598	0.0151	0.0268	0.0103	0.0221	-0.0169	-0.00827
	[0.0607]	[0.0606]	[0.153]	[0.164]	[0.0595]	[0.0603]	[0.0506]	[0.0498]
Border Department	0.0624	0.0482	0.113	0.108	0.151***	0.145***	0.0253	0.0248
	[0.0591]	[0.0550]	[0.158]	[0.159]	[0.0492]	[0.0480]	[0.0419]	[0.0440]
Distance to Paris	-0.0012***	-0.0014***	-0.0015*	-0.0016*	0.00001	0.00001	0.00001	0.00001
	[0.0003]	[0.0003]	[0.0009]	[0.0009]	[0.0003]	[0.0003]	[0.0002]	[0.0002]
Alsace-Lorraine					0.0022	-0.0370	0.0230	-0.0079
					[0.0729]	[0.0861]	[0.0939]	[0.0871]
Urban Population in 1700	0.0323**	0.0225	-0.0181	-0.0246	0.0336***	0.0265**	0.0594***	0.0535***
	[0.0154]	[0.0148]	[0.0342]	[0.0367]	[0.0110]	[0.0104]	[0.0126]	[0.0100]
Observations	87	87	85	85	87	87	89	89
	First stage: the instrumented variable is Horse Power of Steam Engines							
Distance to Fresnes	-0.0073***	-0.0073***	-0.0073***	-0.0073***	-0.0075***	-0.0075***	-0.0075***	-0.0075***
	[0.0026]	[0.0026]	[0.0027]	[0.0027]	[0.0027]	[0.0027]	[0.0026]	[0.0027]
Squared Temperature Deviations (1856-1859)	-4.350*	-4.347*	-3.986*	-3.941*	-4.152*	-4.138*	-4.254**	-4.220*
	[2.246]	[2.261]	[2.337]	[2.355]	[2.313]	[2.331]	[2.092]	[2.124]
F-stat	12.963	12.780	12.134	11.865	12.708	12.505	13.644	13.360
J-stat (p-value)	0.255	0.259	0.644	0.666	0.842	0.918	0.101	0.075

Note: All regressions include a dummy variable for the three departments which had no steam engine in 1860-1865. Aerial distances are measured in kilometers. Other explanatory variables, except the dummies, and the dependent variables are in logarithm. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** at the 5%-level, * at the 10%-level.

Table B.12: Industrialization and income per capita, accounting for the conscripts' ability to read before 1840

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	IV	IV	IV	IV	IV	IV	IV	IV	IV	IV	IV	IV
	GDP per capita, 1860			GDP per capita, 1901			GDP per capita, 1930			GDP per capita, 2001-2005 average		
Horse Power of Steam Engines	0.102***	0.107***	0.113***	0.231***	0.237***	0.241***	0.0999***	0.101***	0.102***	-0.0603***	-0.0627***	-0.0660***
	[0.0366]	[0.0369]	[0.0375]	[0.0796]	[0.0770]	[0.0745]	[0.0244]	[0.0242]	[0.0243]	[0.0221]	[0.0224]	[0.0220]
Share of Conscripts who Could Read 1827-1829		0.0013			0.0040			0.0011			-0.00004	
		[0.00215]			[0.00425]			[0.00174]			[0.0019]	
Share of Conscripts who Could Read 1831-1835			0.0009			0.0032			0.0007			-0.0032**
			[0.00262]			[0.00418]			[0.00167]			[0.0015]
Latitude	-3.884***	-3.757**	-3.946***	-8.752**	-8.093**	-8.153**	-2.982**	-2.804**	-2.857**	1.705*	1.753	1.125
	[1.413]	[1.470]	[1.396]	[3.686]	[3.717]	[3.618]	[1.218]	[1.305]	[1.142]	[1.029]	[1.104]	[1.030]
Land Suitability	0.0968	0.104	0.100	0.224	0.247	0.237	0.223***	0.230***	0.226***	-0.0551	-0.0554	-0.0721
	[0.0907]	[0.0945]	[0.0970]	[0.181]	[0.188]	[0.191]	[0.0659]	[0.0667]	[0.0672]	[0.0770]	[0.0757]	[0.0767]
Average Rainfall (Fall 1845-1859)	0.0002	0.0002	0.0002	0.0003	0.0003	0.0002	-0.0002	-0.0002	-0.0002	-0.0004**	-0.0004**	-0.0004*
	[0.000280]	[0.0003]	[0.0003]	[0.0005]	[0.0006]	[0.0006]	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[0.0002]
Average Temperature	0.174	0.203	0.186	-0.359	-0.261	-0.284	-0.256**	-0.229*	-0.240**	0.0195	0.0215	-0.0394
	[0.165]	[0.172]	[0.166]	[0.401]	[0.400]	[0.381]	[0.113]	[0.120]	[0.114]	[0.123]	[0.132]	[0.114]
Rivers and Tributaries	-0.0533	-0.0490	-0.0584	-0.138	-0.115	-0.130	0.0278	0.0342	0.0297	0.0817**	0.0832***	0.0693**
	[0.0507]	[0.0502]	[0.0494]	[0.114]	[0.116]	[0.108]	[0.0293]	[0.0308]	[0.0294]	[0.0321]	[0.0322]	[0.0298]
Share of Carboniferous Area	-0.102	-0.108	-0.114	-0.333	-0.353	-0.371	0.00112	-0.00341	-0.00597	-0.0807	-0.0792	-0.0299
	[0.212]	[0.219]	[0.225]	[0.327]	[0.332]	[0.332]	[0.141]	[0.146]	[0.144]	[0.130]	[0.136]	[0.132]
Maritime Department	0.0373	0.0360	0.0377	0.0151	0.0106	0.0137	0.0103	0.00953	0.0104	-0.0169	-0.0168	-0.0179
	[0.0607]	[0.0629]	[0.0628]	[0.153]	[0.157]	[0.155]	[0.0595]	[0.0611]	[0.0601]	[0.0506]	[0.0515]	[0.0508]
Border Department	0.0624	0.0591	0.0631	0.113	0.0993	0.111	0.151***	0.148***	0.151***	0.0253	0.0254	0.0352
	[0.0591]	[0.0619]	[0.0624]	[0.158]	[0.163]	[0.161]	[0.0492]	[0.0524]	[0.0500]	[0.0419]	[0.0441]	[0.0456]
Distance to Paris	-0.0012***	-0.0012***	-0.0012***	-0.0015*	-0.0015*	-0.0014	-0.0003	-0.0002	-0.0002	0.0004	0.0004	0.0003
	[0.0003]	[0.0004]	[0.0004]	[0.0009]	[0.0009]	[0.0009]	[0.0003]	[0.0003]	[0.0003]	[0.0002]	[0.0003]	[0.0003]
Paris and Suburbs	0.0944	0.0741	0.0906	-0.125	-0.186	-0.129	0.236***	0.218***	0.235***	0.346**	0.348**	0.356*
	[0.0968]	[0.102]	[0.0981]	[0.187]	[0.218]	[0.200]	[0.0824]	[0.0746]	[0.0803]	[0.170]	[0.163]	[0.182]
Alsace-Lorraine							0.00222	0.00619	0.00216	0.0230	0.0249	0.0219
							[0.0729]	[0.0727]	[0.0735]	[0.0939]	[0.0941]	[0.0812]
Urban Population in 1700	0.0323**	0.0319**	0.0312**	-0.0181	-0.0170	-0.0155	0.0336***	0.0339***	0.0341***	0.0594***	0.0599***	0.0567***
	[0.0154]	[0.0153]	[0.0148]	[0.0342]	[0.0340]	[0.0328]	[0.0110]	[0.0108]	[0.0104]	[0.0126]	[0.0131]	[0.0128]
Observations	87	87	87	85	85	85	87	87	87	89	89	89
	First stage: the instrumented variable is Horse Power of Steam Engines											
Distance to Fresnes	-0.0073***	-0.0085***	-0.0102***	-0.0073***	-0.0082***	-0.0100***	-0.0075***	-0.0087***	-0.0106***	-0.0075***	-0.0084***	-0.0097***
	[0.0026]	[0.0030]	[0.0032]	[0.0027]	[0.0030]	[0.0033]	[0.0027]	[0.0030]	[0.0033]	[0.0026]	[0.0029]	[0.0030]
Squared Temperature Deviations (1856-1859)	-4.350*	-3.504	-2.109	-3.986*	-3.322	-1.906	-4.152*	-3.282	-1.762	-4.254**	-3.781*	-2.903
	[2.246]	[2.442]	[2.709]	[2.337]	[2.504]	[2.741]	[2.313]	[2.497]	[2.737]	[2.092]	[2.175]	[2.311]
F-stat (1st stage)	12.963	13.352	14.769	12.134	12.294	13.646	12.708	13.114	14.480	13.644	13.739	14.953
J-stat (p-value)	0.255	0.347	0.349	0.644	0.896	0.891	0.842	0.953	0.988	0.101	0.101	0.342

Note: All regressions include a dummy variable for the three departments which had no steam engine in 1860-1865. Aerial distances are measured in kilometers. Other explanatory variables, except the dummies, and the dependent variables are in logarithm. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** at the 5%-level, * at the 10%-level.

Table B.13: Industrialization and income per capita, accounting for the share of grooms who signed their marriage license before 1820

	(1) IV	(2) IV	(3) IV	(4) IV	(5) IV	(6) IV	(7) IV	(8) IV	(9) IV	(10) IV	(11) IV	(12) IV	(13) IV	
	GDP per capita, 1860					GDP per capita, 1901				GDP per capita, 1930			GDP per ca	
Horse Power of Steam Engines	0.102***	0.0860***	0.0680*	0.0679*	0.190***	0.177**	0.151**	0.0999***	0.0970***	0.0935***	0.0775***	-0.0603***	-0.0584**	-0
	[0.0366]	[0.0320]	[0.0360]	[0.0358]	[0.0696]	[0.0706]	[0.0727]	[0.0244]	[0.0218]	[0.0231]	[0.0221]	[0.0221]	[0.0230]	[
Grooms who Signed their Marriage License, 1686-1690		0.0069***			0.0053*				0.0032**				0.0007	
		[0.00177]			[0.0030]				[0.0014]				[0.0012]	
Grooms who Signed their Marriage License, 1786-1790			0.0028**			0.0004				0.0003				
			[0.0012]			[0.0024]				[0.0011]				[
Grooms who Signed their Marriage License, 1816-1820				0.0032**			0.0015				0.0021*			
				[0.0014]			[0.0025]				[0.0011]			
Latitude	-3.884***	-3.476**	-3.251**	-3.561**	-8.849**	-8.268**	-6.717*	-2.982**	-3.192**	-2.968**	-2.602**	1.705*	2.123**	
	[1.413]	[1.506]	[1.541]	[1.527]	[3.566]	[3.440]	[3.648]	[1.218]	[1.269]	[1.266]	[1.186]	[1.029]	[0.969]	
Land Suitability	0.0968	0.0907	0.0366	0.0145	0.247	0.188	0.143	0.223***	0.215***	0.207***	0.150**	-0.0551	-0.0772	
	[0.0907]	[0.0773]	[0.0848]	[0.0887]	[0.153]	[0.173]	[0.172]	[0.0659]	[0.0684]	[0.0788]	[0.0749]	[0.0770]	[0.0654]	[
Average Rainfall (Fall 1845-1859)	0.0002	0.0003	0.0002	0.0002	0.0006	0.0003	0.0003	-0.0002	-0.0001	-0.0001	-0.0002	-0.0004**	-0.00053**	-
	[0.0003]	[0.0003]	[0.0003]	[0.0003]	[0.0005]	[0.0005]	[0.0005]	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[
Average Temperature	0.174	0.263	0.347	0.357	-0.773	-0.641	-0.468	-0.256**	-0.248	-0.227	-0.0396	0.0195	0.273	
	[0.165]	[0.196]	[0.233]	[0.240]	[0.479]	[0.497]	[0.489]	[0.113]	[0.158]	[0.197]	[0.193]	[0.123]	[0.177]	
Rivers and Tributaries	-0.0533	-0.0390	-0.00506	-0.00274	-0.126	-0.0748	-0.0677	0.0278	0.0181	0.0385	0.0473*	0.0817**	0.0898***	0
	[0.0507]	[0.0505]	[0.0495]	[0.0501]	[0.116]	[0.110]	[0.106]	[0.0293]	[0.0310]	[0.0299]	[0.0277]	[0.0321]	[0.0347]	[
Share of Carboniferous Area	-0.102	0.0754	-0.0610	-0.0375	-0.198	-0.411	-0.313	0.00112	0.138	0.0195	0.0934	-0.0807	-0.0937	-
	[0.212]	[0.208]	[0.207]	[0.205]	[0.313]	[0.292]	[0.276]	[0.141]	[0.145]	[0.144]	[0.134]	[0.130]	[0.144]	
Paris and Suburbs	0.0944	0.0206	0.00787	-0.0131	-0.0390	-0.0534	-0.0512	0.236***	0.123***	0.125***	0.0911*	0.346**	0.107**	
	[0.0968]	[0.110]	[0.114]	[0.132]	[0.197]	[0.203]	[0.208]	[0.0824]	[0.0439]	[0.0468]	[0.0473]	[0.170]	[0.0438]	[
Maritime Department	0.0373	-0.0053	0.0132	0.0165	0.0538	0.0631	0.0597	0.0103	0.00602	0.0142	0.0055	-0.0169	-0.0544	-
	[0.0607]	[0.0667]	[0.0668]	[0.0668]	[0.145]	[0.149]	[0.139]	[0.0595]	[0.0702]	[0.0718]	[0.0658]	[0.0506]	[0.0492]	[
Border Department	0.0624	0.0246	0.0202	0.0278	0.0707	0.122	0.0936	0.151***	0.122***	0.143***	0.119**	0.0253	0.00423	
	[0.0591]	[0.0505]	[0.0620]	[0.0579]	[0.142]	[0.146]	[0.133]	[0.0492]	[0.0464]	[0.0520]	[0.0473]	[0.0419]	[0.0436]	[
Distance to Paris	-0.0012***	-0.00089**	-0.0011***	-0.0012***	-0.0014	-0.0016*	-0.0013	-0.00026	-0.00023	-0.00032	-0.0003	0.0004	0.0004*	0
	[0.0003]	[0.0004]	[0.0004]	[0.0004]	[0.0009]	[0.0008]	[0.0009]	[0.0003]	[0.0003]	[0.0003]	[0.0003]	[0.0003]	[0.0002]	[
Alsace-Lorraine								0.00222				0.0230		
								[0.0729]				[0.0939]		
Urban Population in 1700	0.0323**	0.0312**	0.0379**	0.0417**	-0.0202	-0.00944	-0.000302	0.0336***	0.0271**	0.0295**	0.0365***	0.0594***	0.0555***	0.
	[0.0154]	[0.0153]	[0.0158]	[0.0167]	[0.0334]	[0.0341]	[0.0340]	[0.0110]	[0.0114]	[0.0127]	[0.0119]	[0.0126]	[0.0105]	[
Observations	87	75	78	77	75	78	77	87	75	78	77	89	76	
	First stage: the instrumented variable is Horse Power of Steam Engines													
Distance to Fresnes	-0.0073***	-0.0080***	-0.0076***	-0.0065**	-0.0079***	-0.0076***	-0.0065**	-0.0075***	-0.0079***	-0.0075***	-0.0065**	-0.0075***	-0.0079***	-0
	[0.0026]	[0.0027]	[0.0028]	[0.0030]	[0.0027]	[0.0028]	[0.0030]	[0.0027]	[0.0027]	[0.0028]	[0.0030]	[0.0026]	[0.0027]	[
Squared Temperature Deviations (1856-1859)	-4.350*	-3.750	-4.128	-4.343*	-3.750	-4.128	-4.343*	-4.152*	-3.750	-4.128	-4.343*	-4.254**	-3.983*	-
	[2.246]	[2.314]	[2.489]	[2.404]	[2.314]	[2.489]	[2.404]	[2.313]	[2.314]	[2.489]	[2.404]	[2.092]	[2.234]	
F-stat (1st stage)	12.963	12.500	10.605	9.662	12.500	10.605	9.662	12.708	12.500	10.605	9.662	13.644	13.244	
J-stat (p-value)	0.255	0.087	0.100	0.102	0.647	0.638	0.866	0.842	0.527	0.631	0.779	0.101	0.381	

Note: All regressions include a dummy variable for the three departments which had no steam engine in 1860-1865. Aerial distances are measured in kilometers. Other explanatory variables, except the dummies, and the dependent variables are in logarithm. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** at the 5%-level, * at the 10%-level.

Table B.14: Industrialization and income per capita, accounting for religious minorities in 1861

	(1) IV	(2) IV	(3) IV	(4) IV	(5) IV	(6) IV	(7) IV	(8) IV	(9) IV	(10) IV	(11) IV	(12) IV	(13) IV	(14) IV	(15) IV	(16) IV
	GDP per capita, 1860					GDP per capita, 1901				GDP per capita, 1930			GDP per capita, 2001-2005 average			
Horse Power of Steam Engines	0.102***	0.104***	0.108***	0.107***	0.231***	0.222***	0.250***	0.240***	0.0999***	0.0908***	0.107***	0.0965***	-0.0603***	-0.0606***	-0.0602***	-0.0593***
	[0.0366]	[0.0383]	[0.0383]	[0.0388]	[0.0796]	[0.0782]	[0.0861]	[0.0841]	[0.0244]	[0.0238]	[0.0254]	[0.0241]	[0.0221]	[0.0220]	[0.0223]	[0.0219]
Jews in Population 1861		-1.106		2.005		26.42		26.12		23.49***		30.81***		18.05*		22.24**
		[3.756]		[4.653]		[42.97]		[44.37]		[8.148]		[8.386]		[10.31]		[9.832]
Protestants in Population 1861			-0.383	-0.465			-1.550*	-1.544*			-0.877***	-1.037***			-0.0688	-0.422
			[0.358]	[0.396]			[0.893]	[0.889]			[0.263]	[0.207]			[0.235]	[0.298]
Average Rainfall (Fall 1845-1859)	0.0002	0.0002	0.0001	0.0002	0.0003	0.0003	0.0003	0.0003	-0.0002	-0.0001	-0.0002	-0.0002	-0.0004**	-0.0004**	-0.0004**	-0.0004**
	[0.0003]	[0.0003]	[0.0003]	[0.0003]	[0.0005]	[0.0005]	[0.0006]	[0.0005]	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[0.0002]
Average Temperature	0.174	0.183	0.178	0.162	-0.359	-0.390	-0.423	-0.452	-0.256**	-0.284***	-0.288**	-0.329***	0.0195	0.00321	0.0167	-0.0181
	[0.165]	[0.175]	[0.174]	[0.183]	[0.401]	[0.383]	[0.433]	[0.413]	[0.113]	[0.103]	[0.120]	[0.107]	[0.123]	[0.120]	[0.125]	[0.120]
Latitude	-3.884***	-3.796**	-3.772***	-3.961**	-8.752**	-9.058***	-9.535**	-9.834***	-2.982**	-3.380***	-3.194***	-3.753***	1.705*	1.207	1.699	1.044
	[1.413]	[1.547]	[1.447]	[1.555]	[3.686]	[3.505]	[3.888]	[3.714]	[1.218]	[1.187]	[1.225]	[1.167]	[1.029]	[1.072]	[1.034]	[1.118]
Land Suitability	0.0968	0.0938	0.0970	0.102	0.224	0.229	0.251	0.255	0.223***	0.228***	0.239***	0.247***	-0.0551	-0.0664	-0.0532	-0.0573
	[0.0907]	[0.0933]	[0.0932]	[0.0950]	[0.181]	[0.177]	[0.188]	[0.183]	[0.0659]	[0.0609]	[0.0668]	[0.0607]	[0.0770]	[0.0745]	[0.0777]	[0.0740]
Rivers and Tributaries	-0.0533	-0.0542	-0.0550	-0.0556	-0.138	-0.131	-0.148	-0.141	0.0278	0.0353	0.0232	0.0323	0.0817**	0.0704**	0.0822**	0.0706**
	[0.0507]	[0.0511]	[0.0522]	[0.0521]	[0.114]	[0.107]	[0.120]	[0.112]	[0.0293]	[0.0269]	[0.0306]	[0.0268]	[0.0321]	[0.0333]	[0.0321]	[0.0329]
Share of Carboniferous Area	-0.102	-0.103	-0.104	-0.104	-0.333	-0.313	-0.324	-0.304	0.00112	0.0338	-0.00943	0.0316	-0.0807	-0.0751	-0.0809	-0.0748
	[0.212]	[0.213]	[0.213]	[0.212]	[0.327]	[0.322]	[0.334]	[0.328]	[0.141]	[0.139]	[0.135]	[0.132]	[0.130]	[0.132]	[0.130]	[0.132]
Maritime Department	0.0373	0.0322	0.0266	0.0335	0.0151	0.0353	0.0213	0.0412	0.0103	0.0352	0.00644	0.0384	-0.0169	-0.00172	-0.0171	0.00108
	[0.0607]	[0.0695]	[0.0645]	[0.0686]	[0.153]	[0.143]	[0.155]	[0.146]	[0.0595]	[0.0609]	[0.0576]	[0.0586]	[0.0506]	[0.0498]	[0.0506]	[0.0502]
Border Department	0.0624	0.0666	0.0630	0.0557	0.113	0.0903	0.0908	0.0686	0.151***	0.134***	0.135***	0.109**	0.0253	0.0156	0.0237	0.00397
	[0.0591]	[0.0652]	[0.0611]	[0.0666]	[0.158]	[0.148]	[0.162]	[0.152]	[0.0492]	[0.0454]	[0.0498]	[0.0454]	[0.0419]	[0.0412]	[0.0423]	[0.0402]
Distance to Paris	-0.0012***	-0.0012***	-0.0011***	-0.0012***	-0.0015*	-0.0017**	-0.0015*	-0.0017**	-0.00026	-0.0004	-0.0002	-0.0004	0.0004	0.0002	0.0004	0.0002
	[0.00035]	[0.0004]	[0.00037]	[0.0004]	[0.0009]	[0.0008]	[0.0009]	[0.0008]	[0.0003]	[0.0003]	[0.0003]	[0.0003]	[0.0002]	[0.0003]	[0.0002]	[0.0003]
Paris and Suburbs	0.0944	0.0992	0.102	0.0938	-0.125	-0.202	-0.118	-0.195	0.236***	0.164***	0.243***	0.151***	0.346**	0.287**	0.347**	0.278**
	[0.0968]	[0.100]	[0.0981]	[0.0999]	[0.187]	[0.232]	[0.192]	[0.237]	[0.0824]	[0.0596]	[0.0808]	[0.0540]	[0.170]	[0.136]	[0.170]	[0.130]
Alsace-Lorraine									0.00222	-0.675***	0.170	-0.687***	0.0230	-0.410*	0.0324	-0.454**
									[0.0729]	[0.224]	[0.128]	[0.227]	[0.0939]	[0.234]	[0.101]	[0.228]
Urban Population in 1700	0.0323**	0.0325**	0.0326**	0.0320**	-0.0181	-0.0238	-0.0213	-0.0269	0.0336***	0.0271**	0.0342***	0.0258**	0.0594***	0.0548***	0.0595***	0.0539***
	[0.0154]	[0.0156]	[0.0156]	[0.0158]	[0.0342]	[0.0333]	[0.0353]	[0.0342]	[0.0110]	[0.0110]	[0.0113]	[0.0110]	[0.0126]	[0.0115]	[0.0126]	[0.0112]
Observations	87	87	87	87	85	85	85	85	87	87	87	87	89	89	89	89
	First stage: the instrumented variable is Horse Power of Steam Engines															
Distance to Fresnes	-0.0073***	-0.0076***	-0.0075***	-0.0075***	-0.0073***	-0.0078***	-0.0071***	-0.0076***	-0.0075***	-0.0076***	-0.0075***	-0.0075***	-0.0075***	-0.0075***	-0.0075***	-0.0074***
	[0.0026]	[0.0028]	[0.0027]	[0.0027]	[0.0027]	[0.0029]	[0.0027]	[0.0028]	[0.0027]	[0.0028]	[0.0027]	[0.0028]	[0.0026]	[0.0027]	[0.0026]	[0.0027]
Squared Temperature Deviations (1856-1859)	-4.350*	-4.050*	-4.060*	-4.020	-3.986*	-3.108	-3.684	-2.840	-4.152*	-4.013	-4.046*	-3.986	-4.254**	-4.240*	-4.226**	-4.262*
	[2.246]	[2.409]	[2.331]	[2.421]	[2.337]	[2.550]	[2.400]	[2.599]	[2.313]	[2.526]	[2.352]	[2.548]	[2.092]	[2.138]	[2.103]	[2.140]
F-stat	12.963	12.545	12.182	12.020	12.134	10.498	10.942	9.685	12.708	12.111	11.986	11.603	13.644	13.515	13.249	13.154
J-stat (p-value)	0.255	0.254	0.305	0.244	0.644	0.480	0.692	0.530	0.842	0.523	0.905	0.487	0.101	0.160	0.100	0.170

Note: All regressions include a dummy variable for the three departments which had no steam engine in 1860-1865. Aerial distances are measured in kilometers. Other explanatory variables, except the dummies, and the dependent variables are in logarithm. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** at the 5%-level, * at the 10%-level.

Table B.15: Industrialization and income per capita, accounting for migrations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	OLS	OLS	IV	IV	IV	IV	IV
	Share of the native population in each department		GDP per capita			GDP per capita	
	1901	2010		1901		2001-2005 average	
Horse Power of Steam Engines By Dpt	-0.00593	0.00809	0.231***	0.193***	-0.0603***	-0.0746***	-0.0564***
	[0.00489]	[0.00688]	[0.0796]	[0.0711]	[0.0221]	[0.0260]	[0.0213]
Share of the native population in each department 1901				-1.845***		-0.884***	
				[0.700]		[0.254]	
Share of the native population in each department 2010							-0.0261
							[0.253]
Latitude	0.0461	2.543***	-8.752**	-7.523**	1.705*	2.526**	1.681
	[0.464]	[0.502]	[3.686]	[3.582]	[1.029]	[1.155]	[1.296]
Land Suitability	-0.0309	-0.0484	0.224	0.156	-0.0551	-0.101	-0.0564
	[0.0284]	[0.0487]	[0.181]	[0.169]	[0.0770]	[0.0784]	[0.0727]
Average Rainfall, Fall 1845-1859	0.0001	0.0003***	0.0003	0.0004	-0.0004**	-0.0004*	-0.0004*
	[0.0001]	[0.0001]	[0.0005]	[0.0005]	[0.0002]	[0.0002]	[0.0002]
Average Temperature	-0.0287	0.0232	-0.359	-0.356	0.0195	0.0440	0.0154
	[0.0534]	[0.0699]	[0.401]	[0.350]	[0.123]	[0.131]	[0.120]
Rivers and Tributaries	-0.00650	0.00227	-0.138	-0.118	0.0817**	0.0819**	0.0787**
	[0.0130]	[0.0196]	[0.114]	[0.0951]	[0.0321]	[0.0385]	[0.0311]
Share of Carboniferous Area	0.0518	0.176**	-0.333	-0.235	-0.0807	-0.0491	-0.0780
	[0.0584]	[0.0724]	[0.327]	[0.276]	[0.130]	[0.124]	[0.144]
Maritime Department	0.0475**	0.00551	0.0151	0.0865	-0.0169	0.00248	-0.0170
	[0.0227]	[0.0226]	[0.153]	[0.128]	[0.0506]	[0.0519]	[0.0495]
Border Department	-0.00811	-0.00243	0.113	0.104	0.0253	0.0279	0.0255
	[0.0221]	[0.0219]	[0.158]	[0.136]	[0.0419]	[0.0471]	[0.0410]
Paris and Suburbs	-0.232***	-0.325***	-0.125	-0.546*	0.346**	0.151	0.336*
	[0.0408]	[0.0267]	[0.187]	[0.298]	[0.170]	[0.155]	[0.187]
Distance to Paris	-0.00005	0.0002	-0.0015*	-0.0015*	0.0004	0.0005**	0.0004
	[0.0001]	[0.0001]	[0.0009]	[0.0008]	[0.0002]	[0.0003]	[0.0003]
Alsace-Lorraine		-0.0123			0.0230		0.0192
		[0.0346]			[0.0939]		[0.0912]
Urban Population in 1700	-0.0183***	-0.0074	-0.0181	-0.0460	0.0594***	0.0481***	0.0585***
	[0.00564]	[0.00528]	[0.0342]	[0.0321]	[0.0126]	[0.0119]	[0.0124]
Adjusted R2	0.567	0.624					
Observations	87	89	85	85	89	87	89
			First stage: the instrumented variable is Horse Power of Steam Engines				
Distance to Fresnes			-0.0073***	-0.0073**	-0.0075***	-0.0071**	-0.0061**
			[0.0027]	[0.0028]	[0.0026]	[0.0028]	[0.0028]
Squared Temperature Deviations (1856-1859)			-3.986*	-3.960	-4.254**	-4.292*	-5.210**
			[2.337]	[2.466]	[2.092]	[2.243]	[2.289]
F-stat (1st stage)	15.016	123.775	12.134	12.132	13.644	12.795	14.242
J-stat (p-value)			0.644	0.237	0.101	0.289	0.088

Note: Data on the native population in 1861 and 1930 are not available. All regressions include a dummy variable for the three departments which had no steam engine in 1860-1865. Aerial distances are measured in kilometers. Other explanatory variables, except the dummies, and the dependent variables are in logarithm. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** at the 5%-level, * at the 10%-level.

Table B.16: Industrialization and income per capita, accounting for the population of the department

	(1) IV	(2) IV	(3) IV	(4) IV	(5) IV	(6) IV	(7) IV	(8) IV	(9) IV	(10) IV	(11) IV	(12) IV	(13) IV	(14) IV	(15) IV	(16) IV	(17) IV	(18) IV
	Population of department				GDP per capita		GDP per capita				GDP per capita					GDP per capita		
	1861	1901	1921	2010	1860		1901				1930					2001-2005 average		
Horse Power of Steam Engines	-0.0605	-0.0437	-0.00538	-0.0708	0.102***	0.0766**	0.231***	0.181***	0.222***	0.0999***	0.0933***	0.0999***	0.0989***	-0.0603***	-0.0292**	-0.0419**	-0.0474**	-0.0441**
	[0.0485]	[0.0613]	[0.0543]	[0.0775]	[0.0366]	[0.0302]	[0.0796]	[0.0670]	[0.0821]	[0.0244]	[0.0220]	[0.0274]	[0.0261]	[0.0221]	[0.0138]	[0.0183]	[0.0187]	[0.0177]
Department Population 1861						-0.192**		-0.485***			-0.0673				0.204***			
						[0.0932]		[0.180]			[0.0769]				[0.0552]			
Department Population 1901									-0.467**			-0.0256				0.227***		
									[0.184]			[0.0758]				[0.0531]		
Department Population 1921													0.00604				0.224***	
													[0.0627]				[0.0481]	
Department Population 2010																		0.170***
																		[0.0283]
Latitude	10.48***	7.864***	9.788***	10.96***	-3.884***	-1.492	-8.752**	-2.952	-4.034	-2.982**	-2.212**	-2.810**	-3.019***	1.705*	-0.847	-0.690	-0.685	0.0390
	[1.892]	[2.726]	[1.903]	[2.995]	[1.413]	[1.252]	[3.686]	[3.416]	[3.349]	[1.218]	[1.045]	[1.134]	[1.110]	[1.029]	[0.794]	[0.746]	[0.760]	[0.695]
Land Suitability	-0.0850	-0.0680	-0.170	-0.0441	0.0968	0.0797	0.224	0.182	0.149	0.223***	0.218***	0.219***	0.224***	-0.0551	-0.0390	-0.0290	-0.0199	-0.0577
	[0.114]	[0.146]	[0.131]	[0.202]	[0.0907]	[0.0833]	[0.181]	[0.158]	[0.182]	[0.0659]	[0.0617]	[0.0657]	[0.0662]	[0.0770]	[0.0633]	[0.0688]	[0.0721]	[0.0576]
Average Rainfall (Fall 1845-1859)	0.0003	0.00008	-0.0002	-0.0013*	0.0002	0.0002	0.0003	0.0004	0.0003	-0.0002	-0.0002	-0.0002	-0.0002	-0.0004**	-0.0005***	-0.0004***	-0.0004***	-0.0002*
	[0.0006]	[0.0007]	[0.0007]	[0.0008]	[0.0003]	[0.0003]	[0.0005]	[0.0004]	[0.0005]	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[0.0001]	[0.0001]	[0.0001]	[0.0001]
Average Temperature	0.694**	0.545	0.776***	0.567	0.174	0.334**	-0.359	0.0242	0.0308	-0.256**	-0.204**	-0.236**	-0.260**	0.0195	-0.143	-0.160	-0.163	-0.0595
	[0.292]	[0.345]	[0.301]	[0.418]	[0.165]	[0.146]	[0.401]	[0.335]	[0.366]	[0.113]	[0.0948]	[0.106]	[0.110]	[0.123]	[0.0955]	[0.105]	[0.108]	[0.0958]
Rivers and Tributaries	0.248***	0.208**	0.213***	0.344***	-0.0533	0.00602	-0.138	-0.00260	-0.0287	0.0278	0.0465	0.0341	0.0274	0.0817**	0.0161	0.00971	0.0249	0.0205
	[0.0701]	[0.0848]	[0.0811]	[0.118]	[0.0507]	[0.0423]	[0.114]	[0.0808]	[0.0909]	[0.0293]	[0.0283]	[0.0289]	[0.0287]	[0.0321]	[0.0234]	[0.0245]	[0.0253]	[0.0249]
Share of Carboniferous Area	0.385*	0.541**	0.618**	-0.374	-0.102	-0.0101	-0.333	-0.125	0.0112	0.00112	0.0326	0.0274	-0.00324	-0.0807	-0.169*	-0.259**	-0.226**	-0.0238
	[0.230]	[0.259]	[0.270]	[0.420]	[0.212]	[0.205]	[0.327]	[0.273]	[0.322]	[0.141]	[0.144]	[0.155]	[0.145]	[0.130]	[0.0943]	[0.102]	[0.103]	[0.0834]
Maritime Department	0.128	0.309**	0.273***	0.394***	0.0373	0.0623	0.0151	0.0720	0.125	0.0103	0.0195	0.0199	0.00864	-0.0169	-0.0454	-0.0812**	-0.0818**	-0.0953**
	[0.0875]	[0.122]	[0.0974]	[0.130]	[0.0607]	[0.0598]	[0.153]	[0.129]	[0.147]	[0.0595]	[0.0598]	[0.0666]	[0.0639]	[0.0506]	[0.0390]	[0.0402]	[0.0408]	[0.0377]
Border Department	0.00287	-0.0313	0.0845	0.170	0.0624	0.0660	0.113	0.118	0.165	0.151***	0.153***	0.156***	0.150***	0.0253	0.0270	0.00775	0.00928	0.00416
	[0.111]	[0.147]	[0.103]	[0.147]	[0.0591]	[0.0463]	[0.158]	[0.121]	[0.138]	[0.0492]	[0.0447]	[0.0493]	[0.0494]	[0.0419]	[0.0355]	[0.0387]	[0.0378]	[0.0343]
Paris and Suburbs	0.512	0.815*	1.095***	2.032***	0.0944	0.201*	-0.125	0.143	0.281	0.236***	0.272***	0.256***	0.229***	0.346**	0.236**	0.154**	0.0981	0.00311
	[0.352]	[0.424]	[0.415]	[0.238]	[0.0968]	[0.122]	[0.187]	[0.184]	[0.213]	[0.0824]	[0.0963]	[0.0909]	[0.0857]	[0.170]	[0.0918]	[0.0750]	[0.0833]	[0.160]
Distance to Paris	0.0013***	0.0009	0.0016***	0.0027***	-0.0012***	-0.0009***	-0.0015*	-0.0008	-0.0008	-0.0003	-0.0002	-0.0002	-0.0003	0.0004	0.00008	0.0001	0.00003	-0.00001
	[0.0005]	[0.0007]	[0.0005]	[0.0007]	[0.0003]	[0.0003]	[0.0009]	[0.0008]	[0.0008]	[0.0003]	[0.0003]	[0.0003]	[0.0003]	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[0.0002]
Alsace-Lorraine										0.00222	0.00481	-0.0901	0.00334	0.0230	-0.00217	0.544***	-0.00477	-0.0432
										[0.0729]	[0.0646]	[0.189]	[0.0724]	[0.0939]	[0.0720]	[0.128]	[0.0905]	[0.0689]
Urban Population in 1700	0.0816***	0.119***	0.131***	0.208***	0.0323**	0.0507***	-0.0181	0.0276	0.0336	0.0336***	0.0396***	0.0355***	0.0330***	0.0594***	0.0391***	0.0344***	0.0280***	0.0244**
	[0.0277]	[0.0328]	[0.0308]	[0.0371]	[0.0154]	[0.0132]	[0.0342]	[0.0270]	[0.0306]	[0.0110]	[0.0109]	[0.0119]	[0.0118]	[0.0126]	[0.0083]	[0.0086]	[0.0090]	[0.0100]
Observations	89	87	89	89	87	87	85	85	85	87	87	86	87	89	89	87	89	89
	First stage: the instrumented variable is Horse Power of Steam Engines																	
Distance to Fresnes	-0.0073***	-0.0069**	-0.0073***	-0.0073***	-0.0073***	-0.0037	-0.0073***	-0.0037	-0.0041	-0.0075***	-0.0038	-0.0041	-0.0051*	-0.0075***	-0.0037	-0.0039	-0.0048*	-0.0075***
	[0.0026]	[0.0026]	[0.0026]	[0.0026]	[0.0026]	[0.0023]	[0.0027]	[0.0024]	[0.0026]	[0.0027]	[0.0024]	[0.0026]	[0.0028]	[0.0026]	[0.0024]	[0.0026]	[0.0027]	[0.0027]
Squared Temperature Deviations (1856-1859)	-4.484**	-4.569**	-4.484**	-4.484**	-4.350*	-7.276***	-3.986*	-6.994***	-5.516***	-4.152*	-7.178***	-5.516***	-5.292**	-4.254**	-7.570***	-6.099***	-5.791***	-5.027**
	[1.995]	[2.111]	[1.995]	[1.995]	[2.246]	[1.868]	[2.337]	[1.983]	[1.974]	[2.313]	[1.953]	[1.985]	[2.023]	[2.092]	[1.811]	[1.874]	[1.885]	[1.941]
F-stat (1st stage)	14.340	13.274	14.340	14.340	12.963	18.039	12.134	16.746	12.270	12.708	17.529	12.128	12.910	13.644	20.381	14.032	14.873	15.979
J-stat (p-value)	0.022	0.039	0.118	0.806	0.255	0.033	0.644	0.135	0.254	0.842	0.569		0.847	0.101	0.012		0.029	0.072

Note: Data on the native population in 1930 are not available. All regressions include a dummy variable for the three departments which had no steam engine in 1860-1865. Aerial distances are measured in kilometers. Other explanatory variables, except the dummies, and the dependent variables are in logarithm. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** at the 5%-level, * at the 10%-level.

Table B.17: Industrialization and income per capita, accounting for the population of the department's administrative capital

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
	IV	IV	IV	IV	IV	IV	IV	IV	IV	IV	IV	IV	IV	IV	IV	IV	IV	IV
	Population of department's administrative capital				GDP per capita		GDP per capita				GDP per capita				GDP per capita			
	1861	1901	1931	2010	1860		1901				1930				2001-2005 average			
Horse Power of Steam Engines	-0.199	-0.171	-0.186	-0.319*	0.102***	0.0877***	0.231***	0.219***	0.233***	0.113***	0.101***	0.106***	0.106***	-0.0603***	-0.0456**	-0.0506***	-0.0513***	-0.0400**
	[0.160]	[0.172]	[0.175]	[0.169]	[0.0366]	[0.0306]	[0.0796]	[0.0756]	[0.0773]	[0.0255]	[0.0238]	[0.0245]	[0.0242]	[0.0221]	[0.0188]	[0.0191]	[0.0194]	[0.0167]
Population of Department's Administrative Capital 1861						0.000299		-0.0276			0.0606**				0.101***			
						[0.0416]		[0.0677]			[0.0278]				[0.0242]			
Population of Department's Administrative Capital 1901									-0.00391			0.0595***				0.0845***		
									[0.0576]			[0.0201]				[0.0192]		
Population of Department's Administrative Capital 1931													0.0604***				0.0784***	
													[0.0182]				[0.0180]	
Population of Department's Administrative Capital 2006																		0.0946***
																		[0.0201]
GDP per capita in 1860	1.096*	0.972	1.039*	1.075*														
	[0.651]	[0.612]	[0.628]	[0.594]														
Average Rainfall (Fall 1845-1859)	0.0001	-0.0007	-0.0012	-0.002*	0.0002	0.0001	0.0003	0.0003	0.0003	-0.0001	-0.0002	-0.0001	-0.0001	-0.0004**	-0.0005***	-0.0004***	-0.0004**	-0.0002
	[0.0015]	[0.0017]	[0.0017]	[0.001]	[0.0003]	[0.0003]	[0.0005]	[0.0005]	[0.0006]	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[0.0001]	[0.0001]	[0.0002]	[0.00015]
Average Temperature	0.268	0.303	-0.0354	0.224	0.174	0.156	-0.359	-0.365	-0.359	-0.280**	-0.293**	-0.282**	-0.267**	0.0195	-0.0117	-0.00671	0.0172	-0.0191
	[0.678]	[0.745]	[0.801]	[0.730]	[0.165]	[0.155]	[0.401]	[0.398]	[0.403]	[0.119]	[0.115]	[0.110]	[0.109]	[0.123]	[0.108]	[0.115]	[0.116]	[0.109]
Latitude	7.605	7.615	4.591	7.989	-3.884***	-3.851***	-8.752**	-8.717**	-8.780**	-3.501***	-3.233***	-3.196***	-3.052***	1.705*	1.414*	1.409	1.635*	1.325*
	[6.762]	[6.722]	[7.141]	[6.750]	[1.413]	[1.294]	[3.686]	[3.659]	[3.683]	[1.159]	[1.161]	[1.195]	[1.165]	[1.029]	[0.855]	[0.867]	[0.909]	[0.732]
Land Suitability	0.0530	0.0253	0.206	-0.138	0.0968	0.104	0.224	0.236	0.225	0.248***	0.217***	0.215***	0.205***	-0.0551	-0.0744	-0.0694	-0.0808	-0.0519
	[0.351]	[0.387]	[0.411]	[0.397]	[0.0907]	[0.0828]	[0.181]	[0.178]	[0.182]	[0.0747]	[0.0623]	[0.0634]	[0.0616]	[0.0770]	[0.0731]	[0.0708]	[0.0705]	[0.0668]
Rivers and Tributaries	0.451*	0.437*	0.490*	0.507**	-0.0533	-0.0520	-0.138	-0.126	-0.137	0.0404	0.0042	0.0041	0.00049	0.0817**	0.0421	0.0461*	0.0451	0.0386
	[0.240]	[0.261]	[0.269]	[0.226]	[0.0507]	[0.0517]	[0.114]	[0.110]	[0.115]	[0.0325]	[0.0333]	[0.0325]	[0.0330]	[0.0321]	[0.0265]	[0.0277]	[0.0282]	[0.0260]
Share of Carboniferous Area	0.739	0.505	0.512	-0.126	-0.102	-0.0894	-0.333	-0.313	-0.331	-0.0253	-0.0347	-0.0228	-0.0238	-0.0807	-0.136	-0.103	-0.0991	-0.0565
	[0.787]	[0.753]	[0.824]	[0.774]	[0.212]	[0.206]	[0.327]	[0.320]	[0.328]	[0.171]	[0.127]	[0.131]	[0.129]	[0.130]	[0.103]	[0.107]	[0.107]	[0.100]
Maritime Department	-0.0543	0.0322	0.202	0.440	0.0373	0.0427	0.0151	0.0210	0.0155	0.0528	0.0146	0.00451	-0.0040	-0.0169	-0.0188	-0.0255	-0.0356	-0.0619
	[0.251]	[0.296]	[0.312]	[0.297]	[0.0607]	[0.0569]	[0.153]	[0.154]	[0.154]	[0.0567]	[0.0551]	[0.0561]	[0.0552]	[0.0506]	[0.0433]	[0.0446]	[0.0464]	[0.0403]
Border Department	0.272	0.353*	0.390*	0.379	0.0624	0.0344	0.113	0.102	0.115	0.142***	0.122**	0.128**	0.124**	0.0253	0.0044	-0.0019	-0.0046	-0.0163
	[0.226]	[0.213]	[0.225]	[0.229]	[0.0591]	[0.0562]	[0.158]	[0.165]	[0.159]	[0.0513]	[0.0516]	[0.0524]	[0.0505]	[0.0419]	[0.0393]	[0.0381]	[0.0385]	[0.0324]
Distance to Paris	0.002	0.00307**	0.003	0.003*	-0.00121***	-0.00120***	-0.00153*	-0.00152*	-0.00153*	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
	[0.0016]	[0.0016]	[0.0017]	[0.002]	[0.0003]	[0.0003]	[0.0009]	[0.0009]	[0.0009]	[0.0003]	[0.0003]	[0.0003]	[0.0003]	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[0.0002]
Paris and Suburbs	0.901	1.025	1.092	0.973	0.0944	0.106	-0.125	-0.0925	-0.121	0.248**	0.176***	0.170***	0.163***	0.346**	0.246***	0.256***	0.257**	0.245**
	[0.740]	[0.829]	[0.801]	[0.643]	[0.0968]	[0.0996]	[0.187]	[0.192]	[0.197]	[0.115]	[0.0520]	[0.0507]	[0.0510]	[0.170]	[0.0909]	[0.0963]	[0.105]	[0.109]
Alsace-Lorraine	0.169		0.378	0.453						0.0276	0.0104	-0.0120	-0.0189	0.0230	-0.0262	-0.0006	-0.0130	-0.0171
	[0.368]		[0.354]	[0.394]						[0.111]	[0.0729]	[0.0732]	[0.0723]	[0.0939]	[0.0917]	[0.0867]	[0.0876]	[0.0785]
Urban Population in 1700	0.355***	0.356***	0.362***	0.366***	0.0323**	0.0386*	-0.0181	-0.00342	-0.0169		0.0113	0.0104	0.0095	0.0594***	0.0177	0.0262**	0.0278***	0.0214**
	[0.0601]	[0.0634]	[0.0659]	[0.063]	[0.0154]	[0.0211]	[0.0342]	[0.0388]	[0.0386]		[0.0147]	[0.0125]	[0.0120]	[0.0126]	[0.0113]	[0.0105]	[0.0105]	[0.0109]
Observations	86	87	87	87	87	86	85	84	85	87	86	87	87	89	88	89	89	89
	First stage: the instrumented variable is Horse Power of Steam Engines																	
Distance to Fresnes	-0.0067**	-0.0061**	-0.0063**	-0.006**	-0.0073***	-0.0085***	-0.0073***	-0.0083***	-0.0081***	-0.0081***	-0.0086***	-0.0084***	-0.0084***	-0.0075***	-0.0085***	-0.0082***	-0.0083***	-0.0088***
	[0.0027]	[0.0027]	[0.0028]	[0.0028]	[0.0026]	[0.0028]	[0.0027]	[0.0029]	[0.0028]	[0.0028]	[0.0029]	[0.0028]	[0.0028]	[0.0026]	[0.0028]	[0.0027]	[0.0027]	[0.0026]
Squared Temperature Deviations (1856-1859)	-4.134*	-4.256*	-4.074*	-4.074*	-4.350*	-4.407*	-3.986*	-4.128*	-3.741	-4.339*	-4.296*	-3.910*	-3.853*	-4.254**	-4.516**	-4.188*	-4.130*	-3.961*
	[2.372]	[2.263]	[2.331]	[2.331]	[2.246]	[2.268]	[2.337]	[2.386]	[2.351]	[2.274]	[2.364]	[2.329]	[2.306]	[2.092]	[2.177]	[2.159]	[2.145]	[2.052]
F-stat	9.641	9.050	8.817	8.82	12.963	15.737	12.134	14.537	13.717	13.559	15.264	14.277	13.988	13.644	16.620	15.199	14.877	14.766
J-stat (p-value)	0.599	0.282	0.241	0.0548	0.255	0.328	0.644	0.672	0.650	0.816	0.808	0.588	0.514	0.101	0.128	0.168	0.188	0.388

Note: All regressions include a dummy variable for the three departments which had no steam engine in 1860-1865. Aerial distances are measured in kilometers. Other explanatory variables, except the dummies, and the dependent variables are in logarithm. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** at the 5%-level, * at the 10%-level.

Table B.18: Industrialization and income per capita, accounting for iron forges before 1811

	(1) IV	(2) IV	(3) IV	(4) IV	(5) IV	(6) IV	(7) IV	(8) IV	(9) IV	(10) IV	(11) IV	)(12) IV
	GDP per capita, 1860			GDP per capita, 1901			GDP per capita, 1930			GDP per capita, 2001-205 average		
Horse Power of Steam Engines	0.102***	0.101***	0.101***	0.231***	0.231***	0.231***	0.0999***	0.0993***	0.0994***	-0.0603***	-0.0614***	-0.0614***
	[0.0366]	[0.0352]	[0.0351]	[0.0796]	[0.0789]	[0.0788]	[0.0244]	[0.0239]	[0.0238]	[0.0221]	[0.0220]	[0.0220]
Iron forges in 1789		-0.0220			-0.00369			-0.0288			-0.0129	
		[0.0459]			[0.0896]			[0.0335]			[0.0311]	
Presence of iron forges in 1811		-0.0714			-0.131			0.0364			-0.0189	
		[0.148]			[0.278]			[0.112]			[0.0791]	
Iron forges in 1811			-0.0269			-0.0116			-0.0286			-0.00785
			[0.0427]			[0.0800]			[0.0302]			[0.0295]
Presence of iron forges in 1811			-0.0565			-0.109			0.0376			-0.0320
			[0.143]			[0.264]			[0.105]			[0.0767]
Average Rainfall (Fall 1845-1859)	0.0002	0.0002	0.0002	0.0003	0.0003	0.0003	-0.0002	-0.0002	-0.0002	-0.0004**	-0.0004**	-0.0004**
	[0.0003]	[0.0003]	[0.0003]	[0.0005]	[0.0005]	[0.0005]	[0.0002]	[0.0005]	[0.0002]	[0.0002]	[0.0002]	[0.0002]
Average Temperature	0.174	0.194	0.192	-0.359	-0.324	-0.327	-0.256**	-0.254**	-0.255**	0.0195	0.0300	0.0311
	[0.165]	[0.168]	[0.168]	[0.401]	[0.413]	[0.413]	[0.113]	[0.116]	[0.116]	[0.123]	[0.124]	[0.124]
Latitude	-3.884***	-4.057***	-4.065***	-8.752**	-8.856**	-8.859**	-2.982**	-2.990**	-3.002**	1.705*	1.687	1.683
	[1.413]	[1.383]	[1.376]	[3.686]	[3.644]	[3.644]	[1.218]	[1.203]	[1.202]	[1.029]	[1.056]	[1.055]
Land Suitability	0.0968	0.101	0.102	0.224	0.224	0.225	0.223***	0.225***	0.226***	-0.0551	-0.0548	-0.0550
	[0.0907]	[0.0858]	[0.0857]	[0.181]	[0.177]	[0.177]	[0.0659]	[0.0646]	[0.0646]	[0.0770]	[0.0785]	[0.0785]
Rivers and Tributaries	-0.0533	-0.0272	-0.0274	-0.138	-0.108	-0.109	0.0278	0.0359	0.0359	0.0817**	0.0926***	0.0928***
	[0.0507]	[0.0512]	[0.0512]	[0.114]	[0.122]	[0.122]	[0.0293]	[0.0314]	[0.0314]	[0.0321]	[0.0339]	[0.0339]
Share of Carboniferous Area	-0.102	-0.0645	-0.0639	-0.333	-0.290	-0.290	0.00112	0.0134	0.0139	-0.0807	-0.0667	-0.0666
	[0.212]	[0.206]	[0.206]	[0.327]	[0.330]	[0.330]	[0.141]	[0.140]	[0.140]	[0.130]	[0.129]	[0.129]
Maritime Department	0.0373	0.0408	0.0409	0.0151	0.0154	0.0154	0.0103	0.00976	0.0101	-0.0169	-0.0173	-0.0171
	[0.0607]	[0.0584]	[0.0583]	[0.153]	[0.151]	[0.151]	[0.0595]	[0.0591]	[0.0591]	[0.0506]	[0.0512]	[0.0511]
Border Department	0.0624	0.0739	0.0729	0.113	0.133	0.131	0.151***	0.152***	0.152***	0.0253	0.0302	0.0310
	[0.0591]	[0.0608]	[0.0607]	[0.158]	[0.158]	[0.158]	[0.0492]	[0.0509]	[0.0508]	[0.0419]	[0.0440]	[0.0440]
Paris and Suburbs	0.0944	0.0597	0.0600	-0.125	-0.163	-0.162	0.236***	0.227***	0.227***	0.346**	0.333*	0.332*
	[0.0968]	[0.0965]	[0.0964]	[0.187]	[0.186]	[0.186]	[0.0824]	[0.0831]	[0.0831]	[0.170]	[0.172]	[0.172]
Distance to Paris	-0.00121***	-0.00129***	-0.00129***	-0.00153*	-0.00160*	-0.00160*	-0.000257	-0.0003	-0.0003	0.0004	0.0004	0.0004
	[0.0003]	[0.0003]	[0.0003]	[0.0009]	[0.0008]	[0.0008]	[0.0003]	[0.0003]	[0.0003]	[0.0002]	[0.0003]	[0.0003]
Alsace-Lorraine							0.0022	-0.0051	-0.0044	0.0230	0.0157	0.0154
							[0.0729]	[0.0735]	[0.0738]	[0.0939]	[0.0921]	[0.0921]
Urban Population in 1700	0.0323**	0.0311**	0.0310**	-0.0181	-0.0198	-0.0197	0.0336***	0.0337***	0.0336***	0.0594***	0.0593***	0.0591***
	[0.0154]	[0.0151]	[0.0150]	[0.0342]	[0.0336]	[0.0337]	[0.0110]	[0.0109]	[0.0108]	[0.0126]	[0.0126]	[0.0125]
Observations	87	87	87	85	85	85	87	87	87	89	89	89
	First stage: the instrumented variable is Horse Power of Steam Engines											
Distance to Fresnes	-0.0073***	-0.0075***	-0.0076***	-0.0073***	-0.0074**	-0.0075**	-0.0075***	-0.0077***	-0.0077***	-0.0075***	-0.0077***	-0.0077***
	[0.0026]	[0.0028]	[0.0028]	[0.0027]	[0.0028]	[0.0028]	[0.0027]	[0.0029]	[0.0028]	[0.0026]	[0.0028]	[0.0028]
Squared Temperature Deviations (1856-1859)	-4.350*	-4.224*	-4.200*	-3.986*	-3.911	-3.889	-4.152*	-4.051*	-4.030*	-4.254**	-4.161*	-4.140*
	[2.246]	[2.313]	[2.313]	[2.337]	[2.394]	[2.394]	[2.313]	[2.372]	[2.373]	[2.092]	[2.150]	[2.150]
F-stat	12.963	12.404	12.408	12.134	11.646	11.656	12.708	12.175	12.186	13.644	13.106	13.108
J-stat (p-value)	0.255	0.120	0.124	0.644	0.518	0.522	0.842	0.762	0.772	0.101	0.143	0.144

Note: All regressions include a dummy variable for the three departments which had no steam engine in 1860-1865. Aerial distances are measured in kilometers. Other explanatory variables, except the dummies, and the dependent variables are in logarithm. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** at the 5%-level, * at the 10%-level.

Table B.19: Industrialization and income per capita, accounting for mines in 1837

	(1) IV	(2) IV	(3) IV	(4) IV	(5) IV	(6) IV	(7) IV	(8) IV
	GDP per capita, 1860		GDP per capita, 1901		GDP per capita, 1930		GDP per capita, 2001-2005	
Horse Power of Steam Engines	0.102***	0.150**	0.231***	0.304**	0.0999***	0.128***	-0.0603***	-0.0591**
	[0.0366]	[0.0593]	[0.0796]	[0.129]	[0.0244]	[0.0393]	[0.0221]	[0.0261]
Area Covered by Mines in Department		-0.0428**		-0.0654		-0.0263*		0.0029
		[0.0210]		[0.0445]		[0.0153]		[0.0090]
Average Rainfall (Fall 1845-1859)	0.0002	0.00001	0.0003	0.0001	-0.0002	-0.0003	-0.0004**	-0.0004**
	[0.00028]	[0.0003]	[0.0005]	[0.0006]	[0.0002]	[0.0002]	[0.0002]	[0.0002]
Average Temperature	0.174	0.105	-0.359	-0.491	-0.256**	-0.307**	0.0195	0.0232
	[0.165]	[0.207]	[0.401]	[0.475]	[0.113]	[0.141]	[0.123]	[0.130]
Latitude	-3.884***	-4.302**	-8.752**	-9.892**	-2.982**	-3.334**	1.705*	1.650
	[1.413]	[1.765]	[3.686]	[4.437]	[1.218]	[1.408]	[1.029]	[1.024]
Land Suitability	0.0968	0.129	0.224	0.280	0.223***	0.246***	-0.0551	-0.0586
	[0.0907]	[0.109]	[0.181]	[0.213]	[0.0659]	[0.0740]	[0.0770]	[0.0772]
Rivers and Tributaries	-0.0533	-0.0791	-0.138	-0.178	0.0278	0.0118	0.0817**	0.0795**
	[0.0507]	[0.0648]	[0.114]	[0.142]	[0.0293]	[0.0379]	[0.0321]	[0.0320]
Share of Carboniferous Area	-0.102	0.0371	-0.333	-0.105	0.00112	0.0853	-0.0807	-0.0895
	[0.212]	[0.239]	[0.327]	[0.385]	[0.141]	[0.155]	[0.130]	[0.129]
Maritime Department	0.0373	0.0431	0.0151	0.0431	0.0103	0.0180	-0.0169	-0.0182
	[0.0607]	[0.0715]	[0.153]	[0.173]	[0.0595]	[0.0657]	[0.0506]	[0.0505]
Border Department	0.0624	0.0228	0.113	0.0481	0.151***	0.123**	0.0253	0.0301
	[0.0591]	[0.0759]	[0.158]	[0.182]	[0.0492]	[0.0627]	[0.0419]	[0.0483]
Paris and Suburbs	0.0944	0.101	-0.125	-0.123	0.236***	0.238***	0.346**	0.345**
	[0.0968]	[0.106]	[0.187]	[0.202]	[0.0824]	[0.0843]	[0.170]	[0.169]
Distance to Paris	-0.0012***	-0.0009**	-0.0015*	-0.0012	-0.0003	-0.0001	0.0004	0.0004
	[0.0003]	[0.0004]	[0.0009]	[0.0010]	[0.0003]	[0.0003]	[0.0002]	[0.0003]
Alsace-Lorraine					0.0022	0.0356	0.0230	0.0173
					[0.0729]	[0.0877]	[0.0939]	[0.0918]
Urban Population in 1700	0.0323**	0.0329**	-0.0181	-0.0201	0.0336***	0.0339***	0.0594***	0.0586***
	[0.0154]	[0.0165]	[0.0342]	[0.0374]	[0.0110]	[0.0115]	[0.0126]	[0.0125]
Observations	87	87	85	85	87	87	89	89
	First stage: the instrumented variable is Horse Power of Steam Engines							
Distance to Fresnes	-0.00732***	-0.00528**	-0.00729***	-0.00495**	-0.00753***	-0.00525**	-0.00750***	-0.00521**
	[0.00261]	[0.00230]	[0.00269]	[0.00236]	[0.00270]	[0.00234]	[0.00263]	[0.00232]
Squared Temperature Deviations (1856-1859)	-4.350*	-3.023	-3.986*	-2.851	-4.152*	-3.051	-4.254**	-4.075**
	[2.246]	[1.989]	[2.337]	[2.058]	[2.313]	[2.046]	[2.092]	[2.024]
F-stat (1st stage)	12.963	9.479	12.134	8.363	12.708	9.366	13.644	11.507
J-stat (p-value)	0.255	0.294	0.644	0.648	0.842	0.817	0.101	0.096

Note: All regressions include a dummy variable for the three departments which had no steam engine in 1860-1865. Aerial distances are measured in kilometers. All the other explanatory variables, except the dummies, and the dependent variables are in logarithm. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** indicates significance at the 5%-level, * indicates significance at the 10%-level.

Table B.20: Industrialization and income per capita, accounting for market integration during the French Revolution

	(1) IV	(2) IV	(3) IV	(4) IV	(5) IV	(6) IV	(7) IV	(8) IV
	GDP per capita, 1860			GDP per capita, 1901		GDP per capita, 1930		GDP per capita, 2001-2005
Horse Power of Steam Engines	0.102***	0.0949**	0.231***	0.233***	0.0999***	0.100***	-0.0603***	-0.0671***
	[0.0366]	[0.0373]	[0.0796]	[0.0814]	[0.0244]	[0.0260]	[0.0221]	[0.0242]
Market Integration during the French Revolution		-0.00324		-0.230**		-0.0417		0.109***
		[0.0544]		[0.103]		[0.0357]		[0.0338]
Share of Carboniferous Area	-0.102	-0.107	-0.333	-0.546	0.00112	-0.0349	-0.0807	0.00899
	[0.212]	[0.209]	[0.327]	[0.333]	[0.141]	[0.147]	[0.130]	[0.127]
Rivers and Tributaries	-0.0533	-0.0363	-0.138	-0.0567	0.0278	0.0449*	0.0817**	0.0578*
	[0.0507]	[0.0476]	[0.114]	[0.101]	[0.0293]	[0.0270]	[0.0321]	[0.0315]
Distance to Paris	-0.0012***	-0.0012***	-0.0015*	-0.0015*	-0.0003	-0.0003	0.0004	0.0004*
	[0.0003]	[0.0004]	[0.0009]	[0.0008]	[0.0003]	[0.0003]	[0.0002]	[0.0002]
Paris and Suburbs	0.0944	0.0981	-0.125	-0.267	0.236***	0.211**	0.346**	0.417***
	[0.0968]	[0.106]	[0.187]	[0.198]	[0.0824]	[0.0971]	[0.170]	[0.159]
Average Rainfall (Fall 1845-1859)	0.0002	0.0003	0.0003	0.0006	-0.0002	-0.0001	-0.0004**	-0.0004**
	[0.0003]	[0.0003]	[0.0005]	[0.0006]	[0.0002]	[0.0002]	[0.0002]	[0.0002]
Average Temperature	0.174	0.0991	-0.359	-0.750*	-0.256**	-0.342***	0.0195	0.125
	[0.165]	[0.166]	[0.401]	[0.399]	[0.113]	[0.122]	[0.123]	[0.144]
Latitude	-3.884***	-3.674***	-8.752**	-8.474***	-2.982**	-2.896**	1.705*	1.778*
	[1.413]	[1.418]	[3.686]	[3.279]	[1.218]	[1.191]	[1.029]	[0.988]
Land Suitability	0.0968	0.120	0.224	0.363**	0.223***	0.255***	-0.0551	-0.0979
	[0.0907]	[0.0859]	[0.181]	[0.174]	[0.0659]	[0.0682]	[0.0770]	[0.0808]
Maritime Department	0.0373	0.0388	0.0151	0.0701	0.0103	0.0182	-0.0169	-0.0465
	[0.0607]	[0.0608]	[0.153]	[0.135]	[0.0595]	[0.0591]	[0.0506]	[0.0461]
Border Department	0.0624	0.0622	0.113	0.0482	0.151***	0.139***	0.0253	0.0529
	[0.0591]	[0.0601]	[0.158]	[0.143]	[0.0492]	[0.0479]	[0.0419]	[0.0441]
Alsace-Lorraine					0.0022	0.0023	0.0230	0.0238
					[0.0729]	[0.0737]	[0.0939]	[0.0919]
Urban Population in 1700	0.0323**	0.0335**	-0.0181	0.0273	0.0336***	0.0418***	0.0594***	0.0387***
	[0.0154]	[0.0166]	[0.0342]	[0.0344]	[0.0110]	[0.0111]	[0.0126]	[0.0120]
Observations	87	85	85	83	87	85	89	86
	First stage: the instrumented variable is Horse Power of Steam Engines							
Distance to Fresnes	-0.0073***	-0.0063**	-0.0073***	-0.0062**	-0.0075***	-0.0065**	-0.0075***	-0.0065**
	[0.0026]	[0.0029]	[0.0027]	[0.0029]	[0.0027]	[0.0029]	[0.0026]	[0.0029]
Squared Temperature Deviations (1856-1859)	-4.350*	-4.441**	-3.986*	-4.168**	-4.152*	-4.315**	-4.254**	-4.340**
	[2.246]	[1.983]	[2.337]	[2.024]	[2.313]	[2.006]	[2.092]	[2.006]
F-stat	12.963	11.069	12.134	10.227	12.708	10.821	13.644	10.962
J-stat (p-value)	0.255	0.289	0.644	0.620	0.842	0.919	0.101	0.044

Note: All regressions include a dummy variable for the three departments which had no steam engine in 1860-1865. Aerial distances are measured in kilometers. Other explanatory variables, except the dummies, and the dependent variables are in logarithm. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** at the 5%-level, * at the 10%-level.

Table B.21: Industrialization and income per capita, accounting for the railroad network in 1860

	(1) IV	(2) IV	(3) IV	(4) IV	(5) IV	(6) IV	(7) IV	(8) IV
	GDP per capita, 1860		GDP per capita, 1901		GDP per capita, 1930		GDP per capita, 2001-2005	
Horse Power of Steam Engines	0.102***	0.105***	0.231***	0.235***	0.0999***	0.101***	-0.0603***	-0.0646***
	[0.0366]	[0.0361]	[0.0796]	[0.0781]	[0.0244]	[0.0238]	[0.0221]	[0.0206]
Railroad connection, Paris, 1860		-0.0248		0.0355		0.0310		0.0949**
		[0.0658]		[0.124]		[0.0498]		[0.0409]
Average Rainfall (Fall 1845-1859)	0.0002	0.0001	0.0003	0.0003	-0.0002	-0.0002	-0.0004**	-0.0004
	[0.0003]	[0.0003]	[0.0005]	[0.0006]	[0.0002]	[0.00020]	[0.0002]	[0.0002]
Average Temperature	0.174	0.187	-0.359	-0.383	-0.256**	-0.275**	0.0195	-0.0434
	[0.165]	[0.168]	[0.401]	[0.408]	[0.113]	[0.116]	[0.123]	[0.113]
Land Suitability	0.0968	0.0988	0.224	0.220	0.223***	0.220***	-0.0551	-0.0632
	[0.0907]	[0.0892]	[0.181]	[0.184]	[0.0659]	[0.0651]	[0.0770]	[0.0701]
Latitude	-3.884***	-4.031***	-8.752**	-8.719**	-2.982**	-2.889**	1.705*	2.138**
	[1.413]	[1.418]	[3.686]	[3.752]	[1.218]	[1.205]	[1.029]	[1.084]
Rivers and Tributaries	-0.0533	-0.0513	-0.138	-0.147	0.0278	0.0212	0.0817**	0.0692**
	[0.0507]	[0.0497]	[0.114]	[0.115]	[0.0293]	[0.0293]	[0.0321]	[0.0314]
Share of Carboniferous Area	-0.102	-0.126	-0.333	-0.299	0.00112	0.0301	-0.0807	-0.00628
	[0.212]	[0.229]	[0.327]	[0.367]	[0.141]	[0.162]	[0.130]	[0.130]
Maritime Department	0.0373	0.0327	0.0151	0.0209	0.0103	0.0148	-0.0169	-0.00238
	[0.0607]	[0.0647]	[0.153]	[0.155]	[0.0595]	[0.0611]	[0.0506]	[0.0547]
Border Department	0.0624	0.0660	0.113	0.111	0.151***	0.148***	0.0253	0.00854
	[0.0591]	[0.0596]	[0.158]	[0.157]	[0.0492]	[0.0480]	[0.0419]	[0.0391]
Paris and Suburbs	0.0944	0.0901	-0.125	-0.121	0.236***	0.240***	0.346**	0.357**
	[0.0968]	[0.0970]	[0.187]	[0.188]	[0.0824]	[0.0823]	[0.170]	[0.174]
Distance to Paris	-0.0012***	-0.0012***	-0.0015*	-0.0015*	-0.0003	-0.0002	0.0004	0.0005*
	[0.0003]	[0.0003]	[0.0009]	[0.0009]	[0.0003]	[0.0003]	[0.0002]	[0.0002]
Alsace-Lorraine					0.0022	-0.0089	0.0230	0.0036
					[0.0729]	[0.0747]	[0.0939]	[0.0931]
Urban Population in 1700	0.0323**	0.0320**	-0.0181	-0.0194	0.0336***	0.0330***	0.0594***	0.0593***
	[0.0154]	[0.0152]	[0.0342]	[0.0340]	[0.0110]	[0.0107]	[0.0126]	[0.0126]
Observations	87	87	85	85	87	87	89	89
First stage: the instrumented variable is Horse Power of Steam Engines								
Distance to Fresnes	-0.0073***	-0.0085***	-0.0073***	-0.0084***	-0.0075***	-0.0087***	-0.0075***	-0.0087***
	[0.0026]	[0.0031]	[0.0027]	[0.0031]	[0.0027]	[0.0031]	[0.0026]	[0.0031]
Squared Temperature Deviations (1856-1859)	-4.350*	-3.681	-3.986*	-3.424	-4.152*	-3.520	-4.254**	-3.505
	[2.246]	[2.384]	[2.337]	[2.416]	[2.313]	[2.398]	[2.092]	[2.337]
F-stat (1st stage)	12.963	12.928	12.134	11.852	12.708	12.621	13.644	14.179
J-stat (p-value)	0.255	0.277	0.644	0.572	0.842	0.668	0.101	0.419

Note: All regressions include a dummy variable for the three departments which had no steam engine in 1860-1865. Aerial distances are measured in kilometers. Other explanatory variables, except the dummies, and the dependent variables are in logarithm. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** at the 5%-level, * at the 10%-level.

Table B.22: Industrialization and income per capita, accounting for the concentration of the industrial sector in 1860-1865 by horse power

	(1) IV	(2) IV	(3) IV	(4) IV	(5) IV	(6) IV	(7) IV	(8) IV
	GDP per capita, 1860		GDP per capita, 1901		GDP per capita, 1930		GDP per capita, 2001-2005	
Horse Power of Steam Engines	0.102***	0.0852**	0.231***	0.219***	0.0999***	0.0951***	-0.0603***	-0.0560***
	[0.0366]	[0.0342]	[0.0796]	[0.0762]	[0.0244]	[0.0238]	[0.0221]	[0.0211]
Concentration Index (Horse Power by Sector)		0.124		0.292		0.0866		-0.124
		[0.114]		[0.255]		[0.0937]		[0.0929]
Average Rainfall (Fall 1845-1859)	0.0002	0.0001	0.0003	0.0001	-0.0002	-0.0003	-0.0004**	-0.0004**
	[0.0003]	[0.0003]	[0.0005]	[0.0005]	[0.0002]	[0.0002]	[0.0002]	[0.0002]
Average Temperature	0.174	0.298*	-0.359	-0.102	-0.256**	-0.166	0.0195	0.00491
	[0.165]	[0.164]	[0.401]	[0.404]	[0.113]	[0.123]	[0.123]	[0.131]
Latitude	-3.884***	-2.806**	-8.752**	-7.960**	-2.982**	-2.695**	1.705*	0.989
	[1.413]	[1.250]	[3.686]	[3.400]	[1.218]	[1.057]	[1.029]	[0.946]
Land Suitability	0.0968	0.117	0.224	0.221	0.223***	0.227***	-0.0551	-0.0410
	[0.0907]	[0.0925]	[0.181]	[0.180]	[0.0659]	[0.0646]	[0.0770]	[0.0817]
Rivers and Tributaries	-0.0533	-0.0250	-0.138	-0.153	0.0278	0.0256	0.0817**	0.0748**
	[0.0507]	[0.0482]	[0.114]	[0.119]	[0.0293]	[0.0304]	[0.0321]	[0.0333]
Share of Carboniferous Area	-0.102	-0.231	-0.333	-0.272	0.00112	0.0205	-0.0807	0.0162
	[0.212]	[0.215]	[0.327]	[0.379]	[0.141]	[0.165]	[0.130]	[0.144]
Maritime Department	0.0373	0.0196	0.0151	-0.0138	0.0103	-0.000125	-0.0169	-0.0089
	[0.0607]	[0.0553]	[0.153]	[0.144]	[0.0595]	[0.0547]	[0.0506]	[0.0475]
Border Department	0.0624	0.0596	0.113	0.172	0.151***	0.170***	0.0253	0.0338
	[0.0591]	[0.0546]	[0.158]	[0.159]	[0.0492]	[0.0497]	[0.0419]	[0.0408]
Paris and Suburbs	0.0944	0.130	-0.125	-0.0701	0.236***	0.252***	0.346**	0.315*
	[0.0968]	[0.0983]	[0.187]	[0.198]	[0.0824]	[0.0839]	[0.170]	[0.171]
Distance to Paris	-0.0012***	-0.0010***	-0.0015*	-0.0014*	-0.0003	-0.00020	0.0004	0.0002
	[0.0003]	[0.0003]	[0.0009]	[0.0008]	[0.0003]	[0.0003]	[0.0002]	[0.0002]
Alsace-Lorraine					0.00222	-0.0317	0.0230	0.0592
					[0.0729]	[0.0745]	[0.0939]	[0.0954]
Urban Population in 1700	0.0323**	0.0385**	-0.0181	-0.00336	0.0336***	0.0381***	0.0594***	0.0539***
	[0.0154]	[0.0150]	[0.0342]	[0.0344]	[0.0110]	[0.0111]	[0.0126]	[0.0127]
Observations	87	83	85	81	87	83	89	85
	First stage: the instrumented variable is Horse Power of Steam Engines							
Distance to Fresnes	-0.0073***	-0.0075**	-0.0073***	-0.0078**	-0.0075***	-0.0079**	-0.0075***	-0.0079***
	[0.0026]	[0.0029]	[0.0027]	[0.0030]	[0.0027]	[0.0030]	[0.0026]	[0.0029]
Squared Temperature Deviations (1856-1859)	-4.350*	-4.696*	-3.986*	-4.080	-4.152*	-4.355*	-4.254**	-4.472**
	[2.246]	[2.404]	[2.337]	[2.543]	[2.313]	[2.497]	[2.092]	[2.204]
F-stat (1st stage)	12.963	12.927	12.134	12.117	12.708	12.613	13.644	13.413
J-stat (p-value)	0.255	0.192	0.644	0.664	0.842	0.835	0.101	0.184

Note: All regressions include a dummy variable for the three departments which had no steam engine in 1860-1865. Aerial distances are measured in kilometers. Other explanatory variables, except the dummies, and the dependent variables are in logarithm. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** at the 5%-level, * at the 10%-level.

Table B.23: Industrialization and income per capita, accounting for the concentration of the industrial sector in 1860-1865 by employment share

	(1) IV	(2) IV	(3) IV	(4) IV	(5) IV	(6) IV	(7) IV	(8) IV
	GDP per capita, 1860		GDP per capita, 1901		GDP per capita, 1930		GDP per capita, 2001-2005	
Horse Power of Steam Engines	0.102***	0.0957**	0.231***	0.235***	0.0999***	0.101***	-0.0603***	-0.0610***
	[0.0366]	[0.0372]	[0.0796]	[0.0798]	[0.0244]	[0.0243]	[0.0221]	[0.0235]
Concentration Index - Share of Employees in Industry		0.184		-0.165		-0.0479		0.0235
		[0.120]		[0.230]		[0.0827]		[0.0945]
Land Suitability	0.0968	0.0550	0.224	0.265	0.223***	0.235***	-0.0551	-0.0610
	[0.0907]	[0.0970]	[0.181]	[0.180]	[0.0659]	[0.0665]	[0.0770]	[0.0781]
Latitude	-3.884***	-3.832***	-8.752**	-8.827**	-2.982**	-3.026**	1.705*	1.722
	[1.413]	[1.364]	[3.686]	[3.742]	[1.218]	[1.239]	[1.029]	[1.052]
Average Rainfall (Fall 1845-1859)	0.0002	0.0001	0.0003	0.0003	-0.0002	-0.0002	-0.0004**	-0.0004**
	[0.0003]	[0.0003]	[0.0005]	[0.0005]	[0.0002]	[0.0002]	[0.0002]	[0.0002]
Average Temperature	0.174	0.258	-0.359	-0.442	-0.256**	-0.281**	0.0195	0.0305
	[0.165]	[0.175]	[0.401]	[0.410]	[0.113]	[0.121]	[0.123]	[0.136]
Rivers and Tributaries	-0.0533	-0.0500	-0.138	-0.141	0.0278	0.0269	0.0817**	0.0820**
	[0.0507]	[0.0480]	[0.114]	[0.116]	[0.0293]	[0.0294]	[0.0321]	[0.0325]
Share of Carboniferous Area	-0.102	-0.157	-0.333	-0.290	0.00112	0.0151	-0.0807	-0.0893
	[0.212]	[0.203]	[0.327]	[0.327]	[0.141]	[0.139]	[0.130]	[0.133]
Maritime Department	0.0373	0.0348	0.0151	0.0191	0.0103	0.0122	-0.0169	-0.0179
	[0.0607]	[0.0579]	[0.153]	[0.154]	[0.0595]	[0.0608]	[0.0506]	[0.0509]
Border Department	0.0624	0.0791	0.113	0.0928	0.151***	0.146***	0.0253	0.0275
	[0.0591]	[0.0587]	[0.158]	[0.161]	[0.0492]	[0.0491]	[0.0419]	[0.0434]
Paris and Suburbs	0.0944	0.117	-0.125	-0.146	0.236***	0.229***	0.346**	0.349**
	[0.0968]	[0.103]	[0.187]	[0.190]	[0.0824]	[0.0829]	[0.170]	[0.171]
Distance to Paris	-0.0012***	-0.0012***	-0.0015*	-0.0015*	-0.0003	-0.0003	0.0004	0.0004
	[0.0003]	[0.0003]	[0.0009]	[0.0009]	[0.0003]	[0.0003]	[0.0002]	[0.0002]
Alsace-Lorraine					0.0022	0.0127	0.0230	0.0204
					[0.0729]	[0.0782]	[0.0939]	[0.0900]
Urban Population in 1700	0.147*	0.148*	0.170*	0.170*	0.144*	0.145*	0.145*	0.146*
	[0.0154]	[0.0152]	[0.0342]	[0.0343]	[0.0110]	[0.0113]	[0.0126]	[0.0127]
Observations	87	87	85	85	87	87	89	89
	First stage: the instrumented variable is Horse Power of Steam Engines							
Distance to Fresnes	-0.0073***	-0.0071***	-0.0073***	-0.0073***	-0.0075***	-0.0073***	-0.0075***	-0.0073***
	[0.0026]	[0.0026]	[0.0027]	[0.0027]	[0.0027]	[0.0027]	[0.0026]	[0.0026]
Squared Temperature Deviations (1856-1859)	-4.350*	-4.320*	-3.986*	-3.983*	-4.152*	-4.174*	-4.254**	-4.223**
	[2.246]	[2.234]	[2.337]	[2.350]	[2.313]	[2.319]	[2.092]	[2.102]
F-stat (1st stage)	12.963	12.162	12.134	11.769	12.708	12.023	13.644	12.859
J-stat (p-value)	0.255	0.260	0.644	0.611	0.842	0.816	0.101	0.097

Note: All regressions include a dummy variable for the three departments which had no steam engine in 1860-1865. Aerial distances are measured in kilometers. Other explanatory variables, except the dummies, and the dependent variables are in logarithm. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** at the 5%-level, * at the 10%-level.

Table B.24: Industrialization and income per capita, accounting for firm size in 1860-1865

	(1) IV	(2) IV	(3) IV	(4) IV	(5) IV	(6) IV	(7) IV	(8) IV
	GDP per capita, 1860		GDP per capita, 1901		GDP per capita, 1930		GDP per capita, 2001-2005	
Horse Power of Steam Engines	0.102***	0.113**	0.231***	0.277***	0.0999***	0.110***	-0.0603***	-0.0628**
	[0.0366]	[0.0506]	[0.0796]	[0.104]	[0.0244]	[0.0339]	[0.0221]	[0.0280]
Number of Employees per Firm 1861-1865		-0.0039		-0.0161***		-0.0030		0.0034
		[0.0033]		[0.0062]		[0.0023]		[0.0024]
Land Suitability	0.0968	0.143	0.224	0.433**	0.223***	0.262***	-0.0551	-0.103
	[0.0907]	[0.0934]	[0.181]	[0.198]	[0.0659]	[0.0752]	[0.0770]	[0.0767]
Latitude	-3.884***	-3.593**	-8.752**	-7.876**	-2.982**	-2.954**	1.705*	1.460
	[1.413]	[1.451]	[3.686]	[3.905]	[1.218]	[1.273]	[1.029]	[1.026]
Average Rainfall (Fall 1845-1859)	0.0002	0.0001	0.0003	0.0001	-0.0002	-0.0002	-0.0004**	-0.000401*
	[0.0003]	[0.0003]	[0.0005]	[0.0005]	[0.0002]	[0.0002]	[0.0002]	[0.0002]
Average Temperature	0.174	0.0945	-0.359	-0.747	-0.256**	-0.330**	0.0195	0.0998
	[0.165]	[0.196]	[0.401]	[0.466]	[0.113]	[0.151]	[0.123]	[0.149]
Rivers and Tributaries	-0.0533	-0.0467	-0.138	-0.123	0.0278	0.0298	0.0817**	0.0698**
	[0.0507]	[0.0504]	[0.114]	[0.116]	[0.0293]	[0.0303]	[0.0321]	[0.0302]
Share of Carboniferous Area	-0.102	-0.0571	-0.333	-0.207	0.00112	0.0330	-0.0807	-0.121
	[0.212]	[0.220]	[0.327]	[0.347]	[0.141]	[0.151]	[0.130]	[0.114]
Maritime Department	0.0373	0.0294	0.0151	-0.0142	0.0103	0.00911	-0.0169	-0.0168
	[0.0607]	[0.0619]	[0.153]	[0.149]	[0.0595]	[0.0594]	[0.0506]	[0.0478]
Border Department	0.0624	0.0607	0.113	0.0753	0.151***	0.146***	0.0253	0.0339
	[0.0591]	[0.0591]	[0.158]	[0.160]	[0.0492]	[0.0501]	[0.0419]	[0.0424]
Paris and Suburbs	0.0944	0.0890	-0.125	-0.151	0.236***	0.229***	0.346**	0.352*
	[0.0968]	[0.0912]	[0.187]	[0.215]	[0.0824]	[0.0730]	[0.170]	[0.180]
Distance to Paris	-0.0012***	-0.0011***	-0.0015*	-0.0011	-0.0003	-0.0002	0.0004	0.0003
	[0.0003]	[0.0003]	[0.0009]	[0.0009]	[0.0003]	[0.0003]	[0.0002]	[0.0002]
Alsace-Lorraine					0.0022	0.0404	0.0230	-0.0146
					[0.0729]	[0.0706]	[0.0939]	[0.0654]
Urban Population in 1700	0.0323**	0.0339**	-0.0181	-0.00768	0.0336***	0.0341***	0.0594***	0.0573***
	[0.0154]	[0.0163]	[0.0342]	[0.0367]	[0.0110]	[0.0118]	[0.0126]	[0.0127]
Observations	87	87	85	85	87	87	89	89
	First stage: the instrumented variable is Horse Power of Steam Engines							
Distance to Fresnes	-0.0073***	-0.0040	-0.0073***	-0.0037	-0.0075***	-0.0037	-0.0075***	-0.0037
	[0.0026]	[0.0027]	[0.0027]	[0.0029]	[0.0027]	[0.0029]	[0.0026]	[0.0028]
Squared Temperature Deviations (1856-1859)	-4.350*	-4.173**	-3.986*	-4.401**	-4.152*	-4.410**	-4.254**	-4.724***
	[2.246]	[1.746]	[2.337]	[1.842]	[2.313]	[1.839]	[2.092]	[1.690]
F-stat (1st stage)	12.963	7.375	12.134	7.394	12.708	7.320	13.644	9.420
J-stat (p-value)	0.255	0.158	0.644	0.241	0.842	0.619	0.101	0.028

Note: All regressions include a dummy variable for the three departments which had no steam engine in 1860-1865. Aerial distances are measured in kilometers. Other explanatory variables, except the dummies, and the dependent variables are in logarithm. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** at the 5%-level, * at the 10%-level.

Appendix C. Industrialization and the Evolution of Sectoral Employment, 1861-2010

Table C.1: Industrialization and the share of workforce in industry, 1861, 1901 and 1930

	(1) OLS	(2) OLS	(3) IV	(4) OLS	(5) OLS	(6) IV	(7) OLS	(8) OLS	(9) IV
	Share of Workforce in Industry, 1861			Share of Workforce in Industry, 1901			Share of Workforce in Industry, 1930		
Horse Power of Steam Engines	0.0433***	0.0246***	0.0501***	0.0424***	0.0337***	0.0641***	0.0524***	0.0392***	0.0866***
	[0.00635]	[0.00557]	[0.0140]	[0.00611]	[0.00700]	[0.0153]	[0.00776]	[0.00794]	[0.0202]
Latitude		0.898*	0.177		0.423	-0.493		0.604	-0.533
		[0.489]	[0.556]		[0.540]	[0.654]		[0.619]	[0.810]
Land Suitability		0.0767**	0.0806**		0.0672*	0.0695*		0.0731*	0.0733
		[0.0349]	[0.0345]		[0.0366]	[0.0374]		[0.0417]	[0.0452]
Average Rainfall (Fall 1845-1859)		0.0001	0.0001		-0.0001	-0.0001		-0.0002	-0.0001
		[0.00008]	[0.00009]		[0.00008]	[0.00009]		[0.0001]	[0.0001]
Average Temperature		0.0529	0.0128		-0.0265	-0.0742		-0.0869	-0.146*
		[0.0626]	[0.0638]		[0.0691]	[0.0660]		[0.0837]	[0.0868]
Rivers and Tributaries		0.0124	-0.0082		0.0177	-0.0089		0.0237	-0.0143
		[0.0154]	[0.0179]		[0.0139]	[0.0195]		[0.0160]	[0.0225]
Share of Carboniferous Area		0.155**	0.144**		0.0636	0.0494		0.0321	0.0091
		[0.0636]	[0.0681]		[0.0614]	[0.0685]		[0.0714]	[0.0871]
Maritime Department		0.0199	0.0228		-0.0203	-0.0157		-0.00653	-0.00921
		[0.0201]	[0.0216]		[0.0227]	[0.0265]		[0.0287]	[0.0349]
Border Department		0.0641***	0.0632**		0.0485**	0.0479*		0.0866***	0.0902**
		[0.0240]	[0.0261]		[0.0238]	[0.0270]		[0.0273]	[0.0366]
Distance to Paris		0.00004	-0.00004		0.00011	0.000002		0.00019	0.00009
		[0.0001]	[0.0001]		[0.0001]	[0.0001]		[0.0002]	[0.0002]
Paris and Suburbs		0.0594	0.0497		0.0317	0.0184		0.110***	0.0942*
		[0.0629]	[0.0518]		[0.0249]	[0.0271]		[0.0387]	[0.0554]
Alsace-Lorraine								0.00551	-0.0386
								[0.0549]	[0.0495]
Urban Population in 1700		0.0169***	0.0114*		0.0104*	0.00372		0.0168***	0.007
		[0.00588]	[0.00667]		[0.00583]	[0.00641]		[0.00592]	[0.008]
Adjusted R2	0.460	0.630		0.528	0.588		0.501	0.678	
Observations	89	89	89	87	87	87	89	89	89
	First stage: the instrumented variable is Horse Power of Steam Engines								
Distance to Fresnes			-0.0073***			-0.0069**			-0.0075***
			[0.0026]			[0.0026]			[0.0026]
Squared Temperature Deviations (1856-1859)			-4.484**			-4.569**			-4.254**
			[1.995]			[2.111]			[2.092]
F-stat (1st stage)			14.340			13.274			13.644
J-stat (p-value)			0.122			0.009			0.169

Note: The dependent variables and the explanatory variables except the dummies are in logarithm. All regressions include a dummy variable for the three departments which had no steam engine in 1860-1865. Aerial distances are measured in kilometers. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** at the 5%-level, * at the 10%-level.

Table C.2: Industrialization and the share of workforce in industry, 1968-2010

	(1) OLS	(2) OLS	(3) IV	(4) OLS	(5) OLS	(6) IV	(7) OLS	(8) OLS	(9) IV
	Share of Workforce in Industry, 1968			Share of Workforce in Industry, 1975			Share of Workforce in Industry, 1982		
Horse Power of Steam Engines	0.0317***	0.0278***	0.0457***	0.0302***	0.0256***	0.0347***	0.0234***	0.0196***	0.0190***
	[0.00465]	[0.00605]	[0.0116]	[0.00406]	[0.00530]	[0.00957]	[0.00329]	[0.00418]	[0.00709]
Latitude		-0.142	-0.572		-0.215	-0.434		-0.132	-0.117
		[0.383]	[0.484]		[0.352]	[0.390]		[0.310]	[0.307]
Land Suitability		0.0352	0.0353		0.0269	0.0270		0.0131	0.0131
		[0.0309]	[0.0272]		[0.0297]	[0.0257]		[0.0252]	[0.0231]
Average Rainfall (Fall 1845-1859)		-0.00018*	-0.00016*		-0.00017*	-0.00016*		-0.00014*	-0.00014*
		[0.00010]	[0.00009]		[0.000103]	[0.00009]		[0.00008]	[0.00007]
Average Temperature		-0.0585	-0.0808		-0.0282	-0.0395		-0.00169	-0.000958
		[0.0585]	[0.0572]		[0.0592]	[0.0561]		[0.0490]	[0.0456]
Rivers and Tributaries		0.0104	-0.00394		0.00999	0.00268		0.00459	0.00507
		[0.0144]	[0.0140]		[0.0140]	[0.0132]		[0.0113]	[0.0107]
Share of Carboniferous Area		-0.0498	-0.0585		-0.0378	-0.0422		-0.0270	-0.0267
		[0.0644]	[0.0607]		[0.0609]	[0.0554]		[0.0532]	[0.0487]
Maritime Department		-0.0405**	-0.0415**		-0.0350**	-0.0355**		-0.0300**	-0.0300**
		[0.0185]	[0.0182]		[0.0171]	[0.0155]		[0.0142]	[0.0130]
Border Department		0.0617***	0.0631***		0.0469**	0.0476**		0.0185	0.0185
		[0.0215]	[0.0226]		[0.0221]	[0.0210]		[0.0181]	[0.0164]
Distance to Paris		0.0000002	-0.00004		-0.00009	-0.00011		-0.00010	-0.00010
		[0.0001]	[0.0001]		[0.0001]	[0.0001]		[0.0001]	[0.00009]
Paris and Suburbs		0.00480	-0.00118		-0.0418	-0.0448		-0.0765**	-0.0763***
		[0.0450]	[0.0485]		[0.0475]	[0.0471]		[0.0313]	[0.0287]
Alsace-Lorraine		-0.0123	-0.0289		-0.00274	-0.0112		0.0186	0.0192
		[0.0333]	[0.0278]		[0.0279]	[0.0233]		[0.0200]	[0.0192]
Urban Population in 1700		0.0043	0.0006		-0.0006	-0.0025		-0.0055	-0.0054
		[0.00472]	[0.00542]		[0.00454]	[0.00493]		[0.0035]	[0.0035]
Adjusted R2	0.375	0.579		0.384	0.561		0.348	0.553	
Observations	89	89	89	89	89	89	89	89	89
	First stage: the instrumented variable is Horse Power of Steam Engines								
Distance to Fresnes			-0.00750***			-0.00750***			-0.00750***
			[0.00263]			[0.00263]			[0.00263]
Squared Temperature Deviations (1856-1859)			-4.254**			-4.254**			-4.254**
			[2.092]			[2.092]			[2.092]
F-stat (1st stage)			13.644			13.644			13.644
J-stat (p-value)			0.341			0.449			0.406

	(10) OLS	(11) OLS	(12) IV	(13) OLS	(14) OLS	(15) IV	(16) OLS	(17) OLS	(18) IV
	Share of Workforce in Industry, 1990			Share of Workforce in Industry, 1999			Share of Workforce in Industry, 2010		
Horse Power of Steam Engines	0.0190***	0.0150***	0.00572	0.0129***	0.00937***	-0.00220	0.00592**	0.00396	-0.00917*
	[0.00339]	[0.00377]	[0.00633]	[0.00313]	[0.00268]	[0.00548]	[0.00239]	[0.00279]	[0.00543]
Average Rainfall, Fall 1845-1859		-0.00014*	-0.00015**		-0.00005	-0.00010		-0.00004	-0.00006
		[0.00007]	[0.00007]		[0.00005]	[0.00005]		[0.00004]	[0.00005]
Average Temperature		0.0190	0.0305		0.0198	0.0342		0.0239	0.0402
		[0.0466]	[0.0456]		[0.0352]	[0.0362]		[0.0321]	[0.0317]
Latitude		-0.0281	0.194		0.237	0.514*		0.350	0.665**
		[0.315]	[0.311]		[0.272]	[0.286]		[0.237]	[0.292]
Land Suitability		0.00780	0.00777		0.00175	0.00171		-0.00617	-0.00622
		[0.0229]	[0.0235]		[0.0181]	[0.0198]		[0.0180]	[0.0211]
Share of Carboniferous Area		-0.0540	-0.0495		-0.0275	-0.0218		-0.0240	-0.0176
		[0.0497]	[0.0481]		[0.0407]	[0.0414]		[0.0330]	[0.0388]
Rivers and Tributaries		0.00118	0.00861		-0.000171	0.00911		0.00868	0.0192**
		[0.0112]	[0.0117]		[0.00913]	[0.00990]		[0.00754]	[0.00834]
Maritime Department		-0.0366**	-0.0361**		-0.0357***	-0.0350***		-0.00308	-0.00234
		[0.0145]	[0.0148]		[0.0126]	[0.0135]		[0.0115]	[0.0130]
Border Department		0.00414	0.00343		-0.00882	-0.00971		-0.00466	-0.00566
		[0.0177]	[0.0162]		[0.0146]	[0.0139]		[0.0114]	[0.0117]
Distance to Paris		-0.00009	-0.00007		-0.00005	-0.00003		0.00007	0.00009
		[0.00009]	[0.00009]		[0.00008]	[0.00008]		[0.00006]	[0.00007]
Paris and Suburbs		-0.0836***	-0.0805***		-0.106***	-0.102***		-0.0435	-0.0391**
		[0.0295]	[0.0240]		[0.0226]	[0.0174]		[0.0262]	[0.0197]
Urban Population in 1700		-0.00740**	-0.00554*		-0.00856***	-0.00623**		-0.0029	-0.0003
		[0.00354]	[0.00328]		[0.00293]	[0.00276]		[0.0026]	[0.0026]
Alsace-Lorraine		0.0158	0.0244		0.0116	0.0223		0.0109	0.0232
		[0.0218]	[0.0237]		[0.0185]	[0.0210]		[0.0197]	[0.0178]
Adjusted R2	0.257	0.511		0.157	0.527		0.092	0.109	
Observations	89	89	89	89	89	89	89	89	89
	First stage: the instrumented variable is Horse Power of Steam Engines								
Distance to Fresnes			-0.0075***			-0.0075***			-0.0075***
			[0.0026]			[0.0026]			[0.0026]
Squared Temperature Deviations (1856-1859)			-4.254**			-4.254**			-4.254**
			[2.092]			[2.092]			[2.092]
F-stat (1st stage)			13.644			13.644			13.644
J-stat (p-value)			0.828			0.952			0.088

Note: All regressions include a dummy variable for the three departments which had no steam engine in 1860-1865. Aerial distances are measured in kilometers. Other explanatory variables, except the dummies, are in logarithm. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** at the 5%-level, * at the 10%-level.

Table C.3: Industrialization and the share of workforce in services, 1861, 1901 & 1930

	(1) OLS	(2) OLS	(3) IV	(4) OLS	(5) OLS	(6) IV	(7) OLS	(8) OLS	(9) IV
	Share of Workforce in Services, 1861			Share of Workforce in Services, 1901			Share of Workforce in Services, 1930		
Horse Power of Steam Engines	0.000633	-0.00105	0.00802*	0.0160**	0.00723	0.0243**	0.0108**	0.00315	0.0160*
	[0.0016]	[0.0010]	[0.0042]	[0.0062]	[0.0044]	[0.0123]	[0.0053]	[0.0032]	[0.0082]
Latitude		0.218**	-0.0401		0.0332	-0.481		-0.249	-0.558*
		[0.105]	[0.191]		[0.380]	[0.431]		[0.277]	[0.318]
Land Suitability		-0.0007	0.0007		0.0413	0.0426		0.0444**	0.0444**
		[0.0102]	[0.0125]		[0.0319]	[0.0333]		[0.0220]	[0.0224]
Average Rainfall (Fall 1845-1859)		-0.00008**	-0.00007*		-0.000180*	-0.00015		-0.00019**	-0.00018**
		[0.00004]	[0.00004]		[0.0001]	[0.00009]		[0.00008]	[0.00008]
Average Temperature		0.0146	0.00025		-0.0408	-0.0676		-0.0335	-0.0495
		[0.0168]	[0.0191]		[0.0692]	[0.0684]		[0.0429]	[0.0448]
Rivers and Tributaries		-0.00395	-0.0113*		0.0129	-0.00211		0.00383	-0.00649
		[0.00401]	[0.00628]		[0.0138]	[0.0185]		[0.00905]	[0.0112]
Share of Carboniferous Area		-0.0245	-0.0283		-0.0625	-0.0704		-0.0484	-0.0546
		[0.0164]	[0.0199]		[0.0488]	[0.0515]		[0.0342]	[0.0344]
Maritime Department		-0.00290	-0.00189		0.0356*	0.0382*		0.0285	0.0277*
		[0.00474]	[0.00613]		[0.0203]	[0.0202]		[0.0178]	[0.0164]
Border Department		0.00723	0.00693		0.0376*	0.0373		0.0332**	0.0342**
		[0.00655]	[0.00769]		[0.0220]	[0.0230]		[0.0147]	[0.0154]
Distance to Paris		0.000108***	0.00008**		0.00011	0.00004		0.00005	0.00002
		[0.00003]	[0.00004]		[0.0001]	[0.0001]		[0.00008]	[0.00008]
Paris and Suburbs		0.0621***	0.0586***		0.155***	0.147***		0.154***	0.150***
		[0.0119]	[0.00879]		[0.0435]	[0.0352]		[0.0339]	[0.0276]
Alsace-Lorraine								0.0261	0.0141
								[0.0200]	[0.0235]
Urban Population in 1700		0.0044***	0.0024*		0.0147**	0.0110**		0.0135***	0.0109***
		[0.0013]	[0.0013]		[0.0058]	[0.0052]		[0.0034]	[0.0032]
Adjusted R2	-0.018	0.394		0.087	0.380		0.081	0.525	
Observations	89	89	89	87	87	87	89	89	89
			First stage: the instrumented variable is Horse Power of Steam Engines						
Distance to Fresnes			-0.0073***			-0.0069**			-0.0075***
			[0.0026]			[0.0026]			[0.0026]
Squared Temperature Deviations (1856-1859)			-4.484**			-4.569**			-4.254**
			[1.995]			[2.111]			[2.092]
F-stat (1st stage)			14.340			13.274			13.644
J-stat (p-value)			0.261			0.086			0.156

Note: All regressions include a dummy variable for the three departments which had no steam engine in 1860-1865. Aerial distances are measured in kilometers. Other explanatory variables, except the dummies, are in logarithm. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** at the 5%-level, * at the 10%-level.

Table C.4: Industrialization and the share of workforce in services, 1968-2010

	(1) OLS	(2) OLS	(3) IV	(4) OLS	(5) OLS	(6) IV	(7) OLS	(8) OLS	(9) IV
	Share of Workforce in Services, 1968			Share of Workforce in Services, 1975			Share of Workforce in Services, 1982		
Horse Power of Steam Engines	0.0037	0.0002	0.0129	-0.0015	-0.0027	0.0084	-0.0033	-0.0048	0.0040
	[0.0051]	[0.0033]	[0.0088]	[0.0052]	[0.0031]	[0.0087]	[0.0048]	[0.0030]	[0.0080]
Latitude		-0.760**	-1.066**		-0.781*	-1.047**		-0.457	-0.669
		[0.381]	[0.438]		[0.417]	[0.486]		[0.394]	[0.445]
Land Suitability		0.0211	0.0212		0.0155	0.0155		0.00479	0.00482
		[0.0235]	[0.0224]		[0.0253]	[0.0242]		[0.0239]	[0.0226]
Average Rainfall (Fall 1845-1859)		-0.0002**	-0.0002**		-0.0002**	-0.0001**		-0.0001*	-0.0001*
		[0.00008]	[0.00007]		[0.00008]	[0.00007]		[0.00007]	[0.00006]
Average Temperature		-0.0474	-0.0632		-0.0670	-0.0807		-0.0529	-0.0639
		[0.0430]	[0.0456]		[0.0471]	[0.0493]		[0.0434]	[0.0447]
Rivers and Tributaries		0.0220**	0.0118		0.0160	0.0071		0.0149	0.0078
		[0.0107]	[0.0120]		[0.0116]	[0.0122]		[0.0106]	[0.0110]
Share of Carboniferous Area		-0.0522	-0.0584*		-0.0660**	-0.0714**		-0.0429	-0.0472*
		[0.0319]	[0.0310]		[0.0318]	[0.0317]		[0.0289]	[0.0278]
Maritime Department		0.0593***	0.0586***		0.0571***	0.0564***		0.0524***	0.0519***
		[0.0169]	[0.0159]		[0.0176]	[0.0168]		[0.0164]	[0.0156]
Border Department		0.0407**	0.0416**		0.0362**	0.0371**		0.0436***	0.0442***
		[0.0157]	[0.0164]		[0.0165]	[0.0168]		[0.0153]	[0.0153]
Distance to Paris		-0.00001	-0.00004		0.00003	0.000002		0.00008	0.00006
		[0.00010]	[0.00010]		[0.00010]	[0.00010]		[0.00010]	[0.00009]
Paris and Suburbs		0.132***	0.127***		0.142***	0.139***		0.155***	0.152***
		[0.0221]	[0.0187]		[0.0249]	[0.0211]		[0.0180]	[0.0161]
Alsace-Lorraine		0.0275	0.0156		0.0229	0.0126		0.000462	-0.00776
		[0.0249]	[0.0281]		[0.0260]	[0.0278]		[0.0243]	[0.0251]
Urban Population in 1700		0.0159***	0.0134***		0.0170***	0.0147***		0.0178***	0.0160***
		[0.00357]	[0.00357]		[0.00383]	[0.00379]		[0.00352]	[0.00334]
Adjusted R2	-0.013	0.530		-0.021	0.533		-0.015	0.581	
Observations	89	89	89	89	89	89	89	89	89
	First stage: the instrumented variable is Horse Power of Steam Engines								
Distance to Fresnes			-0.00750***			-0.00750***			-0.00750***
			[0.00263]			[0.00263]			[0.00263]
Squared Temperature Deviations (1856-1859)			-4.254**			-4.254**			-4.254**
			[2.092]			[2.092]			[2.092]
F-stat (1st stage)			13.644			13.644			13.644
J-stat (p-value)			0.066			0.130			0.064

	(10) OLS	(11) OLS	(12) IV	(13) OLS	(14) OLS	(15) IV	(16) OLS	(17) OLS	(18) IV
	Share of Workforce in Services, 1990			Share of Workforce in Services, 1999			Share of Workforce in Services, 2010		
Horse Power of Steam Engines	-0.00502	-0.00490*	0.00677	-0.00347	-0.00320	0.00692	0.0104	0.00577	-0.00402
	[0.00461]	[0.00280]	[0.00751]	[0.00432]	[0.00258]	[0.00662]	[0.00707]	[0.00469]	[0.0106]
Average Rainfall, Fall 1845-1859		-0.00007	-0.00006		-0.00006	-0.00005		-0.000272***	-0.000284***
		[0.00006]	[0.00006]		[0.00005]	[0.00005]		[0.00008]	[0.00007]
Average Temperature		-0.0643	-0.0788*		-0.0456	-0.0582		-0.0786	-0.0665
		[0.0413]	[0.0437]		[0.0355]	[0.0376]		[0.0641]	[0.0569]
Latitude		-0.413	-0.694*		-0.442	-0.685**		-0.327	-0.0924
		[0.366]	[0.414]		[0.312]	[0.346]		[0.480]	[0.491]
Land Suitability		0.00815	0.00819		0.00909	0.00912		0.0199	0.0199
		[0.0218]	[0.0218]		[0.0185]	[0.0180]		[0.0339]	[0.0314]
Share of Carboniferous Area		0.00970	0.00402		0.00489	-0.00003		-0.0430	-0.0383
		[0.0264]	[0.0281]		[0.0243]	[0.0252]		[0.0425]	[0.0424]
Rivers and Tributaries		0.0103	0.000915		0.00703	-0.00108		0.00873	0.0166
		[0.0105]	[0.0113]		[0.00940]	[0.0101]		[0.0148]	[0.0152]
Maritime Department		0.0560***	0.0553***		0.0488***	0.0482***		0.0564***	0.0570***
		[0.0161]	[0.0159]		[0.0140]	[0.0137]		[0.0203]	[0.0184]
Border Department		0.0415***	0.0424***		0.0391***	0.0398***		0.0120	0.0113
		[0.0143]	[0.0147]		[0.0127]	[0.0129]		[0.0192]	[0.0175]
Distance to Paris		0.00007	0.00005		0.00006	0.00004		0.00017	0.00019*
		[0.00009]	[0.00009]		[0.00008]	[0.00008]		[0.0001]	[0.0001]
Paris and Suburbs		0.145***	0.141***		0.151***	0.147***		0.270***	0.273***
		[0.0183]	[0.0153]		[0.0164]	[0.0138]		[0.0350]	[0.0351]
Urban Population in 1700		0.0164***	0.0141***		0.0150***	0.0130***		0.0149***	0.0168***
		[0.00339]	[0.00326]		[0.00303]	[0.00289]		[0.00461]	[0.00423]
Alsace-Lorraine		-0.000627	-0.0115		-0.00220	-0.0116		0.0675**	0.0766**
		[0.0239]	[0.0256]		[0.0207]	[0.0212]		[0.0319]	[0.0351]
Adjusted R2	0.002	0.583		-0.006	0.607		0.018	0.516	
Observations	89	89	89	89	89	89	89	89	89
	First stage: the instrumented variable is Horse Power of Steam Engines								
Distance to Fresnes			-0.0075***			-0.0075***			-0.0075***
			[0.0026]			[0.0026]			[0.0026]
Squared Temperature Deviations (1856-1859)			-4.254**			-4.254**			-4.254**
			[2.092]			[2.092]			[2.092]
F-stat (1st stage)			13.644			13.644			13.644
J-stat (p-value)			0.190			0.500			0.082

Note: All regressions include a dummy variable for the three departments which had no steam engine in 1860-1865. Aerial distances are measured in kilometers. Other explanatory variables, except the dummies, are in logarithm. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** at the 5%-level, * at the 10%-level.

Table C.5: Industrialization and the share of executives in the workforce (age 25-54), 1968-2010

	(1) OLS	(2) OLS	(3) IV	(4) OLS	(5) OLS	(6) IV	(7) OLS	(8) OLS	(9) IV
	Share of executives and intellectual professions in workforce (age 25-54)								
	1968			1975			1982		
Horse Power of Steam Engines	0.0030***	0.0016**	0.0022	0.0027*	0.0007	-0.0008	0.0028*	0.00001	-0.0035
	[0.0011]	[0.0006]	[0.0015]	[0.0014]	[0.0010]	[0.0022]	[0.0015]	[0.0009]	[0.0024]
Latitude		-0.00709	-0.0226		0.00312	0.0380		0.000494	0.0849
		[0.0650]	[0.0701]		[0.119]	[0.126]		[0.122]	[0.132]
Land Suitability		0.002	0.002		0.0029	0.0029		0.0026	0.0026
		[0.00434]	[0.00388]		[0.00681]	[0.00649]		[0.00670]	[0.00687]
Average Rainfall (Fall 1845-1859)		-2.94e-05**	-2.85e-05**		-4.23e-05*	-4.41e-05*		-4.67e-05**	-5.11e-05**
		[1.29e-05]	[1.17e-05]		[2.39e-05]	[2.35e-05]		[2.28e-05]	[2.43e-05]
Average Temperature		-0.00553	-0.00633		-0.0110	-0.00921		-0.00643	-0.00206
		[0.00712]	[0.00678]		[0.0114]	[0.0115]		[0.0120]	[0.0126]
Rivers and Tributaries		0.00352*	0.00300		0.00522*	0.00639**		0.00609*	0.00891**
		[0.00179]	[0.00183]		[0.00308]	[0.00323]		[0.00315]	[0.00355]
Share of Carboniferous Area		-0.000280	-0.000595		-0.0200**	-0.0193**		-0.0169*	-0.0152
		[0.00664]	[0.00608]		[0.00961]	[0.00914]		[0.0101]	[0.0102]
Maritime Department		-0.00268	-0.00272		0.000953	0.00104		0.00100	0.00120
		[0.00311]	[0.00282]		[0.00464]	[0.00432]		[0.00488]	[0.00485]
Border Department		0.00878***	0.00883***		0.00957**	0.00946***		0.00684	0.00657
		[0.00254]	[0.00243]		[0.00401]	[0.00353]		[0.00446]	[0.00400]
Distance to Paris		2.51e-05	2.38e-05		5.03e-05	5.33e-05*		4.67e-05	5.39e-05*
		[1.73e-05]	[1.62e-05]		[3.04e-05]	[2.87e-05]		[3.22e-05]	[3.01e-05]
Paris and Suburbs		0.0339***	0.0337***		0.0619***	0.0624***		0.0754***	0.0766***
		[0.0124]	[0.0111]		[0.00727]	[0.00684]		[0.00808]	[0.00806]
Urban Population in 1700		0.00405***	0.00392***		0.00552***	0.00582***		0.00601***	0.00671***
		[0.000809]	[0.000830]		[0.000937]	[0.000917]		[0.00100]	[0.00107]
Alsace-Lorraine		0.000274	-0.000329		0.00235	0.00371		0.00129	0.00456
		[0.00498]	[0.00477]		[0.00911]	[0.00808]		[0.00862]	[0.00736]
Adjusted R2	0.125	0.626		0.031	0.634		0.026	0.665	
Observations	89	89	89	89	89	89	89	89	89
	First stage: the instrumented variable is Horse Power of Steam Engines								
Distance to Fresnes			-0.0075***			-0.0075***			-0.0075***
			[0.0026]			[0.0026]			[0.0026]
Squared Temperature Deviations (1856-1859)			-4.254**			-4.254**			-4.254**
			[2.092]			[2.092]			[2.092]
F-stat (1st stage)			13.644			13.644			13.644
J-stat (p-value)			0.761			0.132			0.207

	(1) OLS	(2) OLS	(3) IV	(4) OLS	(5) OLS	(6) IV	(7) OLS	(8) OLS	(9) IV
	Share of executives and intellectual professions in workforce (age 25-54)								
	1990			1999			2010		
Horse Power of Steam Engines	0.0027	-0.00001	-0.0052	0.0037*	0.0001	-0.0068*	0.0052*	0.0009	-0.0116**
	[0.0021]	[0.0012]	[0.0032]	[0.0022]	[0.0013]	[0.0035]	[0.0030]	[0.0017]	[0.0056]
Average Rainfall, Fall 1845-1859		-0.00005	-0.00005*		-0.00005	-0.00006		-0.00008	-0.00009
		[0.00003]	[0.00003]		[0.00003]	[0.00004]		[0.00005]	[-0.00006]
Average Temperature		-0.0039	0.0026		0.0024	0.0110		-0.0005	0.0150
		[0.0166]	[0.0174]		[0.0183]	[0.0198]		[0.0275]	[0.0300]
Latitude		-0.0351	0.0887		0.0403	0.207		0.0712	0.372
		[0.149]	[0.164]		[0.160]	[0.181]		[0.206]	[0.247]
Land Suitability		0.00487	0.00485		0.00201	0.00198		0.000201	0.000158
		[0.00836]	[0.00858]		[0.00895]	[0.00969]		[0.0121]	[0.0140]
Share of Carboniferous Area		-0.0125	-0.00997		-0.00575	-0.00237		-0.0133	-0.00717
		[0.0132]	[0.0138]		[0.0140]	[0.0153]		[0.0219]	[0.0251]
Rivers and Tributaries		0.00655	0.0107**		0.00571	0.0113**		0.00815	0.0182**
		[0.00399]	[0.00466]		[0.00410]	[0.00494]		[0.00551]	[0.00747]
Maritime Department		-0.000979	-0.000687		-0.00301	-0.00262		-0.00400	-0.00329
		[0.00630]	[0.00630]		[0.00687]	[0.00729]		[0.00987]	[0.0109]
Border Department		0.00831	0.00792		0.00925	0.00872		0.0120	0.0111
		[0.00615]	[0.00568]		[0.00698]	[0.00673]		[0.0107]	[0.0107]
Distance to Paris		6.11e-05	7.18e-05*		6.99e-05	8.42e-05**		0.0001*	0.0001**
		[3.95e-05]	[3.72e-05]		[4.24e-05]	[4.15e-05]		[5.75e-05]	[5.82e-05]
Paris and Suburbs		0.0987***	0.100***		0.0959***	0.0982***		0.125***	0.130***
		[0.0123]	[0.0128]		[0.0175]	[0.0183]		[0.0235]	[0.0258]
Urban Population in 1700		0.0081***	0.0091***		0.0092***	0.0106***		0.0127***	0.0152***
		[0.0014]	[0.0015]		[0.0016]	[0.0018]		[0.0024]	[0.0029]
Alsace-Lorraine		0.0011	0.0059		-0.0017	0.0048		-0.0093	0.0023
		[0.0119]	[0.0106]		[0.0115]	[0.0116]		[0.0158]	[0.0185]
Adjusted R2	0.009	0.656		0.031	0.614		0.032	0.584	
Observations	89	89	89	89	89	89	89	89	89
	First stage: the instrumented variable is Horse Power of Steam Engines								
Distance to Fresnes			-0.0075***			-0.0075***			-0.0075***
			[0.0026]			[0.0026]			[0.0026]
Squared Temperature Deviations (1856-1859)			-4.254**			-4.254**			-4.254**
			[2.092]			[2.092]			[2.092]
F-stat (1st stage)			13.644			13.644			13.644
J-stat (p-value)			0.220			0.192			0.239

Note: All regressions include a dummy variable for the three departments which had no steam engine in 1860-1865. All regressions, except for the unconditional ones, include a dummy variable for the three departments which had no steam engine in 1860-1865. Aerial distances are measured in kilometers. Other explanatory variables, except the dummies, are in logarithm. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** indicates significance at the 5%-level, * indicates significance at the 10%-level.

Table C.6: Industrialization and share of intermediary professionals in the workforce (age 25-54), 1968-2010

	(1) OLS	(2) OLS	(3) IV	(4) OLS	(5) OLS	(6) IV	(7) OLS	(8) OLS	(9) IV
	Share of intermediary professions in workforce (age 25-54)								
		1968			1975			1982	
Horse Power of Steam Engines	0.0081***	0.0057***	0.0091**	0.0061***	0.0038***	0.0031	0.0032***	0.0011	-0.0007
	[0.0015]	[0.0012]	[0.0036]	[0.0013]	[0.0012]	[0.0025]	[0.0012]	[0.0012]	[0.0031]
Latitude		-0.0443	-0.125		-0.191	-0.175		-0.0315	0.0115
		[0.113]	[0.135]		[0.130]	[0.141]		[0.147]	[0.157]
Land Suitability		0.0125*	0.0125*		0.0055	0.0055		0.0017	0.0017
		[0.0071]	[0.0066]		[0.0078]	[0.0072]		[0.0082]	[0.0079]
Average Rainfall (Fall 1845-1859)		-4.18e-05*	-3.76e-05*		-7.69e-05***	-7.77e-05***		-5.51e-05**	-5.74e-05**
		[2.32e-05]	[1.99e-05]		[2.74e-05]	[2.59e-05]		[2.59e-05]	[2.51e-05]
Average Temperature		-0.0305*	-0.0347**		-0.0351***	-0.0343***		-0.0377***	-0.0355***
		[0.0162]	[0.0153]		[0.0120]	[0.0119]		[0.0141]	[0.0136]
Rivers and Tributaries		0.00515	0.00247		0.00702*	0.00754*		0.00740*	0.00884**
		[0.00348]	[0.00378]		[0.00408]	[0.00394]		[0.00381]	[0.00382]
Share of Carboniferous Area		0.0159	0.0143		-0.0235	-0.0232		-0.0332**	-0.0323**
		[0.0176]	[0.0165]		[0.0158]	[0.0144]		[0.0149]	[0.0135]
Maritime Department		-0.0106*	-0.0108**		0.00268	0.00272		0.00398	0.00409
		[0.00549]	[0.00508]		[0.00549]	[0.00506]		[0.00558]	[0.00527]
Border Department		0.0175***	0.0178***		0.0137***	0.0136***		0.00546	0.00532
		[0.00578]	[0.00576]		[0.00468]	[0.00423]		[0.00611]	[0.00543]
Distance to Paris		5.05e-06	-1.86e-06		2.30e-06	3.62e-06		4.16e-05	4.53e-05
		[3.21e-05]	[3.06e-05]		[3.68e-05]	[3.48e-05]		[3.82e-05]	[3.57e-05]
Paris and Suburbs		0.0208*	0.0197**		0.0538***	0.0540***		0.0420***	0.0426***
		[0.0107]	[0.00902]		[0.0177]	[0.0161]		[0.0158]	[0.0138]
Alsace-Lorraine		-0.00692	-0.0100		0.00549	0.00609		0.00743	0.00910
		[0.00950]	[0.00825]		[0.00872]	[0.00812]		[0.00994]	[0.00985]
Urban Population in 1700		0.00537***	0.00469***		0.00535***	0.00548***		0.00510***	0.00546***
		[0.00125]	[0.00138]		[0.00130]	[0.00126]		[0.00124]	[0.00131]
Adjusted R2	0.308	0.626		0.143	0.602		0.041	0.486	
Observations	89	89	89	89	89	89	89	89	89
	First stage: the instrumented variable is Horse Power of Steam Engines								
Distance to Fresnes			-0.0075***			-0.0075***			-0.0075***
			[0.0026]			[0.0026]			[0.0026]
Squared Temperature Deviations (1856-1859)			-4.254**			-4.254**			-4.254**
			[2.092]			[2.092]			[2.092]
F-stat (1st stage)			13.644			13.644			13.644
J-stat (p-value)			0.174			0.309			0.661

	(1) OLS	(2) OLS	(3) IV	(4) OLS	(5) OLS	(6) IV	(7) OLS	(8) OLS	(9) IV
	Share of intermediary professions in workforce (age 25-54)								
		1990			1999			2010	
Horse Power of Steam Engines	0.0021*	0.000261	-0.00370	0.00227**	0.000459	-0.00629*	-0.000186	-0.000615	-0.00828**
	[0.00115]	[0.00129]	[0.00279]	[0.00113]	[0.00132]	[0.00329]	[0.00112]	[0.00142]	[0.00336]
Average Rainfall, Fall 1845-1859		-4.86e-05*	-5.37e-05*		-4.42e-05	-5.28e-05		-2.74e-05	-3.72e-05
		[2.66e-05]	[2.80e-05]		[2.71e-05]	[3.35e-05]		[2.22e-05]	[2.87e-05]
Average Temperature		-0.0420***	-0.0371**		-0.0318*	-0.0235		-0.0282*	-0.0187
		[0.0156]	[0.0155]		[0.0168]	[0.0175]		[0.0161]	[0.0166]
Latitude		-0.00424	0.0909		0.0546	0.217		-0.00882	0.175
		[0.153]	[0.163]		[0.158]	[0.171]		[0.140]	[0.157]
Land Suitability		0.00675	0.00674		0.00302	0.00300		-0.000503	-0.000529
		[0.00960]	[0.00974]		[0.00994]	[0.0107]		[0.0104]	[0.0116]
Share of Carboniferous Area		-0.0197	-0.0178		-0.0214	-0.0181		-0.0214	-0.0177
		[0.0144]	[0.0142]		[0.0159]	[0.0173]		[0.0178]	[0.0197]
Rivers and Tributaries		0.00679*	0.00997**		0.00595	0.0114**		0.00440	0.0105**
		[0.00390]	[0.00406]		[0.00415]	[0.00483]		[0.00441]	[0.00490]
Maritime Department		0.00349	0.00372		0.00291	0.00330		0.00641	0.00685
		[0.00579]	[0.00596]		[0.00584]	[0.00638]		[0.00535]	[0.00623]
Border Department		0.00483	0.00453		0.00415	0.00363		0.000515	-7.12e-05
		[0.00635]	[0.00571]		[0.00659]	[0.00617]		[0.00635]	[0.00636]
Distance to Paris		5.72e-05	6.54e-05*		7.17e-05*	8.56e-05**		6.26e-05	7.84e-05**
		[3.96e-05]	[3.74e-05]		[4.20e-05]	[3.96e-05]		[3.94e-05]	[3.73e-05]
Paris and Suburbs		0.0542***	0.0555***		0.0529***	0.0552***		0.0461**	0.0487***
		[0.0164]	[0.0136]		[0.0186]	[0.0146]		[0.0202]	[0.0157]
Alsace-Lorraine		0.0061	0.0098		0.0049	0.0112		0.0004	0.0075
		[0.0101]	[0.0109]		[0.0108]	[0.0129]		[0.0104]	[0.0134]
Urban Population in 1700		0.0052***	0.006***		0.0057***	0.0071***		0.0052***	0.0067***
		[0.0014]	[0.0014]		[0.0015]	[0.0016]		[0.0016]	[0.0017]
Adjusted R2	0.002	0.464		0.007	0.412		-0.016	0.318	
Observations	89	89	89	89	89	89	89	89	89
	First stage: the instrumented variable is Horse Power of Steam Engines								
Distance to Fresnes			-0.0075***			-0.0075***			-0.0075***
			[0.0026]			[0.0026]			[0.0026]
Squared Temperature Deviations (1856-1859)			-4.254**			-4.254**			-4.254**
			[2.092]			[2.092]			[2.092]
F-stat (1st stage)			13.644			13.644			13.644
J-stat (p-value)			0.409			0.178			0.274

Note: All regressions include a dummy variable for the three departments which had no steam engine in 1860-1865. Aerial distances are measured in kilometers. Other explanatory variables, except the dummies, are in logarithm.. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** indicates significance at the 5%-level, * indicates significance at the 10%-level.

Table C.7: Industrialization and the share of employees in the workforce (age 25-54), 1968-2010

	(1) OLS	(2) OLS	(3) IV	(4) OLS	(5) OLS	(6) IV	(7) OLS	(8) OLS	(9) IV
	Share of employees in workforce (age 25-54)								
		1968			1975			1982	
Horse Power of Steam Engines	0.0079***	0.0052***	0.0136**	0.0018	-0.0001	0.0023	-0.0014	-0.0021	-0.0011
	[0.0025]	[0.0018]	[0.0053]	[0.0025]	[0.0018]	[0.0045]	[0.0018]	[0.0013]	[0.0029]
Latitude		-0.295	-0.497**		-0.458**	-0.516**		-0.445***	-0.469***
		[0.185]	[0.229]		[0.202]	[0.222]		[0.144]	[0.158]
Land Suitability		0.0065	0.0066		0.0085	0.0085		0.0021	0.0021
		[0.0129]	[0.0118]		[0.0138]	[0.0122]		[0.0103]	[0.00931]
Average Rainfall (Fall 1845-1859)		-0.00006	-0.00005		-8.52e-05**	-8.21e-05**		-0.00005	-4.47e-05*
		[3.95e-05]	[3.81e-05]		[3.84e-05]	[3.45e-05]		[2.77e-05]	[2.50e-05]
Average Temperature		0.0169	0.00642		0.0129	0.00992		0.00950	0.00824
		[0.0234]	[0.0249]		[0.0222]	[0.0213]		[0.0169]	[0.0163]
Rivers and Tributaries		0.0117**	0.00490		0.0118**	0.00990*		0.00615	0.00533
		[0.00482]	[0.00584]		[0.00569]	[0.00578]		[0.00447]	[0.00436]
Share of Carboniferous Area		0.0031	-0.0010		-0.0334	-0.0345*		-0.0241	-0.0246*
		[0.0188]	[0.0192]		[0.0225]	[0.0200]		[0.0149]	[0.0134]
Maritime Department		-0.00209	-0.00257		0.0154*	0.0153**		0.0227***	0.0227***
		[0.00890]	[0.00882]		[0.00834]	[0.00752]		[0.00636]	[0.00579]
Border Department		0.0338***	0.0344***		0.0287***	0.0289***		0.0182***	0.0183***
		[0.00768]	[0.00894]		[0.00867]	[0.00821]		[0.00611]	[0.00566]
Distance to Paris		-4.59e-05	-6.33e-05		-4.03e-05	-4.52e-05		-5.70e-05	-5.92e-05*
		[4.98e-05]	[4.96e-05]		[5.45e-05]	[5.11e-05]		[3.79e-05]	[3.59e-05]
Paris and Suburbs		0.0355	0.0327		0.0715***	0.0707***		0.0588***	0.0584***
		[0.0272]	[0.0222]		[0.0091]	[0.0087]		[0.0082]	[0.0078]
Alsace-Lorraine		-0.00524	-0.0131		0.000590	-0.00165		0.00902	0.00806
		[0.0118]	[0.0134]		[0.0156]	[0.0148]		[0.0108]	[0.0102]
Urban Population in 1700		0.00675***	0.00505**		0.00679***	0.00630***		0.00457***	0.00437***
		[0.00222]	[0.00238]		[0.00183]	[0.00179]		[0.00134]	[0.00130]
Adjusted R2	0.158	0.441		-0.011	0.491		-0.014	0.514	
Observations	89	89	89	89	89	89	89	89	89
	First stage: the instrumented variable is Horse Power of Steam Engines								
Distance to Fresnes			-0.0075***			-0.0075***			-0.0075***
			[0.0026]			[0.0026]			[0.0026]
Squared Temperature Deviations (1856-1859)			-4.254**			-4.254**			-4.254**
			[2.092]			[2.092]			[2.092]
F-stat (1st stage)			13.644			13.644			13.644
J-stat (p-value)			0.606			0.133			0.056

	(1) OLS	(2) OLS	(3) IV	(4) OLS	(5) OLS	(6) IV	(7) OLS	(8) OLS	(9) IV
	Share of employees in workforce (age 25-54)								
		1990			1999			2010	
Horse Power of Steam Engines	-0.00412***	-0.00352***	-0.000541	-0.00568***	-0.00290***	0.00462	-0.00587***	-0.00239**	0.00947**
	[0.00134]	[0.00103]	[0.00257]	[0.00114]	[0.00101]	[0.00324]	[0.00103]	[0.00112]	[0.00440]
Average Rainfall, Fall 1845-1859		-0.00002	-0.00002		-0.00001	0.00000		0.00003	0.00004
		[1.99e-05]	[1.80e-05]		[2.04e-05]	[2.48e-05]		[2.67e-05]	[3.90e-05]
Average Temperature		0.0168	0.0131		0.00988	0.000553		0.0162	0.00143
		[0.0141]	[0.0142]		[0.0134]	[0.0158]		[0.0162]	[0.0199]
Latitude		-0.290**	-0.362***		-0.363***	-0.544***		-0.297**	-0.582***
		[0.110]	[0.119]		[0.109]	[0.116]		[0.126]	[0.134]
Land Suitability		-0.0084	-0.0084		-0.0058	-0.0058		-0.0009	-0.0009
		[0.00749]	[0.00705]		[0.00584]	[0.00727]		[0.00539]	[0.00858]
Share of Carboniferous Area		-0.0176	-0.0190*		-0.000929	-0.00459		0.0146	0.00879
		[0.0110]	[0.0105]		[0.0112]	[0.0134]		[0.0143]	[0.0181]
Rivers and Tributaries		0.00161	-0.000784		-0.00167	-0.00770*		-0.00305	-0.0126**
		[0.00357]	[0.00376]		[0.00342]	[0.00459]		[0.00373]	[0.00601]
Maritime Department		0.0249***	0.0248***		0.0253***	0.0249***		0.0213***	0.0206***
		[0.00478]	[0.00463]		[0.00501]	[0.00598]		[0.00596]	[0.00776]
Border Department		0.0149***	0.0151***		0.0116*	0.0122*		0.0123	0.0132
		[0.00523]	[0.00516]		[0.00606]	[0.00660]		[0.00815]	[0.00894]
Distance to Paris		-3.54e-05	-4.15e-05		-5.05e-05*	-6.60e-05**		-5.89e-05*	-8.33e-05**
		[2.87e-05]	[2.72e-05]		[2.89e-05]	[2.84e-05]		[3.39e-05]	[3.40e-05]
Paris and Suburbs		0.0376***	0.0366***		0.0163*	0.0138		-9.64e-05	-0.00406
		[0.0105]	[0.0106]		[0.00896]	[0.0107]		[0.00832]	[0.0113]
Urban Population in 1700		0.00231**	0.00171		9.65e-06	-0.00150		-0.00259*	-0.00498***
		[0.00113]	[0.00114]		[0.00114]	[0.00134]		[0.00130]	[0.00176]
Alsace-Lorraine		0.00676	0.00398		0.00561	-0.00139		0.00575	-0.00530
		[0.00732]	[0.00813]		[0.0106]	[0.0120]		[0.0151]	[0.0180]
Adjusted R2	0.105	0.549		0.206	0.541		0.208	0.445	
Observations	89	89	89	89	89	89	89	89	89
	First stage: the instrumented variable is Horse Power of Steam Engines								
Distance to Fresnes			-0.0075***			-0.0075***			-0.0075***
			[0.0026]			[0.0026]			[0.0026]
Squared Temperature Deviations (1856-1859)			-4.254**			-4.254**			-4.254**
			[2.092]			[2.092]			[2.092]
F-stat (1st stage)			13.644			13.644			13.644
J-stat (p-value)			0.157			0.808			0.921

Note: All regressions include a dummy variable for the three departments which had no steam engine in 1860-1865. Aerial distances are measured in kilometers. Other explanatory variables, except the dummies, are in logarithm. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** indicates significance at the 5%-level, * indicates significance at the 10%-level.

Appendix D. Industrialization and the Educational Achievements of Women

Table D.1: Industrialization and female school enrollment in 2010

	(1) OLS	(2) OLS	(3) IV	(4) OLS	(5) OLS	(6) IV
	School Enrollment of Women Age 15-17 in 2010			School Enrollment of Women Age 18-24 in 2010		
Horse Power of Steam Engines	-0.0141	-0.0321	-0.769***	0.614	-0.552	-3.319**
	[0.0718]	[0.0679]	[0.224]	[0.447]	[0.603]	[1.311]
Latitude		18.79***	36.49***		58.77	125.2**
		[6.736]	[10.46]		[53.27]	[63.32]
Land Suitability		-1.009**	-1.012*		-1.134	-1.143
		[0.489]	[0.594]		[3.071]	[3.165]
Average Rainfall (Fall 1845-1859)		-0.00171	-0.00265		-0.00836	-0.0119
		[0.00140]	[0.00244]		[0.0130]	[0.0157]
Average Temperature		-0.00537	0.910		0.443	3.877
		[0.915]	[1.148]		[6.443]	[6.806]
Rivers and Tributaries		-0.231	0.360		2.475	4.694**
		[0.178]	[0.301]		[1.505]	[1.886]
Share of Carboniferous Area		-0.727	-0.368		6.594	7.940
		[0.645]	[0.953]		[4.319]	[5.151]
Maritime Department		-0.704**	-0.663		0.288	0.444
		[0.343]	[0.481]		[2.299]	[2.550]
Border Department		-0.719**	-0.775*		2.282	2.071
		[0.357]	[0.448]		[2.186]	[2.209]
Distance to Paris		0.0051***	0.0067***		0.0243*	0.0300**
		[0.00166]	[0.00226]		[0.0132]	[0.0139]
Paris and Suburbs		1.331***	1.577***		11.48***	12.40***
		[0.335]	[0.551]		[2.538]	[2.077]
Alsace-Lorraine		-0.556	0.130		-4.451	-1.874
		[0.406]	[0.797]		[3.510]	[3.533]
Urban Population in 1700		0.000982	0.149*		3.345***	3.902***
		[0.0583]	[0.0854]		[0.443]	[0.459]
Adjusted R2	-0.005	0.195		0.021	0.441	
Observations	89	89	89	89	89	89
	First stage: the instrumented variable is Horse Power of Steam Engines					
Distance to Fresnes			-0.0075***			-0.0075***
			[0.0026]			[0.0026]
Squared Temperature Deviations (1856-1859)			-4.254**			-4.254**
			[2.092]			[2.092]
F-stat (1st stage)			13.644			13.644
J-stat (p-value)			0.447			0.450

Note: All regressions include a dummy variable for the three departments which had no steam engine in 1860-1865. Aerial distances are measured in kilometers. Other explanatory variables, except the dummies, are in logarithm. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** at the 5%-level, * at the 10%-level.

Table D.2: The long-run effects of industrialization on human capital: female high-school and college graduates, 1968-2010

	(1) OLS	(2) OLS	(3) IV	(4) OLS	(5) OLS	(6) IV	(7) OLS	(8) OLS	(9) IV
	Share of Women Age 25 and above with a Secondary or Post-Secondary Degree, 1968			Share of Women Age 25 and above with a Secondary or Post-Secondary Degree, 1975			Share of Women Age 25 and above with a Secondary or Post-Secondary Degree, 1982		
Horse Power of Steam Engines	0.0001	0.0003	-0.0014	0.0003	0.0006	-0.0032	-0.0012	-0.0003	-0.006*
	[0.0013]	[0.0008]	[0.0016]	[0.0020]	[0.0012]	[0.0026]	[0.0021]	[0.0013]	[0.0033]
Latitude		-0.149*	-0.109		-0.197	-0.107		-0.173	-0.0366
		[0.0771]	[0.0859]		[0.134]	[0.146]		[0.182]	[0.199]
Land Suitability		0.0019	0.0019		0.0029	0.0028		0.0026	0.0026
		[0.00495]	[0.00476]		[0.00839]	[0.00826]		[0.00981]	[0.0100]
Average Rainfall (Fall 1845-1859)		-0.00003*	-0.00003**		-0.00005*	-0.00006*		-0.0001	-0.00006*
		[1.70e-05]	[1.62e-05]		[2.83e-05]	[2.87e-05]		[3.29e-05]	[3.55e-05]
Average Temperature		-0.0269***	-0.0248***		-0.0496***	-0.0449***		-0.0645***	-0.0574***
		[0.00908]	[0.00882]		[0.0155]	[0.0156]		[0.0185]	[0.0192]
Rivers and Tributaries		0.00384*	0.00519**		0.00595*	0.00898**		0.00642	0.0110**
		[0.00206]	[0.00223]		[0.00357]	[0.00390]		[0.00424]	[0.00483]
Share of Carboniferous Area		-0.0104	-0.00954		-0.0218*	-0.0200		-0.0207	-0.0180
		[0.00697]	[0.00700]		[0.0125]	[0.0128]		[0.0143]	[0.0153]
Maritime Department		0.000734	0.000829		0.000949	0.00116		-0.000320	6.30e-07
		[0.00385]	[0.00374]		[0.00598]	[0.00598]		[0.00664]	[0.00700]
Border Department		0.00703**	0.00690**		0.00899	0.00870*		0.00404	0.00360
		[0.00311]	[0.00280]		[0.00546]	[0.00489]		[0.00642]	[0.00594]
Distance to Paris		0.00002	0.00003		5.30e-05	6.08e-05*		8.80e-05*	9.97e-05**
		[2.01e-05]	[1.97e-05]		[3.39e-05]	[3.33e-05]		[4.55e-05]	[4.43e-05]
Paris and Suburbs		0.0522***	0.0527***		0.0861***	0.0874***		0.100***	0.102***
		[0.0103]	[0.00989]		[0.0136]	[0.0135]		[0.0118]	[0.0125]
Alsace-Lorraine		-0.00429	-0.00271		-0.0119	-0.00838		-0.0156	-0.0103
		[0.00642]	[0.00599]		[0.0119]	[0.0115]		[0.0131]	[0.0128]
Urban Population in 1700		0.00402***	0.00436***		0.00712***	0.00788***		0.00850***	0.00965***
		[0.000812]	[0.000825]		[0.00131]	[0.00134]		[0.00140]	[0.00153]
Adjusted R2	-0.023	0.650		-0.020	0.660		-0.008	0.678	
Observations	89	89	89	89	89	89	89	89	89
	First stage: the instrumented variable is Horse Power of Steam Engines								
Distance to Fresnes			-0.00750***			-0.00750***			-0.00750***
			[0.00263]			[0.00263]			[0.00263]
Squared Temperature Deviations (1856-1859)			-4.254**			-4.254**			-4.254**
			[2.092]			[2.092]			[2.092]
F-stat			13.644			13.644			13.644
J-stat (p-value)			0.123			0.142			0.127

	(10) OLS	(11) OLS	(12) IV	(13) OLS	(14) OLS	(15) IV	(16) OLS	(17) OLS	(18) IV
	Share of Women Age 25 and above with a Secondary or Post-Secondary Degree, 1990			Share of Women Age 25 and above with a Secondary or Post-Secondary Degree, 1999			Share of Women Age 25 and above with a Secondary or Post-Secondary Degree, 2010		
Horse Power of Steam Engines	-0.00169	0.000137	-0.00865*	-0.00248	-0.000215	-0.0113*	-0.00462	-0.00174	-0.0177**
	[0.00298]	[0.00182]	[0.00481]	[0.00366]	[0.00234]	[0.00627]	[0.00376]	[0.00269]	[0.00765]
Average Rainfall, Fall 1845-1859		-0.0001	-0.0001		-0.0001	-0.0001		-0.0001	-0.0001
		[4.66e-05]	[5.21e-05]		[5.95e-05]	[6.67e-05]		[6.94e-05]	[8.19e-05]
Average Temperature		-0.0659**	-0.0550**		-0.0655*	-0.0517		-0.0609	-0.0411
		[0.0262]	[0.0278]		[0.0336]	[0.0356]		[0.0395]	[0.0424]
Latitude		-0.164	0.0470		-0.115	0.152		-0.0636	0.319
		[0.249]	[0.274]		[0.303]	[0.334]		[0.337]	[0.377]
Land Suitability		0.000872	0.000842		-0.00412	-0.00416		-0.00958	-0.00963
		[0.0138]	[0.0144]		[0.0165]	[0.0167]		[0.0185]	[0.0201]
Share of Carboniferous Area		-0.0255	-0.0212		-0.0230	-0.0176		-0.00919	-0.00143
		[0.0202]	[0.0220]		[0.0237]	[0.0259]		[0.0263]	[0.0308]
Rivers and Tributaries		0.00846	0.0155**		0.00899	0.0179**		0.00947	0.0222**
		[0.00608]	[0.00709]		[0.00766]	[0.00904]		[0.00867]	[0.0109]
Maritime Department		-0.00233	-0.00183		-0.00182	-0.00119		0.00487	0.00577
		[0.00958]	[0.0102]		[0.0116]	[0.0125]		[0.0131]	[0.0149]
Border Department		0.00774	0.00707		0.00996	0.00911		0.00730	0.00608
		[0.00940]	[0.00895]		[0.0119]	[0.0117]		[0.0144]	[0.0149]
Distance to Paris		0.000147**	0.000165***		0.000205***	0.000228***		0.000224**	0.000257***
		[6.37e-05]	[6.16e-05]		[7.58e-05]	[7.35e-05]		[8.56e-05]	[8.34e-05]
Paris and Suburbs		0.148***	0.151***		0.182***	0.186***		0.192***	0.198***
		[0.0170]	[0.0181]		[0.0220]	[0.0236]		[0.0203]	[0.0232]
Urban Population in 1700		0.0115***	0.0132***		0.0151***	0.0173***		0.0159***	0.0191***
		[0.00210]	[0.00229]		[0.00251]	[0.00285]		[0.00290]	[0.00343]
Alsace-Lorraine		-0.0275	-0.0193		-0.0329	-0.0226		-0.0381*	-0.0232
		[0.0177]	[0.0178]		[0.0212]	[0.0211]		[0.0202]	[0.0229]
Adjusted R2	-0.006	0.673		-0.006	0.677		0.020	0.651	
Observations	89	89	89	89	89	89	89	89	89
	First stage: the instrumented variable is Horse Power of Steam Engines								
Distance to Fresnes			-0.0075***			-0.0075***			-0.0075***
			[0.0026]			[0.0026]			[0.0026]
Squared Temperature Deviations (1856-1859)			-4.254**			-4.254**			-4.254**
			[2.092]			[2.092]			[2.092]
F-stat			13.644			13.644			13.644
J-stat (p-value)			0.127			0.200			0.267

Note: All regressions include a dummy variable for the three departments which had no steam engine in 1860-1865. Aerial distances are measured in kilometers. Other explanatory variables, except the dummies, are in logarithm. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** at the 5%-level, * at the 10%-level.

Table D.3: Long-run effects of industrialization on human capital: the lack of interest in science, 2001

	(1) OLS	(2) OLS	(3) IV
	Share of Individuals who Express no Interest in Science, 2001		
Horse Power of Steam Engines	0.00847	0.0137	0.0774***
	[0.00621]	[0.00878]	[0.0277]
Latitude		-0.516	-0.955
		[0.797]	[1.320]
Land Suitability		0.0581	0.00771
		[0.0494]	[0.0508]
Average Temperature		-0.119	-0.110
		[0.0841]	[0.0951]
Average Rainfall (Fall 1845-1859)		0.0001	0.00002
		[0.000106]	[0.000146]
Rivers and Tributaries		0.00275	-0.0380
		[0.0220]	[0.0284]
Share of Carboniferous Area		0.168	0.168
		[0.107]	[0.158]
Maritime Department		0.0550*	0.0138
		[0.0289]	[0.0387]
Border Department		0.0129	0.0219
		[0.0374]	[0.0488]
Distance to Paris		-0.0002	-0.00002
		[0.0002]	[0.0003]
Paris and Suburbs		-0.0357	-0.0331
		[0.0352]	[0.0458]
Urban Population in 1700		-0.0109	-0.0257**
		[0.00815]	[0.0105]
Adjusted R2	0.060	0.008	
Observations	66	66	66
First stage: the instrumented variable is Horse Power of Steam Engines			
Distance to Fresnes			-0.007**
			[0.003]
Squared Temperature Deviations (1856-1859)			-3.202
			[2.611]
F-stat (1st stage)			8.375
J-stat (p-value)			0.761

Note: All regressions include a dummy variable for the three departments which had no steam engine in 1860-1865. Aerial distances are measured in kilometers. Other explanatory variables, except the dummies, and the dependent variables are in logarithm. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** at the 5%-level, * at the 10%-level.

Appendix E. Industrialization and GDP per Capita, 1860 & 1901, Accounting for Sectoral Tariff Protection

Table E.1: Industrialization and income per capita, 1860 & 1901, accounting for sectoral tariff protection

	(1)	(2)	(3)	(4)	(5)
	IV	IV	IV	IV	IV
	GDP per capita, 1860			GDP per capita, 1901	
Horse Power of Steam Engines By Dpt	0.102***	0.103***	0.231***	0.229***	0.226***
	[0.0366]	[0.0350]	[0.0796]	[0.0779]	[0.0787]
Weighted tariffs across sectors, 1865		0.203**		0.242	
		[0.0986]		[0.177]	
Weighted tariffs across sectors, 1901					0.198
					[0.154]
Weighted tariffs across sectors, 1919					
Average Temperature	0.174	0.284*	-0.359	-0.181	-0.166
	[0.165]	[0.160]	[0.401]	[0.422]	[0.422]
Latitude	-3.884***	-3.437**	-8.752**	-8.211**	-8.586**
	[1.413]	[1.407]	[3.686]	[3.698]	[3.512]
Rivers and Tributaries	-0.0533	-0.0350	-0.138	-0.132	-0.134
	[0.0507]	[0.0471]	[0.114]	[0.116]	[0.117]
Share of Carboniferous Area	-0.102	-0.198	-0.333	-0.467	-0.353
	[0.212]	[0.213]	[0.327]	[0.366]	[0.342]
Paris and Suburbs	0.0944	0.0431	-0.125	-0.179	-0.135
	[0.0968]	[0.0940]	[0.187]	[0.159]	[0.171]
Average Rainfall, Fall 1845-1859	0.0002	0.00004	0.0003	-0.00002	0.0001
	[0.0003]	[0.0003]	[0.0005]	[0.0005]	[0.0005]
Land Suitability	0.0968	0.0354	0.224	0.116	0.192
	[0.0907]	[0.106]	[0.181]	[0.200]	[0.177]
Maritime Department	0.0373	0.0158	0.0151	-0.0213	-0.0273
	[0.0607]	[0.0561]	[0.153]	[0.148]	[0.144]
Border Department	0.0624	0.0272	0.113	0.0976	0.126
	[0.0591]	[0.0597]	[0.158]	[0.165]	[0.160]
Distance to Paris	-0.0012***	-0.0011***	-0.0015*	-0.0013	-0.0015*
	[0.0003]	[0.0003]	[0.0009]	[0.0009]	[0.0009]
Alsace-Lorraine					
Urban Population in 1700	0.0323**	0.0244	-0.0181	-0.0220	-0.0211
	[0.0154]	[0.0154]	[0.0342]	[0.0346]	[0.0364]
Observations	87	84	85	82	82
	First stage: the instrumented variable is Horse Power of Steam Engines				
Distance to Fresnes	-0.00732***	-0.00712**	-0.00729***	-0.00714**	-0.00731**
	[0.00261]	[0.00269]	[0.00269]	[0.00279]	[0.00283]
Squared Temperature Deviations (1856-1859)	-4.350*	-4.593*	-3.986*	-4.185*	-4.073
	[2.246]	[2.348]	[2.337]	[2.447]	[2.514]
F-stat (1st stage)	12.963	12.696	12.134	11.812	12.010
J-stat (p-value)	0.255	0.274	0.644	0.629	0.650

Note: All regressions include a dummy variable for the three departments which had no steam engine in 1860-1865. Aerial distances are measured in kilometers. Other explanatory variables, except the dummies, are in logarithm. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** at the 5%-level, * at the 10%-level.

Appendix F. Industrialization, income per capita and share of the workforce in the industrial sector, accounting for World War I and World War II

Table F.1: Industrialization and income per capita, accounting for the number of buildings destroyed in the World Wars

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	OLS	OLS	IV	IV	IV	IV	IV
	Destroyed Buildings WWI	Destroyed Buildings WWII	GDP per capita, 1930		GDP per capita, 2001-2005		
Horse Power of Steam Engines	0.431**	0.223	0.0999***	0.103***	-0.0603***	-0.0359*	-0.0627***
	[0.194]	[0.229]	[0.0244]	[0.0317]	[0.0221]	[0.0214]	[0.0229]
Destroyed Buildings WWI				-0.00024		-0.0093*	
				[0.0055]		[0.0048]	
Destroyed Buildings WWII							0.0147
							[0.0110]
Land Suitability	0.619	1.460	0.223***	0.223***	-0.0551	-0.0573	-0.0838
	[1.424]	[1.350]	[0.0659]	[0.0670]	[0.0770]	[0.0670]	[0.0786]
Latitude	69.96***	18.50	-2.982**	-3.111**	1.705*	1.995**	1.594
	[25.51]	[12.72]	[1.218]	[1.262]	[1.029]	[0.870]	[0.988]
Average Rainfall (Fall 1845-1859)	0.0052**	-0.0108***	-0.0002	-0.0002	-0.000**	-0.0004*	-0.0003
	[0.0025]	[0.0034]	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[0.0002]
Average Temperature	0.802	0.177	-0.256**	-0.259**	0.0195	0.0078	0.0223
	[2.884]	[2.389]	[0.113]	[0.116]	[0.123]	[0.108]	[0.125]
Rivers and Tributaries	0.128	0.0240	0.0278	0.0262	0.0817**	0.0585**	0.0730**
	[0.772]	[0.554]	[0.0293]	[0.0317]	[0.0321]	[0.0278]	[0.0327]
Share of Carboniferous Area	0.0303	-0.416	0.00112	0.0087	-0.0807	-0.118	-0.106
	[1.728]	[1.898]	[0.141]	[0.144]	[0.130]	[0.107]	[0.126]
Maritime Department	-0.729	1.545***	0.0103	0.0138	-0.0169	-0.0342	-0.0512
	[1.159]	[0.551]	[0.0595]	[0.0616]	[0.0506]	[0.0438]	[0.0532]
Border Department	3.488***	0.900	0.151***	0.154***	0.0253	0.0569	0.00896
	[1.044]	[0.607]	[0.0492]	[0.0529]	[0.0419]	[0.0399]	[0.0400]
Distance to Paris	0.0071	0.00140	-0.0003	-0.0003	0.0004	0.0004**	0.0004*
	[0.0065]	[0.0032]	[0.0003]	[0.0003]	[0.0002]	[0.0002]	[0.0002]
Paris and Suburbs	-2.512**	1.372*	0.236***	0.233***	0.346**	0.317**	0.328*
	[1.090]	[0.717]	[0.0824]	[0.0859]	[0.170]	[0.155]	[0.174]
Alsace-Lorraine			0.00222		0.0230		
			[0.0729]		[0.0939]		
Urban Population in 1700	0.0592	0.295**	0.0336***	0.0322***	0.0594***	0.0586***	0.0581***
	[0.200]	[0.115]	[0.0110]	[0.0110]	[0.0126]	[0.0113]	[0.0131]
Adjusted R2	0.401	0.596					
Observations	86	86	87	85	89	86	86
	First stage: the instrumented variable is Horse Power of Steam Engines						
Distance to Fresnes			-0.0075***	-0.0108**	-0.0075***	-0.0108**	-0.0078***
			[0.0027]	[0.0043]	[0.0026]	[0.0043]	[0.0027]
Squared Temperature Deviations (1856-1859)			-4.152*	-3.683	-4.254**	-3.774*	-3.779*
			[2.313]	[2.295]	[2.092]	[2.095]	[2.081]
F-stat (1st stage)			12.708	6.798	13.644	7.659	13.087
J-stat (p-value)			0.842	0.817	0.101	0.246	0.142

Note: All regressions include a dummy variable for the three departments which had no steam engine in 1860-1865. Aerial distances are measured in kilometers. Other explanatory variables, except the dummies, and the dependent variables are in logarithm. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** at the 5%-level, * at the 10%-level.

Table F.2: Industrialization and the evolution of the share of the workforce in the industrial sector, accounting for the number of buildings destroyed in the World Wars

	(1) IV	(2) IV	(3) IV	(4) IV	(5) IV	(6) IV	(7) IV	(8) IV	(9) IV	(10) IV	(11) IV	(12) IV	(13) IV	(14) IV
	Share of Workforce in Industry 1930		Share of Workforce in Industry 1968		Share of Workforce in Industry 1975		Share of Workforce in Industry 1982		Share of Workforce in Industry 1990		Share of Workforce in Industry 1999		Share of Workforce in Industry 2010	
Horse Power of Steam Engines	0.0866***	0.0724***	0.0457***	0.0452***	0.0347***	0.0342***	0.0190***	0.0187***	0.0057	0.0055	-0.0022	-0.0025	-0.0092*	-0.0092
	[0.0202]	[0.0223]	[0.0116]	[0.0117]	[0.0096]	[0.0097]	[0.0071]	[0.0072]	[0.0063]	[0.0067]	[0.0055]	[0.0058]	[0.0054]	[0.0057]
Destroyed Buildings WWI		0.00557												
		[0.00360]												
Destroyed Buildings WWII				-0.00266		-0.00231		-0.00186		-0.000430		-0.00189		0.00161
				[0.00468]		[0.00410]		[0.00322]		[0.00319]		[0.00297]		[0.00303]
Latitude	-0.533	-0.615	-0.572	-0.477	-0.434	-0.342	-0.117	-0.0443	0.194	0.243	0.514*	0.597**	0.665**	0.633**
	[0.810]	[0.724]	[0.484]	[0.490]	[0.390]	[0.399]	[0.307]	[0.315]	[0.311]	[0.325]	[0.286]	[0.295]	[0.292]	[0.304]
Land Suitability	0.0733	0.0710*	0.0353	0.0416	0.0270	0.0316	0.0131	0.0168	0.00777	0.00777	0.00171	0.00403	-0.00622	-0.0102
	[0.0452]	[0.0388]	[0.0272]	[0.0292]	[0.0257]	[0.0265]	[0.0231]	[0.0227]	[0.0235]	[0.0225]	[0.0198]	[0.0190]	[0.0211]	[0.0195]
Average Rainfall (Fall 1845-1859)	-0.0001	-0.0001	-0.0002*	-0.0002**	-0.0002*	-0.0002**	-0.0001*	-0.0002**	-0.0001**	-0.0002**	-0.0001	-0.0001*	-0.00006	-0.00004
	[0.0001]	[0.0001]	[9.06e-05]	[8.79e-05]	[9.18e-05]	[9.24e-05]	[7.60e-05]	[8.03e-05]	[7.06e-05]	[7.90e-05]	[5.83e-05]	[6.84e-05]	[5.25e-05]	[6.64e-05]
Average Temperature	-0.146*	-0.136*	-0.0808	-0.0800	-0.0395	-0.0382	-0.000958	4.32e-05	0.0305	0.0318	0.0342	0.0360	0.0402	0.0405
	[0.0868]	[0.0758]	[0.0572]	[0.0563]	[0.0561]	[0.0553]	[0.0456]	[0.0448]	[0.0456]	[0.0454]	[0.0362]	[0.0352]	[0.0317]	[0.0320]
Rivers and Tributaries	-0.0143	-0.00469	-0.00394	-0.000975	0.00268	0.00442	0.00507	0.00631	0.00861	0.0081	0.00911	0.00908	0.0192**	0.0174**
	[0.0225]	[0.0203]	[0.0140]	[0.0144]	[0.0132]	[0.0137]	[0.0107]	[0.0112]	[0.0117]	[0.0122]	[0.00990]	[0.0102]	[0.00834]	[0.00869]
Share of Carboniferous Area	0.00906	0.0149	-0.0585	-0.0557	-0.0422	-0.0424	-0.0267	-0.0272	-0.0495	-0.0538	-0.0218	-0.0259	-0.0176	-0.0210
	[0.0871]	[0.0773]	[0.0607]	[0.0598]	[0.0554]	[0.0550]	[0.0487]	[0.0491]	[0.0481]	[0.0490]	[0.0414]	[0.0423]	[0.0388]	[0.0394]
Maritime Department	-0.00921	-0.00509	-0.0415**	-0.0371*	-0.0355**	-0.0325*	-0.0300**	-0.0277**	-0.0361**	-0.0372**	-0.0350***	-0.0337**	-0.00234	-0.00583
	[0.0349]	[0.0307]	[0.0182]	[0.0197]	[0.0155]	[0.0167]	[0.0130]	[0.0138]	[0.0148]	[0.0155]	[0.0135]	[0.0141]	[0.0130]	[0.0140]
Border Department	0.0902**	0.0695**	0.0631***	0.0652***	0.0476**	0.0493**	0.0185	0.0198	0.00343	0.00324	-0.00971	-0.00858	-0.00566	-0.00722
	[0.0366]	[0.0322]	[0.0226]	[0.0214]	[0.0210]	[0.0201]	[0.0164]	[0.0160]	[0.0162]	[0.0163]	[0.0139]	[0.0142]	[0.0117]	[0.0118]
Distance to Paris	0.00009	0.00008	-0.00004	-0.00002	-0.00011	-0.00009	-0.00010	-0.00009	-0.00007	-0.00006	-0.00003	-0.00001	0.00009	0.00009
	[0.000182]	[0.000165]	[0.000120]	[0.000125]	[0.000109]	[0.000113]	[9.27e-05]	[9.59e-05]	[9.26e-05]	[9.64e-05]	[8.16e-05]	[8.36e-05]	[7.00e-05]	[7.43e-05]
Paris and Suburbs	0.0942*	0.113**	-0.00118	0.00381	-0.0448	-0.0405	-0.0763***	-0.0728**	-0.0805***	-0.0793***	-0.102***	-0.0986***	-0.0391**	-0.0417**
	[0.0554]	[0.0523]	[0.0485]	[0.0497]	[0.0471]	[0.0484]	[0.0287]	[0.0296]	[0.0240]	[0.0249]	[0.0174]	[0.0185]	[0.0197]	[0.0198]
Alsace-Lorraine	-0.0386		-0.0289		-0.0112		0.0192		0.0244		0.0223		0.0232	
	[0.0495]		[0.0278]		[0.0233]		[0.0192]		[0.0237]		[0.0210]		[0.0178]	
Urban Population in 1700	0.0072	0.0093	0.0006	0.00144	-0.00248	-0.00154	-0.00540	-0.0046	-0.0055*	-0.0049	-0.0062**	-0.0051*	-0.0003	-0.0005
	[0.008]	[0.0074]	[0.0054]	[0.0055]	[0.0049]	[0.0051]	[0.0035]	[0.0036]	[0.0033]	[0.0035]	[0.0028]	[0.0029]	[0.0026]	[0.0027]
Observations	89	86	89	86	89	86	89	86	89	86	89	86	89	86
	First stage: the instrumented variable is Horse Power of Steam Engines													
Distance to Fresnes	-0.0075***	-0.0108**	-0.0075***	-0.0078***	-0.0075***	-0.0078***	-0.0075***	-0.0078***	-0.0075***	-0.0078***	-0.0075***	-0.0078***	-0.0075***	-0.0078***
	[0.0026]	[0.0043]	[0.0026]	[0.0027]	[0.0026]	[0.0027]	[0.0026]	[0.0027]	[0.0026]	[0.0027]	[0.0026]	[0.0027]	[0.0026]	[0.0027]
Squared Temperature Deviations (1856-1859)	-4.254**	-3.774*	-4.254**	-3.779*	-4.254**	-3.779*	-4.254**	-3.779*	-4.254**	-3.779*	-4.254**	-3.779*	-4.254**	-3.779*
	[2.092]	[2.095]	[2.092]	[2.081]	[2.092]	[2.081]	[2.092]	[2.081]	[2.092]	[2.081]	[2.092]	[2.081]	[2.092]	[2.081]
F-stat (1st stage)	13.644	7.659	13.644	13.087	13.644	13.087	13.644	13.087	13.644	13.087	13.644	13.087	13.644	13.087
J-stat (p-value)	0.169	0.268	0.341	0.368	0.449	0.490	0.406	0.450	0.828	0.852	0.952	0.873	0.088	0.112

Note: All regressions include a dummy variable for the three departments which had no steam engine in 1860-1865. Aerial distances are measured in kilometers. Other explanatory variables, except the dummies, and the dependent variables are in logarithm. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** at the 5%-level, * at the 10%-level.

Table F.3: Industrialization and the evolution of the share of the workforce in the industrial sector, accounting for military casualties in the World Wars

	(1) IV	(2) IV	(3) IV	(4) IV	(5) IV	(6) IV	(7) IV	(8) IV	(9) IV	(10) IV	(11) IV	(12) IV	(13) IV	(14) IV
	Share of Workforce in Industry 1930		Share of Workforce in Industry 1968		Share of Workforce in Industry 1975		Share of Workforce in Industry 1982		Share of Workforce in Industry 1990		Share of Workforce in Industry 1999		Share of Workforce in Industry 2010	
Horse Power of Steam Engines	0.0866***	0.0722***	0.0457***	0.0450***	0.0347***	0.0344***	0.0190***	0.0188***	0.0057	0.0055	-0.0022	-0.0024	-0.0092*	-0.0087*
	[0.0202]	[0.0177]	[0.0116]	[0.0113]	[0.0096]	[0.0093]	[0.0071]	[0.0068]	[0.0063]	[0.0060]	[0.0055]	[0.0052]	[0.0054]	[0.0050]
WWI Deaths		-0.0785**												
		[0.0372]												
WWII Deaths				-0.0030		-0.0004		0.0002		-0.0012		-0.0024		0.0021
				[0.0115]		[0.0116]		[0.0111]		[0.0129]		[0.0112]		[0.00955]
Latitude	-0.533	0.613	-0.572	-0.505	-0.434	-0.420	-0.117	-0.117	0.194	0.221	0.514*	0.560*	0.665**	0.618**
	[0.810]	[0.709]	[0.484]	[0.458]	[0.390]	[0.365]	[0.307]	[0.299]	[0.311]	[0.327]	[0.286]	[0.303]	[0.292]	[0.303]
Land Suitability	0.0733	0.0521	0.0353	0.0343	0.0270	0.0268	0.0131	0.0132	0.00777	0.00732	0.00171	0.000870	-0.00622	-0.00550
	[0.0452]	[0.0421]	[0.0272]	[0.0278]	[0.0257]	[0.0263]	[0.0231]	[0.0237]	[0.0235]	[0.0240]	[0.0198]	[0.0202]	[0.0211]	[0.0211]
Average Rainfall (Fall 1845-1859)	-0.0001	-0.0001	-0.0002*	-0.0002*	-0.0002*	-0.0002*	-0.0001*	-0.0001*	-0.0001**	-0.0001**	-0.0001	-0.0001	-0.0001	-0.0001
	[0.0001]	[0.0001]	[9.06e-05]	[9.04e-05]	[9.18e-05]	[9.20e-05]	[7.60e-05]	[7.61e-05]	[7.06e-05]	[7.10e-05]	[5.83e-05]	[5.90e-05]	[5.25e-05]	[5.12e-05]
Average Temperature	-0.146*	-0.0767	-0.0808	-0.0760	-0.0395	-0.0385	-0.000958	-0.00103	0.0305	0.0324	0.0342	0.0376	0.0402	0.0369
	[0.0868]	[0.0820]	[0.0572]	[0.0596]	[0.0561]	[0.0574]	[0.0456]	[0.0473]	[0.0456]	[0.0457]	[0.0362]	[0.0369]	[0.0317]	[0.0331]
Rivers and Tributaries	-0.0143	0.00959	-0.00394	-0.00315	0.00268	0.00296	0.00507	0.00520	0.00861	0.00886	0.00911	0.00948	0.0192**	0.0186**
	[0.0225]	[0.0197]	[0.0140]	[0.0138]	[0.0132]	[0.0130]	[0.0107]	[0.0106]	[0.0117]	[0.0114]	[0.00990]	[0.00977]	[0.00834]	[0.00812]
Share of Carboniferous Area	0.00906	0.0742	-0.0585	-0.0546	-0.0422	-0.0416	-0.0267	-0.0269	-0.0495	-0.0479	-0.0218	-0.0188	-0.0176	-0.0203
	[0.0871]	[0.0846]	[0.0607]	[0.0628]	[0.0554]	[0.0580]	[0.0487]	[0.0514]	[0.0481]	[0.0519]	[0.0414]	[0.0448]	[0.0388]	[0.0394]
Maritime Department	-0.00921	0.0109	-0.0415**	-0.0406**	-0.0355**	-0.0353**	-0.0300**	-0.0301**	-0.0361**	-0.0357**	-0.0350***	-0.0343**	-0.00234	-0.00300
	[0.0349]	[0.0343]	[0.0182]	[0.0193]	[0.0155]	[0.0168]	[0.0130]	[0.0139]	[0.0148]	[0.0154]	[0.0135]	[0.0140]	[0.0130]	[0.0131]
Border Department	0.0902**	0.0888***	0.0631***	0.0641***	0.0476**	0.0478**	0.0185	0.0184	0.00343	0.00386	-0.00971	-0.00888	-0.00566	-0.00634
	[0.0366]	[0.0317]	[0.0226]	[0.0231]	[0.0210]	[0.0214]	[0.0164]	[0.0168]	[0.0162]	[0.0163]	[0.0139]	[0.0140]	[0.0117]	[0.0118]
Distance to Paris	8.99e-05	0.000207	-3.67e-05	-2.92e-05	-0.000106	-0.000104	-0.000102	-0.000102	-7.20e-05	-6.91e-05	-2.81e-05	-2.28e-05	9.38e-05	8.85e-05
	[0.000182]	[0.000177]	[0.000120]	[0.000117]	[0.000109]	[0.000105]	[9.27e-05]	[8.96e-05]	[9.26e-05]	[9.29e-05]	[8.16e-05]	[8.29e-05]	[7.00e-05]	[7.02e-05]
Paris and Suburbs	0.0942*	0.150***	-0.00118	0.00197	-0.0448	-0.0443	-0.0763***	-0.0764***	-0.0805***	-0.0792***	-0.102***	-0.0995***	-0.0391**	-0.0413*
	[0.0554]	[0.0330]	[0.0485]	[0.0459]	[0.0471]	[0.0458]	[0.0287]	[0.0283]	[0.0240]	[0.0250]	[0.0174]	[0.0185]	[0.0197]	[0.0212]
Alsace-Lorraine	-0.0386		-0.0289	-0.0297	-0.0112	-0.0111	0.0192	0.0195	0.0244	0.0240	0.0223	0.0214	0.0232	0.0236
	[0.0495]		[0.0278]	[0.0287]	[0.0233]	[0.0238]	[0.0192]	[0.0198]	[0.0237]	[0.0245]	[0.0210]	[0.0219]	[0.0178]	[0.0181]
Urban Population in 1700	0.00722	0.0150**	0.000648	0.00115	-0.00248	-0.00237	-0.00540	-0.00540	-0.00554*	-0.00534	-0.00623**	-0.00589**	-0.000254	-0.000613
	[0.00779]	[0.00663]	[0.00542]	[0.00508]	[0.00493]	[0.00456]	[0.00352]	[0.00337]	[0.00328]	[0.00328]	[0.00276]	[0.00285]	[0.00256]	[0.00245]
Adjusted R2														
Observations	89	86	89	89	89	89	89	89	89	89	89	89	89	89
	First stage: the instrumented variable is Horse Power of Steam Engines													
Distance to Fresnes	-0.0075***	-0.0057**	-0.0075***	-0.0074***	-0.0075***	-0.0074***	-0.0075***	-0.0074***	-0.0075***	-0.0074***	-0.0075***	-0.0074***	-0.0075***	-0.0074***
	[0.0026]	[0.0026]	[0.0026]	[0.0026]	[0.0026]	[0.0026]	[0.0026]	[0.0026]	[0.0026]	[0.0026]	[0.0026]	[0.0026]	[0.0026]	[0.0026]
Squared Temperature Deviations (1856-1859)	-4.254**	-6.439***	-4.254**	-4.794**	-4.254**	-4.794**	-4.254**	-4.794**	-4.254**	-4.794**	-4.254**	-4.794**	-4.254**	-4.794**
	[2.092]	[1.806]	[2.092]	[1.977]	[2.092]	[1.977]	[2.092]	[1.977]	[2.092]	[1.977]	[2.092]	[1.977]	[2.092]	[1.977]
F-stat	13.644	17.629	13.644	14.741	13.644	14.741	13.644	14.741	13.644	14.741	13.644	14.741	13.644	14.741
J-stat (p-value)	0.169	0.048	0.341	0.328	0.449	0.442	0.406	0.403	0.828	0.822	0.952	0.967	0.088	0.084

Note: All regressions include a dummy variable for the three departments which had no steam engine in 1860-1865. Aerial distances are measured in kilometers. Other explanatory variables, except the dummies, and the dependent variables are in logarithm. Robust standard errors are reported in brackets. *** indicates significance at the 1%-level, ** at the 5%-level, * at the 10%-level.

Appendix G. Average Height of Soldiers in France, 1700-1765

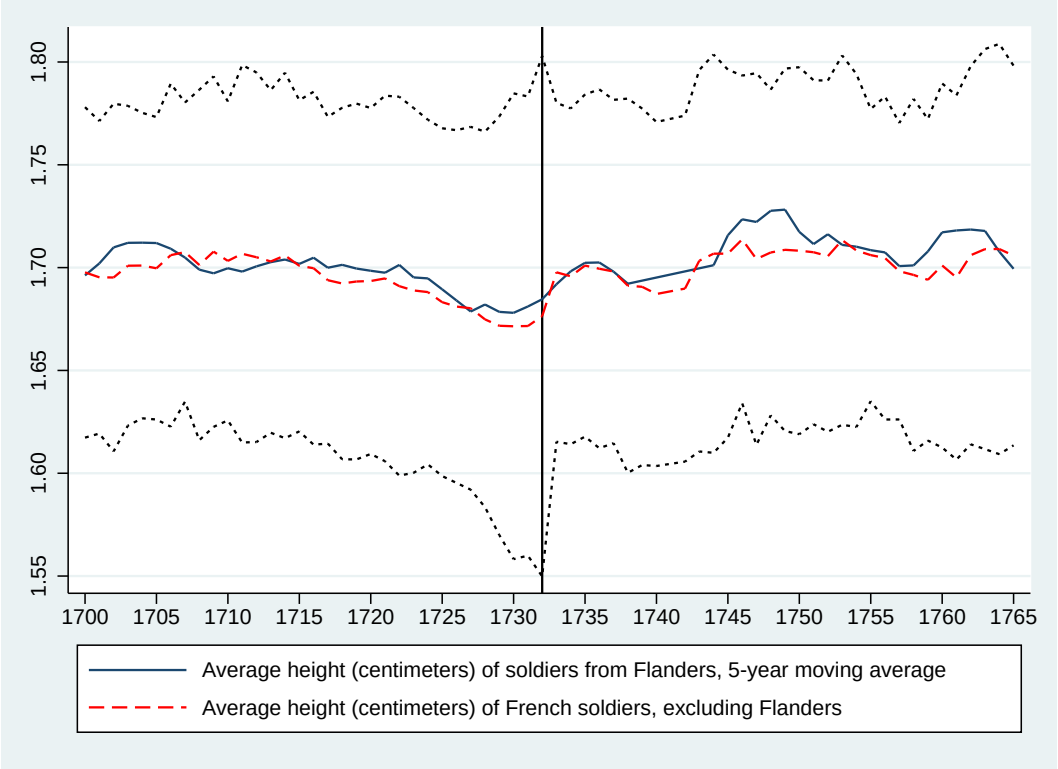


Figure G.10: Average height of soldiers in France, 1700-1765

Note: This figure displays the average mean height of soldiers from Flanders and from the rest of France. The interval between the dotted lines reflects the standard deviation around the national average (excluding Flanders). The vertical line marks the year 1732 when the first commercial application of the steam engine was made in France.

Appendix H. Variable definitions and sources

Dependent variables

Income.

GDP per capita, 1960 & 1930. Each department's GDP per capita in 1860 and 1930. Source: Combes et al. (2011).

GDP per capita, 1901. Each department's GDP per capita in 1901. Source: Caruana-Galizia (2013).

GDP per capita, 2001-2005 average. Each department's GDP per capita averaged over the 2001-2005 period. Source: French bureau of statistics (INSEE - *Institut National de la Statistique et des Etudes Economiques*).

Unemployment and Gini coefficient.

Unemployment rate, 2003-2005 average. Each department's unemployment rate averaged over the 2003-2005 period. Source: French bureau of statistics (INSEE - *Institut National de la Statistique et des Etudes Economiques*).

Gini coefficient, 2001-2005 average. Each department's Gini coefficient averaged over the 2001-2005 period. Source: French bureau of statistics (INSEE - *Institut National de la Statistique et des Etudes Economiques*)

Workforce, Pre-WWII.

Share of workforce in industry, 1861, 1901, 1931. Each department's share of the workforce in the industrial sector in 1861, 1901 and 1931 (the control group is made of the agricultural sector). Sources: *Annuaire Statistique De La France* (1878-1939) and Béaur, Gérard, and Béatrice Marin. 2011. La Statistique Générale de la France Présentation. L'Atelier du Centre de recherches historiques. http:acrh.revues.org/index2891.html.

Share of workforce in services, 1861, 1901 and 1931. Source: Each department's share of the workforce in the service sector in 1861, 1901 and 1931 (the control group is made of the agricultural sector). Sources: *Annuaire Statistique De La France* (1878-1939) and Béaur, Gérard, and Béatrice Marin. 2011. La Statistique Générale de la France Présentation. L'Atelier du Centre de recherches historiques. http:acrh.revues.org/index2891.html.

Workforce, Post-WWII.

Share of workforce in industry, 1968, 1975, 1982, 1990, 1999 and 2010. The share of the workforce working in the industrial sector (the control group is made of the agricultural sector). Source: The successive censuses conducted by the French bureau of statistics (INSEE - *Institut National de la Statistique et des Etudes Economiques*) in 1968, 1975, 1982, 1990, 1999 and 2010.

Share of workforce in services, 1968, 1975, 1982, 1990, 1999 and 2010. The share of the workforce working in the service sector (the control group is made of the agricultural sector). Source: The

successive censuses conducted by the French bureau of statistics (INSEE - *Institut National de la Statistique et des Etudes Economiques*) in 1968, 1975, 1982, 1990, 1999 and 2010.

Share of Executives in Workforce (age 25-54), 1968, 1975, 1982, 1990, 1999 and 2010. The share of executives and other intellectual professions (i.e, engineers, executives, journalists, wage-earners in the arts, information, entertainment sectors, secondary school and university teachers) in the workforce age 25-54. Individuals in this group have a high-level of human capital. Source: The successive censuses conducted by the French bureau of statistics (INSEE - *Institut National de la Statistique et des Etudes Economiques*) in 1968, 1975, 1982, 1990, 1999 and 2010.

Share of Intermediary Professionals in Workforce (age 25-54), 1968, 1975, 1982, 1990, 1999 and 2010. Source: The share of middle management professionals (i.e., technicians, foremen, supervisors, primary school teachers, nurses) and employees (unqualified or qualified industrial and farm workers, as well as workers working for craftsmen) in the workforce age 25-54. Individuals in this group have a medium-level of human capital. Source: The successive censuses conducted by the French bureau of statistics (INSEE - *Institut National de la Statistique et des Etudes Economiques*) in 1968, 1975, 1982, 1990, 1999 and 2010.

Share of Employees in Workforce (age 25-54), 1968, 1975, 1982, 1990, 1999 and 2010. The share of employees (unqualified or qualified industrial and farm workers, as well as workers working for craftsmen) in the workforce age 25-54. Individuals in this group have a low-level of human capital (the control group is made of farmers, artisans and other self-employed individuals). Source: The successive censuses conducted by the French bureau of statistics (INSEE - *Institut National de la Statistique et des Etudes Economiques*) in 1968, 1975, 1982, 1990, 1999 and 2010.

Education Measures, Pre-WWI.

Share of literate individuals among conscripts, 1874-1883 and 1894-1903. The average share of French army conscripts, i.e., 20-year-old men who reported for military service in the department where their father lived, who could read and write, computed over the 1874-1883 and 1894-1903 periods. Source: *Annuaire Statistique De La France* (1878-1939).

Education Measures, Post-WWII.

Share of men age 25 and above with a secondary or post-secondary degree, 1968, 1975, 1982, 1990, 1999 and 2010. The share of men age 25 and above in the population of each department who at least completed secondary schooling. Source: The successive censuses conducted by the French bureau of statistics (INSEE - *Institut National de la Statistique et des Etudes Economiques*) in 1968, 1975, 1982, 1990, 1999 and 2010.

Share of women age 25 and above with a secondary or post-secondary degree, 1968, 1975, 1982, 1990, 1999 and 2010. The share of women age 25 and above in the population of each department who at least completed secondary schooling. Source: The successive censuses conducted by the French bureau of statistics (INSEE - *Institut National de la Statistique et des Etudes Economiques*) in 1968, 1975, 1982, 1990, 1999 and 2010.

School enrollment of men/women age 15-17/18-24, in 2010. The shares of men and women in the age groups 15-17 and 18-24 enrolled in an educational institution. Source: The successive censuses conducted by the French bureau of statistics (INSEE - *Institut National de la Statistique et des*

Etudes Economiques) in 2010.

Share of Individuals who Express No Interest in Science, 2001

Share of Individuals who Express No Interest in Science, 2001. The share of individuals in each French department who express no interest in science. Source: Centre de recherches politiques de Sciences Po, Enquête science 2001.

Department (Public) Spending on Education, per Inhabitant

Department Spending on Primary Schooling 1874-1882 (in French francs), per Inhabitant. Sources: *Annuaire Statistique De La France* (1878-1939) and Béaur, Gérard, and Béatrice Marin. 2011. La Statistique Générale de la France Présentation. L'Atelier du Centre de recherches historiques. http:acrh.revues.org/index2891.html.

Department Spending on Secondary Schooling 2010 (in euros), per Inhabitant. Average spending per capita by the departmental government in 2010. Source: Département des Etudes et Statistiques Locales - DGCL Comptes administratifs 2010 des départements

Explanatory variables

Horse power of steam engines. This variable reports the total horse power of the steam *Engines* in the firms of each department, which is computed from the industrial survey carried out by the French government between 1860 and 1865. See Chanut et al. (2000) for details on the implementation of this survey.

Average Rainfall (Fall 1845-1859). Average rainfall in fall over the 1845-1859 in each French department. The data are reconstructed by Luterbacher et al. (2004), Luterbacher et al. (2006) and Pauling et al. (2006) for the 1500-1900 period, at a resolution of 0:5 by 0:5 decimal degrees.

Average temperature. The average temperature (in celsius), reported at a half-degree resolution by Ramankutty et al. (2002), across the French departments.

Latitude. The latitude of the centroid of each French department.

Land Suitability The land suitability index, reported at a half-degree resolution by Ramankutty et al. (2002), across the French departments.

Share of carboniferous area in department. The share of carboniferous area in each department. Source: Fernihough and O'Rourke (2014).

Rivers and Tributaries. This dummy variable takes the value 1 if at least one of the main French rivers or tributaries (whose total length is above 300 km) crosses a given department. These are the Rhin, Loire, Meuse, Rhône, Seine, Garonne, Dordogne, Charente and Escaut.

Maritime department. This dummy variable takes the value one if a French department borders the coastline and zero otherwise.

Border department. This dummy variable takes the value one if a French department borders one of the foreign countries around France (Belgium, Luxembourg, Germany, Switzerland, Italy and Spain) and zero otherwise.

Distance to Paris. The great circle distance as "the crow flies" from Paris, the capital of France, to the administrative center of each department. This aerial distance is computed in kilometers.

Paris and suburbs. This dummy variable takes the value one for the three departments, i.e., Seine, Seine-et-Marne and Seine-et-Oise, which encompass *Paris and its suburbs* and zero otherwise.

Alsace-Lorraine. This dummy variable takes the value one for the Bas-Rhin, Haut-Rhin and Moselle departments and zero otherwise in all the regressions on post-WWI outcomes since these three departments were under German rule between 1871 and 1918.

Urban population in 1700 (thousand of inhabitants). This variable reports the total population of the major urban centers, i.e., with more than 10,000 inhabitants, in each French department in 1700 using the data in Lepetit (1994, Appendix B).

Instrumental variables

Distance to Fresnes sur Escaut. The great circle distance as "the crow flies" from Fresnes-sur-Escaut, where a steam engine was first successfully operated in France for commercial and industrial purposes from 1732 onwards, to the administrative center of each department. This aerial distance is computed in kilometers.

Squared Temperature Deviations (1856-1859). Squared deviations of temperature in fall 1856-1859 where 1831-1855 is the baseline period. The data are reconstructed by Luterbacher et al. (2004), Luterbacher et al. (2006) and Pauling et al. (2006) for the 1500-1900 period, at a resolution of 0:5 by 0:5 decimal degrees.

Variables for robustness analysis

Education before 1840

Percentage of conscripts who could read, 1827-1829 and 1831-1835. Source: Béaur, Gérard, and Béatrice Marin. 2011. La Statistique Générale de la France Présentation. L'Atelier du Centre de recherches historiques. http:acrh.revues.org/index2891.html.

Share of Grooms who Signed their Wedding Licenses, 1686-1690, 1786-1790 and 1816-1820. The share of grooms who signed their wedding licenses with their names over the 1686-1690, 1786-1790 and 1816-1820 periods (as opposed to those who marked it with a cross). Source: Béaur, Gérard, and Béatrice Marin. 2011. La Statistique Générale de la France Présentation. L'Atelier du Centre de recherches historiques. http:acrh.revues.org/ index2891.html.

University in 1700. Number of universities in 1700 in each department. Source: Bosker et al. (2013).

Religious minorities

Jews in Population, 1861. Share of Jews in the population in each department. Source: Béaur, Gérard, and Béatrice Marin. 2011. La Statistique Générale de la France Présentation. L'Atelier du Centre de recherches historiques. http:acrh.revues.org/index2891.html.

Protestants in Population, 1861. Share of Protestants in the population in each department. Source:

Béaur, Gérard, and Béatrice Marin. 2011. La Statistique Générale de la France Présentation. L'Atelier du Centre de recherches historiques. http:acrh.revues.org/index2891.html.

Presence of raw material

Iron forges, 1789 and 1811. The number of iron forges in each department in 1789 and 1811. Source: Woronoff (1997).

Presence of iron forges, 1789 and 1811. This dummy variable takes the value 1 if there was at least one iron forge in a department in 1789. Source: Woronoff (1997).

Area covered by mines in department. The area covered by coal mines in 1837 in each department. Source: France - Ministère des Travaux Publics (1838). Statistique de l'industrie minérale et des appareils à vapeur en France et en Algérie, Paris.

Economic integration

Market integration during the French Revolution. The number of external suppliers for each department in the 1790s for the following categories of products: cotton, hosiery, hardware, misc. production goods, misc. consumption goods, linen and hemp, wool and wool cloth, leather products hides and hats, iron, Food items, drinks, paper, wood for industry, fuel (wood and coal). Source: Daudin (2010).

Railroad connection to Paris in 1860. This dummy variable takes the value 1 if the administrative center of the department was connected to the railroad network in 1860. Source: Caron (1997).

Population density

Population density, 1801, 1831 and 1861. Source for the data on population: Béaur, Gérard, and Béatrice Marin. 2011. La Statistique Générale de la France Présentation. L'Atelier du Centre de recherches historiques. http:acrh.revues.org/index2891.html. The area covered by each department is computed via GIS.

Distance to cities

Distance to London. The great circle distance as "the crow flies"from London, the capital of England, to the administrative center of each department. This aerial distance is computed in kilometers.

Distance to Marseille. The great circle distance as "the crow flies"from Marseille to the administrative center of each department. This aerial distance is computed in kilometers.

Distance to Lyon. The great circle distance as "the crow flies"from Lyon to the administrative center of each department. This aerial distance is computed in kilometers.

Distance to Rouen. The great circle distance as "the crow flies"from Rouen to the administrative center of each department. This aerial distance is computed in kilometers.

Distance to Mulhouse. The great circle distance as "the crow flies"from Mulhouse to the administrative center of each department. This aerial distance is computed in kilometers.

Distance to Bordeaux. The great circle distance as "the crow flies" from Bordeaux to the administrative center of each department. This aerial distance is computed in kilometers.

Distance from Paris (weeks of travel). The time needed for a surface travel from Paris to the administrative center of each department measured in weeks of travel. Source: Özak (2010).

Distance from Marseille (weeks of travel). The time needed for a surface travel from Marseille to the administrative center of each department measured in weeks of travel. Source: Özak (2010).

Distance from Lyon (weeks of travel). The time needed for a surface travel from Lyon from Lyon to the administrative center of each department measured in weeks of travel. Source: Özak (2010).

Distance from Rouen (weeks of travel). The time needed for a surface travel from Rouen to the administrative center of each department measured in weeks of travel. Source: Özak (2010).

*Distance from Mulhouse (weeks of travel).*The time needed for a surface travel from Mulhouse to the administrative center of each department measured in weeks of travel. Source: Özak (2010).

Distance from Bordeaux (weeks of travel). The time needed for a surface travel from Bordeaux to the administrative center of each department measured in weeks of travel. Source: Özak (2010).

Share of the native population

Share of the native population in each department, 1901. This variable is constructed as the share of the population born in a given department, out of the total population inhabiting this department in the 1901 census of the French population. Source: *Annuaire Statistique De La France* (1878-1939).

Share of the native population in each department, 2010. This variable is constructed as the share of the population born in a given department, out of the total population inhabiting this department in the 2010 census of the French population. Source: (INSEE - *Institut National de la Statistique et des Etudes Economiques*).

Building Destruction and Military Casualties in World Wars

World War I Building Destruction. Number of buildings destroyed in World War I. Source: Michel (1926, 1932)

World War I Building Destruction. Number of buildings destroyed in World War II. Source: France (1995).

Soldier deaths, World War I and World War II. Number of soldiers born in each department who died in World War I and in World War II. Source: French Ministry of Defense's website www.memoiredeshommes.sga.defense.gouv.fr.

Population 1911. Number of inhabitants in each department. Source: General Census of the French Population, 1911.

Population 1936. Number of inhabitants in each department. Source: General Census of the French Population, 1936.

Share of unionized workers in workforce

Share of unionized workers in workforce, 1930. The share of individuals in the workforce who belonged to an union in 1930 in each department. Source: *Annuaire Statistique De La France* (1878-1939).

Average wage, 1901 (in French Francs)

Average adult wage, 1901. Each department's average wage for men and women in 1901. Source: France. Ministère du travail et de la prévoyance sociale (1911).

Industrial concentration and firm size

Concentration index. This variable computes the Herfindahl index of industry concentration for each department using the 16 different industries listed in the 1860-1865 industrial survey (textile, mines, metallurgy, metal objects, leather, wood, ceramics, chemistry, construction, lighting, furnitures, clothing, food, transportation, sciences & arts, and luxury goods). The Herfindahl index of industry concentration is defined as, $H_d = \sum_{i=1}^{16} \left(E_{i,d}/E_d\right)^2$, where H_d is the Herfindahl concentration index for department d, $E_{i,d}$ is the horse power of the steam engines in the firms in sector i of department d and E_d is the horse power of the steam engines in the firms of department d. Source: Chanut et al. (2000).

Concentration Index - Share of Employees in Industry. This variable computes the Herfindahl index of the share of employees in each of the 16 different industries listed in the 1860-1865 industrial survey (textile, mines, metallurgy, metal objects, leather, wood, ceramics, chemistry, construction, lighting, furnitures, clothing, food, transportation, sciences & arts, and luxury goods) for each department. This Herfindahl index of is defined as, $H_d = \sum_{i=1}^{16} \left(W_{i,d}/W_d\right)^2$, where H_d is the Herfindahl concentration index for department d, $W_{i,d}$ is the number of the employees in the firms in sector i of department d and W_d is the total number of employees in the firms of department d. Source: Chanut et al. (2000).

Number of Employees per Firm 1861-1865. This variable computes the average number of employees per firm in 1860-1865. Source: Chanut et al. (2000).

Weighted tariffs across sectors

Weighted tariffs across sectors. The weighted average of the tariff rates for each of the 16 sectors listed in the 1860-1865 industrial survey (textile, mines, metallurgy, metal objects, leather, wood, ceramics, chemistry, construction, lighting, furnitures, clothing, food, transportation, sciences & arts, and luxury goods) in 1865, 1901 and 1919, where the weights by the shares of the horse power of the steam engine horse in each department. Source: Chanut et al. (2000) for the industrial survey and Dormois (2006, 2009) for the tariffs.