



EXTENDED ABSTRACT

Title: Wages and productivity in late nineteenth-century France: Two sides of the same coin?

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Abstract: Spatial wage disparities were, and still are, sizable. Theoretically, the real wage, or the wage measured in terms of the goods and services that can be purchased, is expected to equal labour productivity. Wage disparities would thus reflect productivity differences which might result from region-specific characteristics such as economic structure, capital deepening, agglomeration economies, infrastructure, skill-composition of labour force or institutions, and even product specific demand shocks, among others. Using wage information for 82 departments (NUTS3) in late nineteenth-century France we first document wage disparities across space and occupations. In line with the existing literature, we find sizable wage disparities across departments. Following Combes et al. (2008), we then explore to what extent workers sorting mattered. In doing so, we empirically test the relevance of regional endowments and characteristics to shed further light on the subject.

Keywords: Wages, Regional studies, Economic history

JEL codes:

“wages...vary more from place to place than the price of provisions”

Adam Smith (1776: Book I, Chapter VIII)

1. Introduction

Classical economists departed from the idea that the *“produce of labour constitutes the natural recompense or wages of labour”* (Adam Smith, 1776: Book I, Chapter VIII). Furthermore, the wage-bargaining process between employers and employees was, on the whole, understood¹. Since then, there has been abundant research and discussion on labour economics. But, despite disagreements, there appears to be a broad consensus on the relationship between wages and productivity, at least up to the 1980s. Theoretically, money wages, under perfect competition, are expected to reflect labour productivity.

$$\text{MPL} \cdot p = w$$

This equilibrium condition, in turn, has been used by Geary and Stark (2002) to develop a method to estimate historical regional GDPs. It let to overcome the main drawback for historical data construction, the lack of statistics. Geary and Stark (2002) departs from the identity that national output, Y , equals the sum of regional outputs, Y_i :

$$Y = \sum_i Y_i$$

The regional output can be expressed as:

$$Y_i = \sum_j y_{ij} L_{ij}$$

where y_{ij} represents the average value added per worker in region i and industry j , while L_{ij} captures the number of workers. The fundamental issue with this approach is the measurement of regional labour productivity in each industry, y_{ij} , using regional wages by industry to proxy for labour productivity:

¹ *“What are the common wages of labour, depends everywhere upon the contract usually made between those two parties, whose interests are by no means the same. The workmen desire to get as much, the masters to give as little, as possible. The former are disposed to combine in order to raise, the latter in order to lower, the wages of labour”* (Adam Smith, 1776: Book I, Chapter VIII).

$$Y_i = \sum_j \left[y_j \beta_j \left(\frac{\omega_{ij}}{\omega_j} \right) \right] L_{ij}$$

where y_j stands for the value added per worker at national level in industry j while β_j is a scalar that preserves differences across regions. Similarly, (ω_{ij}/ω_j) reflects the wages paid to workers in region i and industry j with respect to the national average. This approach assumes that regional sectoral productivity relative to the national average is reflected in the relative wages.

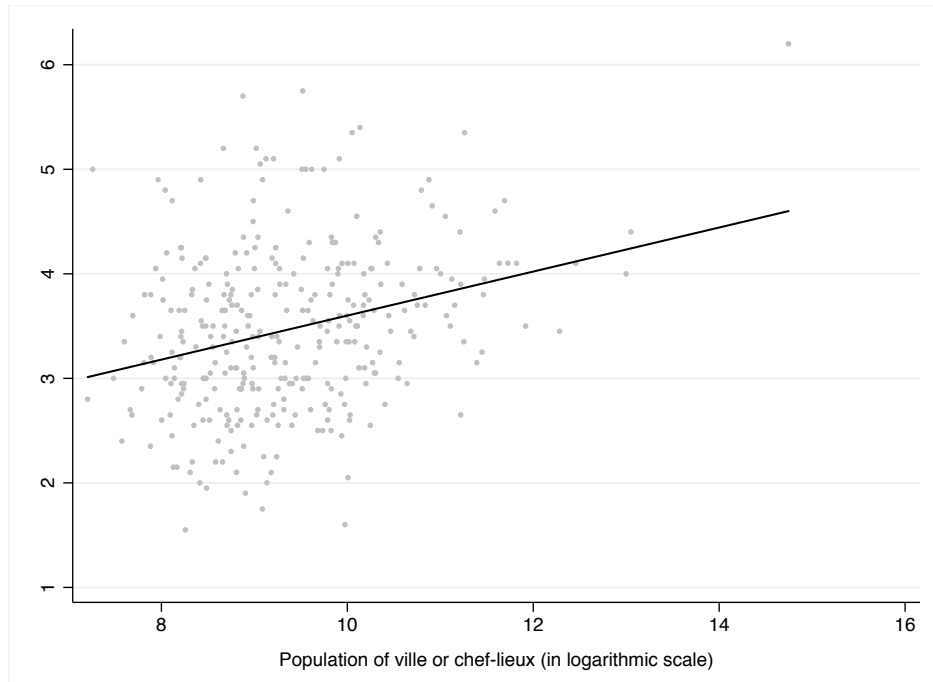
This indirect method let to distribute national GDP across subnational units by gathering only a handful of data: national GDPs by sector, labour force by sector and region taken from the population censuses and wages by sector and region. This low data consuming method has opened new avenues for historical research. Several researchers, especially in Europe, have applied it and provided new benchmark estimates to test the relationship between economic development and regional disparities as proposed by the *Williamson hypothesis* (Williamson, 1965)².

However, spatial disparities in wages were, and still are, sizable. Figure 1, for instance, show nominal wages of male industrial workers for a selection of cities and towns in late nineteenth-century France. In general, there appears to be a considerable dispersion. In this line of research, Combes et al. (2008) hinted that these differences might result from various forces. First, spatial disparities in the skill-composition of the labour force. This implies that the uneven distribution of industries matters. For example, regions with skill-intensive industries may attract more skilled workers. In this regard, the average skills of the labour force of a particular territory would be correlated with the average wage. Second, spatial disparities may arise as a result of differences in endowments (infrastructure, physical capital, institutions...). Finally, Combes et al.

² Rosés and Wolf (*forthcoming*) have compiled a set of studies for 16 European nations based on estimates of regional GDPs which comprises 173 regions at Nuts-2 level corresponding to 11 benchmark years between 1900 to 2010. Felice (2011), Badia-Miró et al (2012), Buyst (2010 and 2011) Enflo et al (2014), Geary and Stark (2015), Minns and Rosés (2018) and Diez and Sanchis (2018) provide historical regional GDPs for Italy, Portugal, Belgium, Sweden, United Kingdom, Canada and France by following the Geary and Stark (2002) method.

(2008) argue that agglomeration economies, or the benefits accrued from the concentration of workers and firms, might also be of relevance. Anyhow, the main issue is identification, and the existing evidence is inconclusive.

Figure 1. Nominal wages of male industrial workers and size, France 1891-93 (Villes)



Source: Office du Travail 1893-97; SGF.

In this research we document French wages at the end of the 19th using a survey on salaries for 1893/1897 which picks up data at city and department levels (NUTS-3). This period is especially appealing for the purposes of the present research because of two reasons. One is that economic inequality was high and increasing in France in the *Belle Epoque* (1870-1913) fuelled by the industrialization process (Piketty, 2013). The other is that labour market institutions were still poorly developed and the wages used to be a market outcome.³ Employees and employers bargain over the labour contract, with workers trying to raise wages and employers to squeeze them. This economic behaviour is more evident “in the cities, where the free exchange of labour appears to have been close to a textbook labor market” (Naidu and Yachtman, 2018). Under such conditions one should expect that territorial differences in productivity were reflected in workers’ wages in the late 19th. Hence, we consider that it is interesting to isolate that

³ Fishback (1998) and Goldin (2000) have argued that markets played an important role in the United States at the end period previous to the First World War. For a more recent discussion about this issue see Naidu and Yuchtman (2018).

part of wages formation more correlated with factors linked to the value of labour productivity in order to map more accurately from worker productivity to wages.

The remainder of the paper is organized as follows. Section 2 briefly the data gathered to run this research. Section 3 draws some figures to map wages across time and cities in France between 1840/1845 and 1891/1893. And Section 4 presents the model to be estimated for carry out the main purposes of this research.

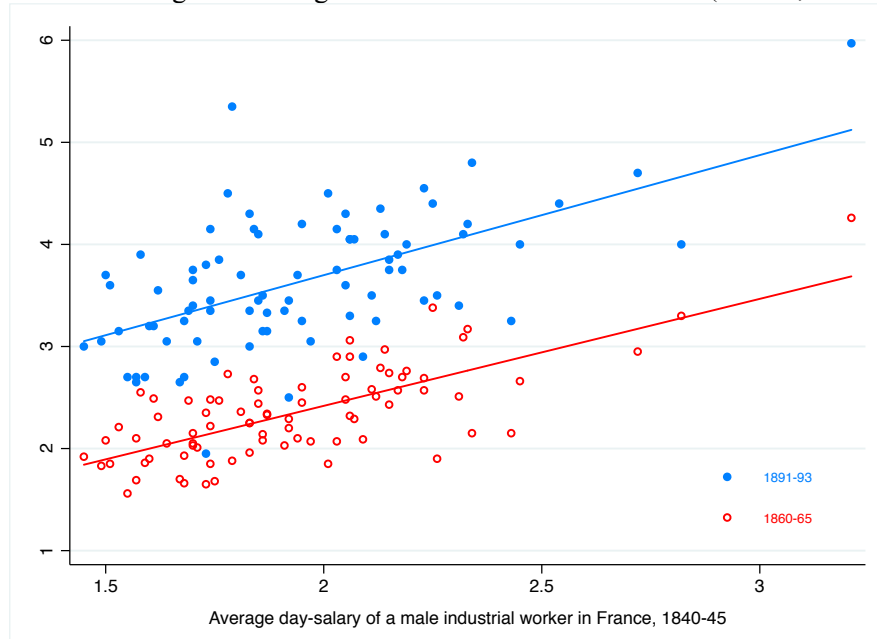
2. Data and methodology

A fundamental issue in this line of research is data. This becomes more challenging in historical settings. In France, several historical sources reported prices and money wages during the nineteenth and early twentieth-century. Our main source, however, will be the survey ("*Salaires et Durée du Travail dans l'Industrie Française*") conducted by the Office du Travail (*Ministère du commerce, de l'industrie et des colonies*) 1893-1897. Wage information was collected for a number of industrial establishments. Then, it was tabulated and organised by major occupation, town and department (NUTS3). In most cases, wage information refers to blue-collar workers. Overall, the survey offers two distinct samples. On the one hand, wage information is offered for 52 occupations in 155 villes, corresponding to survey conducted in administrative capitals or towns where a *conseil de prud'hommes* existed. Additionally, wage information is also reported for 12 occupations and 125 villes.

3. Descriptive analysis.

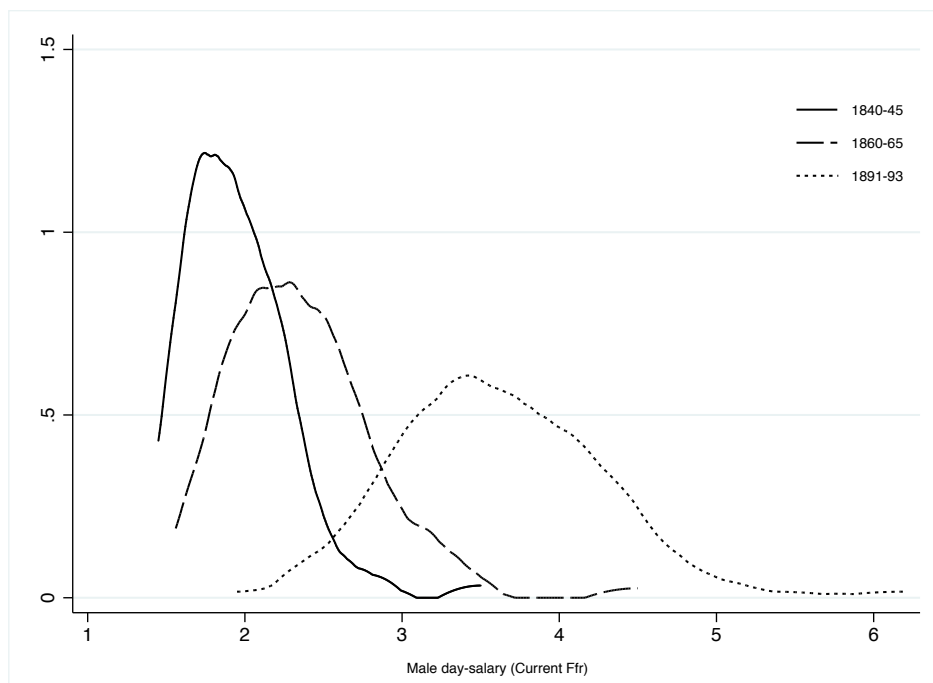
A first glance at the wage information allows for a better understanding of the central theme. Figures 2 and 3 offer the evolution of wages across French departments (NUTS3), using information from the industrial surveys conducted in 1840-45 and 1860-65. Figure 2 shows that spatial disparities in wages are persistent. That is to say, departments where the average male industrial wage was high in the 1840s are, in general, in the upper tail of the distribution in 1860/1865 and in 1891/1893. This is rather compelling since industrialisation was underway.

Figure 2. Nominal wages of average male industrial worker France (1840-45; 1860-65; 1891-93)



Source: Office du Travail 1893-97.

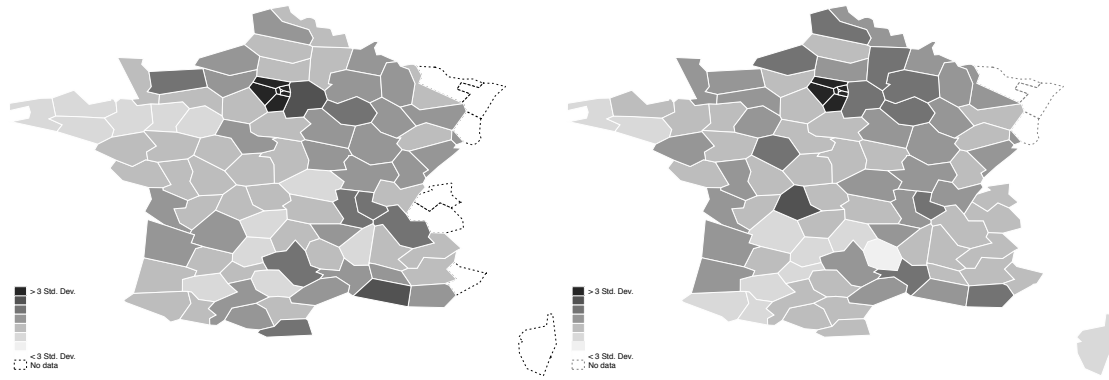
Figure 3. Nominal wages of average male industrial worker France (1840-45; 1860-65; 1891-93)



Source: Office du Travail 1893-97.

Nonetheless, when exploring the spatial distribution of wages, as in Figure 3, it appears that disparities grew. This goes in line with the uneven development caused by the process of industrialisation. The changing shape of the Kernel density functions across time reflects the increase in the wage disparity. Map 1, on the other hand, clearly shows how industrial wages in the North were in the upper tail of the distribution after industrialisation.

Map 1. Nominal wages of an average male industrial worker, 1840-45 (left) and 1891-93 (right)



Source: Office du Travail 1893-97.

4. Approach

In this study we propose a 2-step strategy. On the one hand, we gather information from the survey (“*Salaires et Durée du Travail dans l’Industrie Française*”) conducted by the Office du Travail (*Ministère du commerce, de l’industrie et des colonies*) 1893-1897 and estimate the spatial disparities in wages. Although the survey offers an average wage at the departmental (NUTS3) level we will exploit the historical wage information and estimate spatial differences as follows,

$$w_{ij} = A_i \cdot c_j \cdot u_{ij}$$

where A_i and c_j capture the spatial and occupational dimensions, while u_{ij} is a random disturbance term. The above expression can be easily transformed into:

$$\ln w_{ij} = \ln A_i + \ln c_j + \ln u_{ij} = \alpha_i + \beta_j + \varepsilon_{ij}$$

Using Ordinary Least Squares (OLS), we estimate this equation:

$$\ln w_{ij} = \sum_{i=2}^N \alpha_i D_i + \sum_{j=2}^K \beta_j D_j + \varepsilon_{ij}$$

where D_i and D_j are department and occupation dummy variables, whereas ε_{ij} is an iid error term. Besides, wage information is presented at the city/town level. As a result, we adjust the above expression with the term capital which captures whether the city or town was the administrative capital of the department.

$$\ln w_{ij} = \sum_{i=2}^N \alpha_i D_i + \sum_{j=2}^K \beta_j D_j + \gamma \cdot \text{capital} + \varepsilon_{ij}$$

The estimation of the above equation will allow us to compute the spatial index or A_i ,

$$A_i = \exp(\hat{\alpha}_i)$$

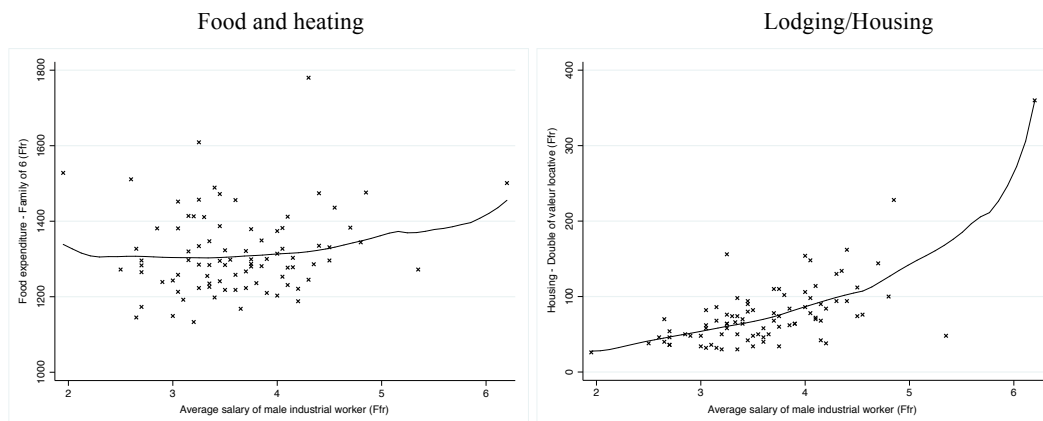
Then, we will empirically test A_i with w_i , the aggregate wage. Besides, we will evaluate, following Combes et al. (2008), what drives spatial wage disparities. For this, we combine our estimates with information from (a) Census of 1896 and (b) Industrial Survey of 1896. In doing so, we will test to what extent regional specialisation explains the spatial variation in male industrial workers. We will thus study,

$$A_i = f(x_i)$$

where x_i is a vector of department (NUTS3) specific characteristics that include capital per worker and regional industrial specialization, among other covariates.

In a similar vein, we will combine our findings with price information on food, lodging and heating in order to assess spatial differences in material wellbeing. In particular, late nineteenth-century France is a period of enormous interest because of the large internal migrations. Then, real wage differences could have stimulated migration from backward or poor departments to rich ones.

Figure 4. Nominal wages of an average male industrial worker in France expenditure, 1891-93



Source: Office du Travail 1893-97.

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Appendix

Table A.1. List of French departments (N=86)

Code	Department	Region	Code	Department	Region
1	Ain	Rhône-Alpes	45	Loiret	Centre
2	Aisne	Picardie	46	Lot	Midi-Pyrénées
3	Allier	Auvergne	47	Lot-et-Garonne	Aquitaine
4	Alpes-de-Hte-Provence	Provence-Alpes-Côte d'Azur	48	Lozère	Languedoc-Roussillon
5	Hautes-Alpes	Provence-Alpes-Côte d'Azur	49	Maine-et-Loire	Pays de la Loire
6	Alpes-Maritimes	Provence-Alpes-Côte d'Azur	50	Manche	Basse-Normandie
7	Ardèche	Rhône-Alpes	51	Marne	Champagne-Ardenne
8	Ardenne	Champagne-Ardenne	52	Haute-Marne	Champagne-Ardenne
9	Ariège	Midi-Pyrénées	53	Mayenne	Pays de la Loire
10	Aube	Champagne-Ardenne	54	Meurthe-et-Moselle ^a	Lorraine
11	Aude	Languedoc-Roussillon	55	Meuse	Lorraine
12	Aveyron	Midi-Pyrénées	56	Morbihan	Bretagne
13	Bouches-du-Rhône	Provence-Alpes-Côte d'Azur	58	Nièvre	Bourgogne
14	Calvados	Basse-Normandie	59	Nord	Nord-Pas-de-Calais
15	Cantal	Auvergne	60	Oise	Picardie
16	Charente	Poitou-Charentes	61	Orne	Basse-Normandie
17	Charente-Maritime	Poitou-Charentes	62	Pas-de-Calais	Nord-Pas-de-Calais
18	Cher	Centre	63	Puy-de-Dôme	Auvergne
19	Corrèze	Limousin	64	Pyrénées-Atlantiques	Aquitaine
21	Côte-d'Or	Bourgogne	65	Hautes-Pyrénées	Midi-Pyrénées
22	Côtes-d'Armor	Bretagne	66	Pyrénées-Orientales	Languedoc-Roussillon
23	Creuse	Limousin	67	Bas-Rhin	Alsace
24	Dordogne	Aquitaine	68	Haut-Rhin	Alsace
25	Doubs	Franche-Comté	69	Rhône	Rhône-Alpes
26	Drôme	Rhône-Alpes	70	Haute-Saône	Franche-Comté
27	Eure	Haute-Normandie	71	Saône-et-Loire	Bourgogne
28	Eure-et-Loir	Centre	72	Sarthe	Pays de la Loire
29	Finistère	Bretagne	73	Savoie	Rhône-Alpes
30	Gard	Languedoc-Roussillon	74	Haute-Savoie	Rhône-Alpes
31	Haute-Garonne	Midi-Pyrénées	75	Seine ^b	Île de France
32	Gers	Midi-Pyrénées	76	Seine-Maritime	Haute-Normandie
33	Gironde	Aquitaine	77	Seine-et-Marne	Île de France
34	Hérault	Languedoc-Roussillon	79	Deux-Sèvres	Poitou-Charentes
35	Ille-et-Vilaine	Bretagne	80	Somme	Picardie
36	Indre	Centre	81	Tarn	Midi-Pyrénées
37	Indre-et-Loire	Centre	82	Tarn-et-Garonne	Midi-Pyrénées
38	Isère	Rhône-Alpes	83	Var	Provence-Alpes-Côte d'Azur
39	Jura	Franche-Comté	84	Vaucluse	Provence-Alpes-Côte d'Azur
40	Landes	Aquitaine	85	Vendée	Pays de la Loire
41	Loir-et-Cher	Centre	86	Vienne	Poitou-Charentes
42	Loire	Rhône-Alpes	87	Haute-Vienne	Limousin
43	Haute-Loire	Auvergne	88	Vosges	Lorraine
44	Loire-Atlantique	Pays de la Loire	89	Yonne	Bourgogne

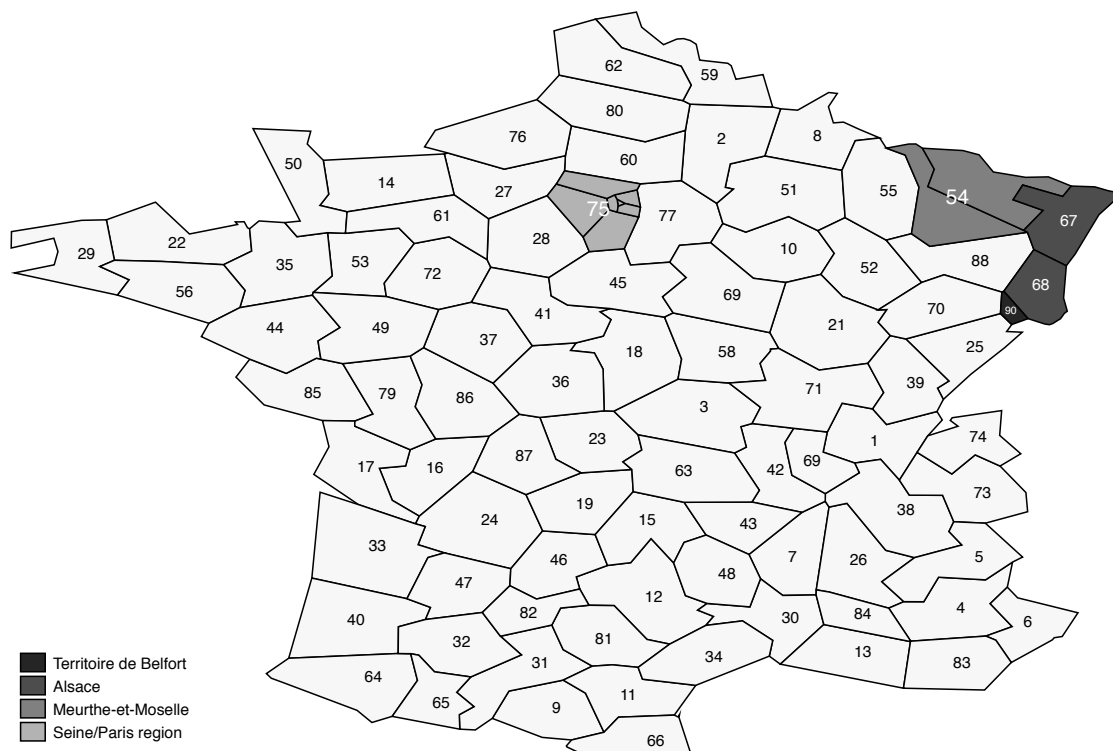
Notes: ^a Meurthe-et-Moselle is a «pseudo-department» comprising Meurthe (99), Moselle (57) and Meurthe-et-Moselle (54).

^b Seine includes Seine (75) and Seine-et-Oise (78) from 1860 to 1968. Since then Seine has comprised Essone (91), Hauts-de-Seine (92), Paris (75), Seine-Saint Denis (93), Val de Marne (94), Val-d'Oise (95) and Yvelines (78).

^c Territoire de Belfort (90) was added to Haute-Saône between 1871 and 1918. In 1954 it was included in Jura (39). For the remaining years it was part of Haut-Rhin (68).

^d Corse has been excluded.

Map A.1. France (NUTS3) administrative organisation.



Notes: Meurthe-et-Moselle (54) is a «pseudo-department» comprising Meurthe (99), Moselle (57) and Meurthe-et-Moselle (54).

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