What drove (or choked) French entrepreneurship under Napoleon III?
A department-level analysis

Jean-Pierre Dormois (University of Strasbourg) and

James Foreman-Peck (University of Cardiff Business School)

Abstract: Systematic judgement about 19th Century French entrepreneurs have been hampered by the piece-meal nature of the evidence analysed by historians. Thus the partial and limited diffusion of industrialization has been attributed to timid or deficient entrepreneurship. Here we attempt to tackle the full picture of the French industrial firms under the Second Empire by processing information from three sources: the population census of 1866 which provides statistics of industrial employers; the records of schedule C of the *patente* business tax – both of which represent a stock – along with data on company incorporation for the same benchmark. Observing the enduring NE-SW rift in industrial development, we search for the features in the physical, cultural, demographic and economic environment which could have constrained entrepreneurs to settle in greater numbers in some areas rather than in others. These various indicators are employed for an econometric analysis which assumes that entrepreneurship is constrained or stimulated by the size and accessibility of markets and by factor quality and supplies.

France's inability to keep pace with Britain during the first phase of industrialisation has been a favourite subject of controversy among economic historians of the 1960s and 70s. David Landes suggested in an oft-quoted article of 1949 that this failure had to do with a dearth of adventurous entrepreneurs of the kind that developed the key innovations of the new industrial age. French historians have usually preferred to assign the French lag to circumstantial causes and have been instead prone to extol the prowess of certain French inventors and captains of industry.

In the present study we endeavour to take the "full picture" of French industrial entrepreneurs under the Second Empire, at a time, the 1860s when the "industrial revolution" has been under way for about two decades. Were there structural factors which could explain why industrial firms tended to concentrate disproportionately in certain parts of the country, typically in its North Eastern half (north of the St-Malo-Geneva line)?

Heretofore scholars have directed their efforts to scrutinize individual entrepreneurs, usually very prominent ones in achievement or wealth. The rank and file of French industry is much less known however and some of the generalizations, which have been made on the basis of the history of individual protagonists, may be called into question once the sample is enlarged to include the whole of French industrial firms. As has been remarked by numerous observers of French industrialization (Patrick O'Brien among others), the only possible path of development and exporting opportunities for follower countries (such as France) lay in end-of-the-line, finished products embedding higher skill contents. By focussing on the branches 'revolutionized' in Britain, historians have been to some extent 'barking up the wrong tree.' It was inevitable that some particularly daring entrepreneurs took up the challenge of copying the kind of large-scale textile mills and iron smelters, which had excited their wonder when they had visited England. But the more natural behaviour, given the competitive constraints faced by French prospective industrialists, would have been to look for market opportunities outside of the realm of the champions of the industrial revolution.

Of course in order to analyze the behaviour of such a vast and varied community one should work with manageable sub-samples of to a large extent anonymous individuals and restrict the questioning to the kinds of problems, which are tractable with the available data.

In order to throw light on the problem of specifically industrial firm creation during the Second Empire, we built a database on a departmental basis. Some departments (89 in total) were more industrial than others: could differentials in entrepreneurship account for the observed discrepancy? To establish the number of industrial firms, we tapped the numbers provided by the professional section of the 1866 population census as well as the records of

the *patente* business tax which are regarded as a more precise instrument for determining firm activity in this period (Bignon, 2011). Additional statistical information was collected from the Survey of industry of 1861-65 as well as other sources.

The NE/SW divide in French history

Although it built on earlier individual experiments in the last years of the Old Regime and Napoleonic period, French industrialisation began in earnest only after 1830. Dunham (1955) observed the deployment of the industrial revolution in this country precisely after that date, and Rostow dated the French 'take-off' during the three decades after 1830, an observation which was later warranted by the first GNP and industrial output series. By mid-century France was still a formidable industrial power, as evidenced by the bulk and variety of its merchandise exports, with an aggregate industrial value added only second (but very close) to Britain's – although four fifths originated in traditional, non-mechanised ateliers and shops. The modern branches of manufacturing were struggling to catch up with the pioneer. These were predominantly located in the North Eastern half of the country, beyond a line running between Brittany and Marseilles.[1] This **fault line** was to shape economic development for decades to come and endure well into the 20th Century. By the beginning of the 21st Century, industry was still more prevalent north of this line than to the south of it (map 1). By 1866 this was already the case: two thirds of all industrial establishments (and 70% of their industrial labour force) were located north of the St-Malo – Geneva divide, an area representing 42 out of 89 departments (map 2).

This distortion is matched by the regional distribution of the population reliant on industry for its sustenance (map 3) and is also apparent in the distribution of business licences and company incorporation (map 4 and 5).

Such a skewed geographical distribution of industrial enterprise certainly begs for an explanation and has obvious links with the debate about the adequate or deficient supply of entrepreneurship at this crucial stage of French industrialisation. Following Landes (1949), the "leisurely pace" of French industrialisation has been ascribed to a dearth of entrepreneurship both in quality and quantity. To what extent the relative dearth of industrial enterprise in some parts other country can be attributable to "physical" or "rational" constraints or, alternatively, to a lack of entrepreneurial spirit – as had been first argued by the Landes thesis?

---

[1] In its original form, the "St-Malo – Geneva line" first materialised in 1826 in a study of school enrolment and literacy rates across departments. It was later shown, in its revised version 'St-Malo – Marseilles' (SMM) to apply to several other socio-cultural indicators.

differences in the business environment in the North and South

French industrial enterprise in the Second Empire

Although structural change proceeded in France more slowly during the first phases of industrialisation, there seems to have been no shortage of business initiative: industrial concerns were plentiful and industrial activities extensive and very diversified as export statistics can testify. The professional census of 1866 (which is used here as a benchmark) numbered some 1.4 million industrial establishments across the country headed by an equivalent number of employers (200,000 jointly by husband and wife).

Collectively these employed 4.715 million workers (about 28.5% of the total working population), putting on cursory inspection the average establishment size apparently very low (3.3 worker). Such a picture, as induced from crude numbers, would be misleading however. An unknown proportion of those qualifying as industrial business owners ("*patrons de l'industrie*") were independent craftsmen working. A truer picture of France's industrial employers could be obtained from a different source: the records of the *patente* business tax.

Since a law of 1791, all businesses selling goods and services on the market had to register for a business licence (*patente*) for which they were subject to an annual tax (based on the estimated value of their premises). By 1866, several amendments (in 1850, 1858 and 1862) had exempted all manner of independent workers (lately those working on commission).

Table 1. Classes and numbers of the *patente* business licences and tax base, France 1866

Schedule		Numbers	Rental value of premises	Tax receipts	Tax rate
			(Fm)	(Fm)	(%)
A	Ordinary trade	1 174 000	477.8	42.0	8.80
B	Banking; wholesale trade	12 800	30.0	3.9	13.15
C	Industry	198 000	217.0	12.2	5.62
D	Professions	51 800	24.8	1.6	6.53
		1 436 600	750.0	59.8	7.98

Patente records thus provide possibly the best device for tracking of the number of firms in France at the time. Industrial business licence holders, pooled in schedule C, represented only a tenth of the total of those classed as industrial employers in the Census (Table 1). As the breakdown by branch makes clear, it included only those active in what was known as "*grande*" or manufacturing industry, working with raw materials and processing mainly semi-finished goods– to be distinguished from "*petite industrie*" or the crafts which were included in schedule A (with the heading "ordinary trade") and numbering four times as many licensees.

Table 2. Number of business licences by main branch of industry, France 1866

Grande industrie	Establishments	Stall owners, hawkers	Associates	Total
Metals and minerals	26 520	28	506	27 054
Metal wares	14 052	204	591	14 847
Earthenware and glass	23 990	261	307	24 558
Wood	21 075	58	927	22 060
Paper	4 073	59	190	4 322
Leather, hides, animal matter	8 297	50	419	8 766
Chemicals, pharmaceuticals, perfumes	15 203	77	570	15 850
Yarn, fabrics, felt and rope	53 179	1 400	2 332	56 911
Machinery and tools	8 567	36	447	9 050
Fire arms, hunting and fishing equipment	2 921	9	47	2 977
	177 877	2 182	6 336	186 395
Petite industrie				
Agricultural implements, seeds and fertilizers	68 839	386	1 752	70 977
Building trades	85 180	23	2 628	87 831
Furniture, crockery	32 297	965	950	34 212
Heating and lighting	28 561	148	846	29 555
Saddle and harness, coach-making	21 525	18	351	21 894
Food and drink	328 351	15 590	6 039	349 980
Clothing and dress-making	164 647	3 443	3 759	171 849
Publishing, scientific instruments, art supplies	17 011	807	3 232	21 050
Jewellery, watch and clock, luxury goods	15 542	99	640	16 281
	761 953	21 479	20 197	803 629

Finally a third indicator of entrepreneurship can be resorted to, but this latter a flow rather than a stock: the number of company incorporated annually. Until the law of 1867 (Freedeman, 1979) company creation was strictly supervised by the authorities and incorporation had to be registered by the local commercial court (*tribunaux de commerce*). Annual creations were accordingly limited in numbers, the vast majority of them being general full-liability partnerships. Unfortunately we don't have, except for the public companies (authorized to issue securities), the breakdown of creations by branch of activity and the totals include industrial concerns as well as other types of businesses. However, a global indicator has been computed as the average of annual creations over the period 1861-7, after the annexation of Savoy and Nice and before the introduction of the 1867 reform.

Table 3. Company creations by type, France 1866 and 1867

	1866	*1867*
General partnerships (*Sociétés en nom collectif*)	3,179	3,084
Limited partnerships (*Sociétés en commandite*)	715	530
Joint-stock companies (*Sociétés par action*)	131	101
Public companies (*Sociétés anonymes*)	6	9
Limited liability companies (*Sociétés à responsabilité limitée*)	88	77
	4,119	3,801

Meanwhile historical research has mainly approached entrepreneurship from a biographical angle. A survey of French patrons of the Second Empire launched in the 1980s (Anceau et al. 1991) has assembled a sample of some 770 prominent businessmen, mostly active in industry but with a sizeable share of bankers (in Paris) and merchants and ship-owners (in Marseille and Bordeaux) in 29 departments, all of them, save two, located north of the St-Malo – Geneva line. The strategy has consisted in selecting in any one department the most prominent industrialists/businessmen in their trade and the resulting sample exhibits consequently the 'upper crust' of this milieu: none of the big names are missing and the distribution across various branches of industry is not out of line with their share of value added as reported in the industrial survey carried out in this period (Table 2). Biographical information was gathered from a variety of sources, such as newspaper obituaries and, for those lucky ones, in the records of the Legion of Honour.

Table 4. The sectoral distribution of sampled entrepreneurs and value added (N=770)

(in %)	Total in sample	Industrial concerns survey	Value added 1861-65[2] sector-wide
Bankers, insurers, stock-brokers	17.1	—	—
Wholesale traders and merchants	13.8	—	—
Transport equipment	3.9	5.5	1.2
Textile manufacturing	28.0	40.7	20.5
Metallurgy	15.5	22.4	10.9
Food and drink industry	7.9	11.5	23.6
Chemicals	3.0	4.3	4.2
Mining	1.4	2.0	7.6
Construction	1.7	2.5	2.5
Publishing	1.3	1.9	1.8
Miscellaneous	6.4	9.2	9.7
	100	100	—

source: Anceau et al. *Les entrepreneurs du Second Empire*

This approach is probably the best suited to investigate the behaviour, motivations and business strategies of individual personalities. The question is of course to what extent this sample is representative of the whole class (less than 1% of all industrial employers). The focus on modern or heavy industries (such as metal-making and textiles) tends to distort the picture of a sector where processing industries loomed very large in the sector as a whole and employed the most workers. Owners of small family firms (SME), the backbone of French business in the 19th Century, are absent from the sample. Thus, among the silk-weavers of Lyons, only 19 out of an estimated total of 400 'houses' are identified. In the Nièvre department, 16 prominent patrons were selected for a detailed biography but the listings of the

---

[2] As taken from: Statistique Générale de la France, *Enquête industrielle 1861-65* (Paris, 1873)

professional *Annuaire général du commerce* for 1864 mention 73 industrial concerns in the main town, Nevers, alone, not all in the shadow of the local magnate Boigues, Rambourg & Cie.

French sources distinguish between '*grande industrie*' which comprised manufacturing (but not exclusively) and '*petite industrie*' or crafts, which was made up of smaller production units, usually devoid of steam-powered equipment. In the workforce count below, '*grande industrie*' congregates branch I to IX and accounts for 44% of the workforce classified as 'industrial' while classes X-XVI qualify as '*petite industrie*'.

Table 5. Employment in French industry by major branches, 1866

			%	
I.	Textile industry	2,038,747	18.6	24.7
II.	Metal-making	151,858	1.4	1.8
III.	Metalworking	525,349	4.8	6.4
IV.	Leather	121,452	1.1	1.5
V.	Wood	287,769	2.6	3.5
VI.	Earthen and stoneware	236,355	2.2	2.9
VII.	Chemicals	73,235	0.7	0.9
VIII.	Lighting instruments and materials	60,303	0.6	0.7
IX.	Furniture-making	151,620	1.4	1.8
X.	Dressmaking	2,108,324	19.2	25.5
XI.	Food and drink	1,704,596	15.6	20.6
XII.	Vehicles, coach-making (incl. railway equipment)	426,660	3.9	5.2
XIII.	Paper, printing, scientific instruments	142,343	1.3	1.7
XIV.	Luxury goods	145,285	1.3	1.8
XV.	Arms and weapons	66,414	0.6	0.8
XVI.	Miscellaneous	27,637	0.3	0.3
	Manufacturing	8,267,947	75.4	100.0
XVII.	Mining and quarrying	429,211	3.9	
XVIII.	Building	2,261,933	20.6	
	Industry	10,959,091	100.0	

An indicator of the relative prevalence of industrial firms

The frequency of entrepreneurship during industrialisation can be approached with three indicators. First, the relative density of industrial businesses, already mentioned, can be computed using the number of individuals classed as industrial employers (which matches the number of "establishments"). A second, more encompassing measure, is provided by the records of the *patente* business tax, considered by some scholars (Chevaillé, Bignon) as the true indicator of the stock of firms at any given time during the 19th Century. These two indicators measure a stock of firms at any given time. Finally statistics on the annual incorporation of companies, which exhibit much smaller numbers can provide a supplementary measure of entrepreneurship – even if the vast majority of firms were not

incorporated. Until the law of 1867, company registration was submitted to a cumbersome legal process in the *tribunaux de commerce* but data do not provide the breakdown by economic sector. Most were partnerships and public joint-stock companies had to be approved by the highest court in the land, the *Conseil d'Etat*.

We use these three indicators concurrently to gauge the prevalence of industrial entrepreneurship.

Determinants of firms' location

Firms tend to locate in large markets because large markets allow them ready access to both supply side inputs and demand side sales. When locating in large markets, firms expand them. This two-way interaction is termed agglomeration. Some of this concentration can be attributed to physical aspects of the economy such as rivers, coasts, mineral deposits and climate. But much of it is explained by acquired advantages; an educated labour force, an efficient railway system and/or a stable legal environment. Some of these acquired features-including culture – can be regarded as fixed in the short term because they change only slowly. The empirical question to be faced in this study is which departmental characteristics can be regarded as exogenous to business location and which are determined by similar influence to those that bring about business agglomeration.

Without precise information on the profile of individual entrepreneurs we take here, what was essentially the 'Habakkuk view', that the character of enterprise was primarily a product of the economic environment rather than the reverse and that in particular the family firm was the common agent of 19th Century capitalism (Habakkuk, 1955, p. 159).

Obviously natural and social endowments played a role in the unequal geographical distribution of industrial firms in France. Leaving aside personal or subjective factors in business creation, we investigate the role played by the physical, economic and social environment to account for the unbalanced concentration of industrial enterprise in departments north of the SMM line. In order to carry out we use a number of objective constraints as possible determinants of more or less plentiful firm creation.

First we introduce **physical constraint variables** in the shape of the elevation (above sea level) of the department's main town which takes into account the general repellent character of mountainous areas as well as climate variables (average temperature and rainfall). Higher regions are likely to be less accessible than lower ones, which will adversely affect the location of industry. Climate may affect the productivity of agriculture and therefore the comparative advantage for industrial employment. Both agriculture and industry are likely to be less productive with height, and so the sign of this variable does not allow us to distinguish

whether agricultural productivity is a boost to industry or a substitute. In interpreting the rainfall effect, the mean value of the sample must be borne in mind (724mm). It is likely that the availability of water even in the driest departments was not sufficient to adversely affect agriculture, whereas too much rainfall may well do. If this is so, then a negative rainfall coefficient indicates that there is again a complementary relation between industry and agriculture; too much rain lowers agricultural productivity (including the effect on the type of crops and farming) and this also adversely impacts on business.

Climate may also affect the supply of effort and leisure preferences; in warmer sunnier climes the attraction of work may be less. In this case, we would expect a negative coefficient on a temperature variable in the *patentes* equation. Alternatively, is there is an advantage to location in warmer departments, because people prefer living their lives there, a positive temperature coefficient would be expected.

Furthermore the shortest distance from Paris is included as an indicator of accessibility of special services (political and administrative, legal and banking).

This group of characteristics have the merit that they cannot be changed by the industrial distribution of economic activity – they are exogenous influences on the spatial distribution of business. By contrast, the following variables might to a lesser or greater extent be responses to enterprise as well as determinants of it.

A second group of variables, **institutions and culture**, might respond to business activity but surely only very slowly. On balance they might be treated as largely exogenous. Church attendance is one measure of religious culture and the attitudes that go with it that could influence the supply of businesses or the demand. Possibly less exogenous to business is literacy. A skilled labour force, human capital, may well influence industrial productivity and competitiveness. On the other hand the needs of industry might strengthen the demand for literacy. The crime rate calculated over several years (from 1861[3]) and restricted to "crimes against property" (as opposed to "crimes against persons") gives an indication as to the security of property rights (Table 6).

Inadequate enforcement of law and order creates an uncongenial environment for business[4]. But also an industrial environment may create more opportunities for crime. The departmental bankruptcy rate is the consequence of applying a common institutional arrangement to different economic environments. That is, spatial variations are likely to

---

[3] That year three new departments were added following the annexation of Nice and Savoy.
[4] Business malfeasance was a staple of 19th Century novels (such as Balzac's *La Maison Nucingen* and Zola's *La fortune des Rougon*). See also the descriptions (mostly from court cases) in Eugene Weber, *Peasants into Frenchmen* (Stanford, 1976).

reflect different industrial structures. In this sense, it can hardly be termed a feature of the local institutional environment. Nonetheless, along with other business exits, bankruptcy is likely to be an influence on the size of the business stocks and the pace of new entry, often associated with entrepreneneurship.

Table 6. Criminal cases against property: average annual number of convictions

	1861-65	1866-69
Counterfeit money	28	29
Other forgeries	370	289
Breach of trust		89
Embezzlement; larceny	1,230	313
Highway robbery		35
Other burglary		852
Arson	202	209
Fraudulent bankruptcy	76	72
Other attacks on property	35	—
	1,941	1,888

Our third group of potential influences on business consists of **demographic and economic departmental variables**. These are much more likely than the other two categories to respond to business as well as to determine location. The rate of urbanisation is indicative of the potential mobilisation of labour and access to specifically urban services. In the age of rail and steam, the extent of the rail network and the local price of coal could have influenced the decision to settle in one area rather than the next. The average standard of living as well as the prevailing wage could also have played a role in the demand for the products of business. Indicators of the former are of two kinds. We have the level of disposable income per capita which has been reconstructed for 1864 on the basis of extensive information on employment and compensation (Delefortrie & Morice, 1959) and data on the average size of conscripts which qualifies as the 'biological' standard of living. The introduction of the prevailing wage rate, on the other hand, might have come into the calculations of aspiring industrialists. Departmental averages were computed on the basis of recorded wages paid to local craftsmen in some 35 professions (skilled as well as unskilled). Wage costs entered for a large share of total production costs and high wages could have deterred investors. The paternalistic policy of industrial employers of the time is in some measure explained by the relatively high wages paid by alternative sources of employment.

Considering possible reverse causation, the presence of many businesses in a department is a potential stimulus to urban development, to railway construction, and may bid up the local

price of coal, if local industry is energy intensive, as well as wages. High productivity business will have provided high incomes for workers and employers.

While we might reasonably ignore reverse causation for the first two groups of variables, we cannot do so for this third group, which are of particular interest for understanding the nature and consequences of business location. One estimation technique used here is instrumental variables. We need instrumental variables that are exogenous to each of the dependent variables of interest. Consider the relationship between business and departmental income per head. Identification of the true effects requires that, for an equation explaining business or *patentes* density, there is at least one instrumental variable that is exogenous to income, as an endogenous independent variable, but has no effect on business density. Similarly, in estimating the effect of business density upon departmental income per head, we need at least one instrumental variable that determines business density but has no influence upon income.

Findings

As was apparent from a cursory inspection of Map 2, Table 7 shows that the difference between North-East and South-West is most significant statistically for business density. It is also highly significant for patentes and disposable income. For urbanisation, conventionally associated with higher productivity, there is no significant difference between the two areas.

Table 7. Mean NE/SW differences and t-statistic: France 1866

	Patentes	Business Density	Company formation	Disposable Income	Wage	Urbanisation
South-West	3.9683	3.73	40	405	2.25	15.57
North-East	4.8263	5.1	72.37	503	2.49	17.1
t test	-3.855	-6.9902	-2.1549	-4.5819	-2.441	-0.6246

This geographical divide has been much commented on but never adequately explained. The correlation matrix (Appendix B) shows that the highest inter-departmental (positive) associations with patentes are incomes per head, urbanisation and wages, all of which may well be a consequence of business activity, as much as a cause. Apart from distance from Paris, the highest correlation with the north-south divide is female literacy, temperature (negative, because the south is coded zero) and conscript heights (a living standard variable).

Using OLS regression more than half the interdepartmental variation in *patentes* can be explained by physical geography and conscript literacy (Table 8). The north-south effect is

entirely eliminated when these variables are included in the equation. The addition of literacy to physical geography is required to knock out the north-south variable (eqs 2 and 3). It is no surprise that the south is significantly less literate than the north; 66.7 v 80.3 (t=4.5566). but literacy alone is not sufficient to do so (eq 5). Inclusion of distance from Paris (a negative influence on *patentes*) ensures temperature becomes a significant positive influence on *patentes*. Altitude as expected is an adverse influence upon business, as is rainfall. One standard deviation improvement in conscript literacy (15.76 percentage points) in equation 4 is associated with a 0.54 increase in *patentes*, which is about 12 percent of the mean. Undertaking a similar exercise for altitude and rainfall, each has about half the negative of the effect of literacy (-.28, -.3 respectively) in equation 4. One standard deviation increase of temperature has a similar effect to literacy (0.55). Overall these four variables are of considerable importance for the stock of licensed businesses.

Table 8. OLS regression:

	(1)	(2)	(3)	(4)	(5)
	patentes	patentes	patentes	patentes	patentes
Altitude	-0.00264***	-0.00179**	-0.00215***	-0.00161**	
	(-4.77)	(-3.17)	(-3.68)	(-2.68)	
Temperature	-0.0954	0.132	0.135	0.362**	
	(-1.34)	(1.24)	(1.36)	(3.01)	
Rain	-0.00306***	-0.00240**	-0.00281***	-0.00239***	
	(-3.90)	(-3.10)	(-4.13)	(-3.47)	
N/S		0.948**	0.538	0.314	0.600*
		(3.27)	(1.71)	(0.9)	(2.59)
Literacy			0.0279***	0.0345***	0.0187**
			(4.12)	(4.71)	(2.73)
Distance				-0.00150*	
				(-2.06)	
Constant	8.153***	4.425**	2.898	0.169	2.720***
	-7.18	-2.72	-1.98	-0.11	-6.38
N	89	89	89	87	89
r2_a	0.265	0.341	0.457	0.498	0.183
aic	250.3	241.4	225.1	215.8	258.7

We now turn to consider explanatory variables that may well also be endogenous.

Equation 1

Table 9 includes the cultural / institutional influences of crime, church attendance and bankruptcy. Crime is positively and significantly associated with businesses, presumably reflecting reverse causation; the better pay-offs encourage more criminal activity in business-

intensive departments. Church attendance and bankruptcy are negatively associated with business licence intensity, but not so we can reject at the 5 percent level that they have no effect at all (Equation2 in Table 9).

Table 9 adds in three potentially endogenous explanations for *patentes* density ; income per head, urbanisation and wages, all of which appear to be statistically significant boosts to business density. To test whether the appearance is correct we instrument each potentially endogenous variable singly, respectively in equations 3, 4 and 5 Table 6 and conduct a Durbin-Wu-Hausman test. [5]

Equation 3 tests the income per head variable using the north-south divide and conscript height as instruments. There is only weak identification but otherwise the instruments pass the Hansen J test and the KP under-identification test. The coefficient on income remains statistically significant and increases in value compared with the OLS estimate (Equation 2). The DWH test indicates the hypothesis that income is exogenous cannot be rejected. The OLS coefficient is an acceptable estimate of the effect of income on patentes.

Table 9. OLS departmental regression: determinants of business density, 1866

	(1)	(2)	(3)	(4)	(5)
	patentes	patentes	patentes	patentes	Patentes
	OLS	OLS	IV	IV	IV
alt	-0.00149**	-0.00128**		-0.00179***	
	(-2.97)	(-2.93)		(-3.35)	
temp	0.284*				
	(2.24)				
rain	-0.00142*	-0.00114**	-0.000947	-0.00139**	-0.00155**
	(-2.59)	(-2.94)	(-1.87)	(-3.05)	(-2.78)
lit	0.0307***	0.0149**	0.0084	0.0143**	0.0183**
	(4.97)	(2.99)	(1.8)	(2.97)	(2.82)
dist	-0.00151*				
	(-2.26)				
crime	0.0661***				
	(4.49)				
church	-0.00994				
	(-1.65)				
bankruptcy	-0.0785	-0.867**		-0.727*	-0.14
	(-0.17)	(-2.84)		(-2.43)	(-0.28)
income		0.00405***	**0.00662*****	0.00381***	0.00624***
		(4.36)	(3.94)	(3.74)	(7.33)

[5] This entails estimating the potentially endogenous variable as a function of all the exogenous variables of the system. Then include the residuals from this equation in the structural equation of interest, testing whether the coefficient on the inserted residuals is significantly different from zero. If they are not then OLS estimates are unbiased.

wage		0.667***	0.152	0.991***	**-0.946**
		(3.76)	(0.69)	(4.12)	(-1.72)
urban		0.0249***	0.0273**	**0.00483**	0.0485***
		(3.96)	(2.85)	(0.61)	(5.28)
_cons	0.535	0.917	0.591	0.883	2.734**
	-0.31	-1.64	-0.76	-1.53	-2.72
N	85	87	86	86	87
R-sq	0.592	0.839	0.774	0.805	0.645
DWH test χ(p)			1.59 (0.21)	7.41 (0.006)	11.49 (0.0007)
instd			income	urban	Wage
exexog			ns height	ns rail	alt femlit
widstat			5.345	52.53	4.16
idstat			8.651	5.494	8.063
idp			0.0132	0.0641	0.0177
j			0.857	0.2	0.385
jp			0.355	0.654	0.535

The opposite results are obtained for urbanisation and wages in equations 4 and 5. Their instrumented coefficients become much smaller than the OLS estimates and the DWH tests reject exogeneity. The wage coefficient changes sign; once the tendency of businesses to bid up departmental wages is taken into account, lower wages encourage more *patentes*[6]. The instrumented urbanisation coefficient falls to around one quarter of the OLS estimate[7]. Urbanisation is largely a consequence of business activity; the contribution to business activity is small. Taking the standard deviation of urbanisation as 14, one standard deviation greater increases *patentes* by one and a half percent of the mean value.

In view of the lack of precision of the instrumented values of wages and urbanisation probably the most accurate assessment of influences upon *patentes* are from OLS estimates of physical geography contributors literacy and income (Table 10). This specification explains 69 percent of interdepartmental variation. The OLS coefficient of income at 0.006 is very similar to the IV estimate of Table 6. This implies income per head dominates other influences upon businesses. A one standard deviation increase in income raises *patentes* by 15 percent of the mean value. Table 10 also shows how this compares to the other principal influences. The income effect on *patentes* is about equal or greater than the absolute value of any three other variables in the equation. Local demand for business activity was critical for location.

---

[6] Similar results are obtained when temperature replaces female literacy as an instrument. One SD lower wages raises *patentes* by around ten percent of the average value.
[7] Similar results are obtained with North-South and church attendance as instruments, though identification is weak (DWH rejects exogeneity at the 4.4% level).

Table 10. Determinants of interdepartmental variation in *Patentes* (OLS Regression)

	patentes		
Altitude	-0.00102*	Income	0.00611***
	(-2.25)		(7.7)
Temperature	0.117*	_cons	0.374
	(2.29)		-0.35
Rain	-0.00170**	N	89
	(-2.84)	r2_a	0.669
Literacy	0.0174***	Aic	181.1
	(3.43)	Ramsey Reset Test F (pr)	.44(.72)

One SD of variable* coefficient	
Altitude	-0.17757
Temperature	0.17873
Rain	-0.21172
Literacy	0.274178
Income	0.680966

New Firm Creation

Entrepreneurship is often measured by new contributions to the stock of businesses rather than the stock, on which we have focussed so far. Another reason for being concerned with business entry and exit more generally is that 'churn', the stirring up of the business stock by this process, has been shown to be a major contributor to productivity growth. The correlation between start ups 1860-67 and those since 1840 is 0.99, so it does not make much difference which is used.

In the specification of Table 11, we postulate that enterprise formation increases with the stock of businesses and with the rate of bankruptcy. Otherwise, we assume that similar exogenous variables are relevant to those determining the stock of *patentes*. We consider the shorter period 1860-67 and find the expected signs and significance of bankruptcies and the stock of businesses. Human capital and living standards appear to be irrelevant.

Replacing business density with *patentes*, 47 percent of the variation in start-ups is explained without any other variables. Bankruptcy adds a few more percent. No human capital or cultural variables matter. If we are prepared to consider rail density and urbanisation as exogenous to start ups then these add considerably to the explanation, which rises to 82 percent when these are included in the model (Equation 6).

Table 11. OLS department regression: company formation per head of population, 1866

	(1)	(2)	(3)	(4)	(5)	(6)
Bankruptcies	763.9*	797.0**	816.3**	1269.8*	1068.9*	396.4
	(2.52)	(3.02)	(2.95)	(2.41)	(2.06)	(1.96)
Altitude	0.6	0.532*	0.519*	0.552		
	(1.98)	(2.23)	(2.14)	(1.4)		
Rain	1.256*	1.224**	1.210*	1.298*		
	(2.5)	(2.69)	(2.59)	(2.24)		
Temperature	36.14			-56.72		
	(0.66)			(-0.82)		
Distance	-0.756*	-0.677*	-0.540**	0.621		
	(-2.39)	(-2.56)	(-3.05)	(1.49)		
Bus. density	39.27***	39.37***	38.64***			
	(5.45)	(5.54)	(5.37)			
Patentes				508.5***	350.4***	98.93**
				(4.02)	(4.2)	(2.65)
Height	-42.8			-93.3		
	(-0.97)			(-1.40)		
Literacy	3.99			-8.209		
	(1.76)			(-1.69)		
N-S		-83.05		152.3		
		(-0.68)		-0.93		
Railways						48.56***
						(3.65)
Urbanisation						23.57**
						(3.28)
N	85	87	87	85	89	86
r2_a	0.771	0.759	0.761	0.612	0.562	0.816
Aic	1247.7	1277.3	1275.8	1293.3	1354.6	1239
t statistics in parentheses			robust standard errors			
* p<0.05, ** p<0.01, *** p<0.001						

Conclusion

Local demand for business was critical for location in 1866. This is what the income per head variable and its exogeneity show. We cannot as yet be sure whether the physical characteristics of departments mattered because of the indirect effect through agricultural productivity, or entirely because of the direct effect on industry. But the adverse effects of altitude and rainfall are consistent with a complementary relation between local agriculture and industry; poor agricultural conditions adversely affected the number of businesses. The positive impact of temperature is consistent with a 'sunbelt' effect; the draw of warmer

weather, although it may also as with the other climatic variables reflect the local agricultural productivity and complementarity with industry. Why literacy should vary between departments is not a question investigated here, but the consequences of such spatial dispersion clearly mattered for industry; more literate workers encouraged businesses presumably by raising their productivity.

Urbanisation is largely a consequence of business activity, though there is a small effect of towns on business numbers. Crime does not seem to be a deterrent to industry, but a consequence of it. Other manifestations of departmental culture – such as the degree of church attendance – played no role in business location.

OLS regression analysis can eliminate the north south effect for income (and for wages). That is, if we take into account physical geography variables and human capital the north south effect is irrelevant for the distribution of business licences.

Ultimately new firm formation changes the location of economic activity and also depends upon more changeable factors such as infrastructure.

Start-ups depend upon the stock of businesses bankruptcies, the railway density and urbanisation; the north south divide is irrelevant here as well.

Appendix A: Sources and Definitions of Variables

Dependent variables:
- density of industrial firms by department. We use the proportion of head of industrial businesses to the total labour force in the 1866 population census (%)
- number of business licences ("*patentes*") in schedule C ("industry") in 1866
- average annual number of companies incorporated 1861-67

Explanatory variables:
- literacy rate: although literacy was clearly not a prerequisite for establishing or running a business in the age of the industrial revolution, we assume that, as a important component of human capital it must have been positively correlated to firm creation.
- Wage rate: average daily wage rate of male workers in 50 or so professions in various industries as recorded by local authorities in 1865 (source: *Statistique Annuelle*). According to Lévy-Leboyer, the spread of paternalistic policies (subsidised housing etc.) on the part of French industrial firms was dictated by the need to gain employees' loyalty and also as a way of allaying demands for high wages. These could have therefore constituted a brake on firm creation.
- Length of local railway network (in km): although canals still played a role in the transport of heavy cargoes or materials, access to markets was more and more dependent on the availability of railway service (source: *Annuaire statistique*)
- Shortest distance from Paris (usually by railway; in km): tries to measure the impact of the concentration of power and influence of the capital on the economic development of the regions.
- Price of coal (F per ton). According to many authors, French industrialists suffered from the paucity of French coal deposits and their consequent dependence on imported mineral fuels. Could the high price of coal have been a deterrent to firm creation?
- Crime rate (number of criminal sentences for 100,000 in 1866). We use this as an indicator of business safety on the assumption that areas where crime was more prevalent, investors would be reluctant to launch business ventures. Church attendance: proportion of total population attending weekly catholic mass in 1870 (%)
- Family size

Measures of well-being
- average disposable income per head (in F as computed by Delafortrie & Morice for 1864)
- average height of conscripts (the so-called biological standard of living) of the class of 1870 (the closest available). Source: Chamla

Appendix B : Correlation Matrix

	patent	alt	rain	lit	bankrupt	wage	ns	height	crime	rail	coalpr	church	income	urban
patent	1													
Alt	-0.4176	1												
Rain	-0.3555	0.0992	1											
Lit	0.379	0.0601	0.099	1										
bankrupt	0.4125	-0.2023	-0.0824	0.2731	1									
Wage	0.6806	-0.0301	-0.2441	0.3078	0.5379	1								
Ns	0.382	-0.2013	-0.0726	0.4389	0.2062	0.2559	1							
height	0.3312	-0.0705	0.0308	0.5124	0.2957	0.2216	0.5275	1						
Crime	0.4973	-0.128	-0.309	0.2196	0.2684	0.4883	0.0606	-0.0665	1					
Rail	0.5168	-0.1952	-0.1279	0.2383	0.5469	0.5809	0.3253	0.1472	0.3499	1				
Coalpr	-0.0301	-0.1798	0.0062	-0.2218	0.0291	-0.1036	-0.1807	-0.253	0.0468	-0.0707	1			
church	0.3393	0.2024	0.2551	0.0754	-0.2571	0.2705	0.0552	-0.2086	-0.1011	0.1197	-0.1053	1		
income	0.7647	-0.378	-0.243	0.3645	0.4968	0.5344	0.4409	0.3641	0.3051	0.5422	0.0901	-0.3487	1	
urban	0.6705	-0.3174	-0.2613	0.1074	0.4276	0.5932	0.1035	0.0006	0.535	0.6698	0.0308	-0.0151	0.3913	1
femlit	0.4004	-0.0312	0.045	0.8657	0.3255	0.347	0.6935	0.5445	0.2031	0.3027	0.2781	-0.0379	0.4198	0.1227
Temp	0.0024	-0.1714	-0.1824	-0.3584	-0.1205	-0.1433	-0.6437	-0.4335	0.0963	0.1887	0.388	-0.0476	-0.2155	0.1954
Dist	-0.2618	0.2568	0.0513	-0.2144	-0.2957	-0.222	-0.7419	-0.4249	0.0085	0.3201	0.2047	0.2351	-0.5166	0.0562

References

Sources:

Annuaire général du commerce, de l'industrie, de la magistrature et de l'administration, Paris, Firmin-Didot, 1867.

Compte général de l'administration de la justice civile et commerciale en France pendant l'année…, Paris, Imprimerie Impériale, 18..

Compte général de l'administration de la justice criminelle en France pendant l'année …, Paris, Imprimerie Impériale, 18..

Résultats généraux du dénombrement de 1866, Paris, Berger-Levrault, 1869.

Statistique Générale de la France, *Enquête industrielle 1861-65*, Nancy, Berger-Levrault, 1873.

Statistique Générale de la France, *Prix et salaires à diverses époques,* Strasbourg, Berger-Levrault, 1863.

Other references:

Anceau, Eric, D. Barjot, I. Lescent-Gile, B. Marnot (eds.), *Les entrepreneurs du Second Empire*, Paris, PUPS, 2002.

Bignon, Vincent, "Financial crises, Business cycles, and Bankruptcies in the Very Long Run: France during the 19th Century" Past, Present and Policy 4th International Conference Graduate Institute, Geneva 3-4 February 2011.

Chevaillé, J. C., "Firm creations and failures in Nineteenth Century France," in Philippe Jobert & M. Moss (eds.), *The Birth and Death of Companies. An Historical Perspective*, Carnforth, Parthenon Publishing, 1990, pp. 19-32.

Carter, Edward C. et al., *Enterprise and Entrepreneurs in 19th and 20th-Century France*, Baltimore, The Johns-Hopkins University Press, 1976.

Chanut, Jean-Marie et al., *L'industrie française au milieu du 19e siècle : les enquêtes de la Statistique Générale de la France*, Paris, Editions de l'EHESS, 2000.

Chartier, Roger, « La ligne Saint-Malo - Genève», Les Lieux de mémoire, vol. III. 1. « Conflits et partages », Gallimard, 1992, pp. 738-775.

Crouzet, François, "Les dynasties d'entrepreneurs en France et en Grande-Bretagne," *Entreprises et Histoire* No. 9 (Sept. 1995), pp. 25-42.

Delefortrie, Nicole & Janine Morice, *Les revenus départementaux en 1864 et 1954*, Paris, Armand Colin, 1959.

Dormois, Jean-Pierre, "La statistique industrielle de 1841-45 revisitée", in Katia de Queiros Mattoso, dir*., L'Angleterre et le Monde. Mélanges François Crouzet*, Paris, Presses de la Sorbonne, 1998, p. 205-45.

Dormois, Jean-Pierre, review of *Les entrepreneurs du Second Empire* on : eh.net/content/dormois-barjot-et-al-les entrepreneurs-du-second-empire

Dunham, Alfred, *The Industrial Revolution in France* 1815-1848, New York, Exposition Press, 1955.

Faure, Alain, "Notes sur la petite entreprise en France au XXe siècle", in *Entreprises et entrepreneurs XIXe-XXe siècles*, Paris, Presses de l'Université de Paris-Sorbonne, 1983, p. 199-215.

Foreman-Peck, James, "Measuring historical entrepreneurship", in Youssef Cassis & Ioanna Pepelasis Minoglou (eds.), *Entrepreneurship in Theory and History*, Basingstoke, Palgrave Macmillan, 2005, pp. 77-110.

Foreman-Peck, James & Elisa Boccaletti, "The Supply and Demand for entrepreneurs in Nineteenth Century France" www.cliometrics.org/conferences/Wabstracts/6b.shtml

Foreman-Peck, James, Elisa Boccaletti and Tom Nicholas, "Entrepreneurs and business performance in nineteenth century France," *European Review of Economic History* Vol. 3 (1998), pp 235-262.

Freedeman, Charles E., *Joint Stock Enterprise in France 1807-1867*, Chapel Hill, University of North Carolina Press, 1979.

Habakkuk, H. John, "The historical experience on the Basic conditions of Economic progress," *in* Leon H. Dupriez (ed.), *Economic Progress*, Louvain, Institut de recherches économiques et sociales, 1955.

Hau, Michel, "Entrepreneurship in France", in David Landes, Joel Mokyr & William Baumol (eds.), *The Invention of Enterprise*, Princeton, Princeton University Press, 2010, pp. 305- 30.

Jobert, Philippe, *Les enterprises aux XIXe-XXe siècles*, Paris, Presses de l'ENS, 1991.

Id., « Leçons de chiffres : le compte général de l'administration de la justice civile et commerciale au 19e siècle », in Michèle Merger (ed.), *Les entreprises et leurs réseaux: hommes, capitaux, techniques et pouvoirs*, pp. 67-82.

Kindleberger, Charles P., *Economic Growth in France and Britain 1851-1950*, Cambridge MA, Harvard University Press, 1964.

Landes, David S., "French entrepreneurship and industrial growth in the 19th Century," *Journal of Economic History* vol. 9 No. 1 (1949), pp. 45-61.

Levêque, Pierre, « La Patente, indicateur de croissance économique différentielle au 19ème siècle », in *Entreprises et entrepreneurs XIXe-XXe siècles*, Paris, Presses de l'Université de Paris-Sorbonne, 1983, pp. 46–73.

Locke, Robert R., "A Method for Identifying French Corporate Businessmen (The Second Empire)," *French Historical Studies* vol. 10 (1972), pp. 261-92.

Noin, Daniel, *L'espace français*, Paris, Armand Colin, 1976.

Nye, John V. C., "Firm Size and Economic Backwardness: A New Look at the French Industrialization Debate," Journal of Economic History vol. 47 (1987), pp. 649-69.

Santuari, Alceste, "The société anonyme and the industrial revolution in France," *Journal of European Economic History*, Winter 1995, vol. 24, no. 3, pp. 587-618.

Yoo, Dongwoo, "Is the British colonization better than that of the French?: A study of Vanuatu," EHA 2013 Annual meeting, Washington D.C. September 20-22, 2013 eh.net/eha/wp-content/uploads/2013/11/Yoo.pdf

Zylberman, Evelyne, *La croissance et les comptes économiques de la France sous le Second Empire*, Université de Paris, thèse pour le doctorat, 1969.