UNIVERSITY OF OXFORD

Discussion Papers in Economic and Social History

Number 69, April 2008

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DOMESTIC TRADE AND MARKET SIZE IN LATE EIGHTEENTH-CENTURY FRANCE[1]

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(OFCE / Sciences Po Paris)

[1] Subsequent versions of this paper benefited from comments of participants at the 2005 European Historical Economics Society meeting in Istanbul, the conference "Cities and Globalization" organized by the CORE in Louvain-la-Neuve in 2006; the Congrès Annuel de l'AFSE in 2006; the *Journée d'étude sur l'histoire quantitative 2006* of the AFHE; the Cliometric Society session in the ASSA meetings in 2007; the Modern History Seminar at Edinburgh University in 2007; the EHS annual conference in Exeter in 2007; the economic history seminar at the Universitat de Barcelona in 2007; and the Economic and Social History seminar at Oxford University in 2007. I thank Dominique Margairaz and Kris Mitchener for their discussions, Nicholas Crafts, Branko Milanovic, Kevin O'Rourke and Rick Szostak for comments, and Hildegard Schaeper for sharing STATA programs with me. I am responsible for all errors. A large part of this work was done while I was a temporary lecturer at the Department of Economic and Social History at Edinburgh University.

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Abstract

Market size is claimed by various economic traditions to be an important factor in explaining the transition to modern economic growth. This paper examines whether differences in market size might explain the retardation of the Industrial Revolution in France. It uses an exceptional source on French domestic trade in a variety of goods in the late eighteenth century: the *Tableaux du Maximum*. The first part presents this source and the data. The second part assesses whether the data are plausible using a logit theoretical gravity equation. The third part uses the results of this gravity equation to compute the expected market size of specific supply centres. For all types of high value-to-weight goods, some French supply centres reached 25 million people or more. For all types of textile groups, some French supply centres reached 20 million people or more. Even taking into account differences in real, nominal and disposable income per capita, these supply centres had access to domestic markets that were at least as large as the whole of Britain. Differences in the size of foreign markets were too small to reverse that result.

JEL Code: F15, N73.

Introduction

Unified growth theory models hold that the transition to modern growth in the eighteenth century depended on the crossing of a specific population threshold.[3] Endogenous growth theory models have long suggested that size matters for innovation and growth. This can be explained by many mechanisms; the simplest is that innovations are non-rival goods for which costs are fixed. The larger the potential market for an innovation, the larger the economic incentives for the innovator.[4] Other theoretical traditions suggest similar links between market size and growth. Set-up costs in the creation of an industrial sector can only be paid if the market is large enough to recoup them.[5] A larger market encourages division of labour and Smithian growth.[6] A larger market is also a necessary condition for the formation of industrial districts conducive to agglomeration economies in a new geography setting.[7]

And yet, cross-country evidence does not show a correlation between population size and growth. The Industrial Revolution happened in Britain before France, despite the fact that the British population was much smaller than the French population (10 million versus 28 million in 1791).[8] A ready answer to that objection is that the population of nations is not relevant. If size intervenes through the multiplication of ideas and the rise of scientific knowledge, one should look at the size of the relevant scientific world – Europe and North America in the late eighteenth century.[9] If size intervenes through agglomeration effects, one should look at the production scale of industrial districts.[10] If

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[3] The first paper to make this point was Kremer, "Population Growth". For a presentation of the effects of population size in these models, see Galor, "Unified Growth Theory", e.g. p. 239.

[4] Romer, "Endogenous Technological Change", Grossman and Helpman, *Innovation and growth*, Desmet and Parente, "Bigger is Better".

[5] Murphy, Shleifer, and Vishny, "Income Distribution".

[6] Smith, *Wealth of Nations*, Yang and Ng, "Specialization and Division of Labour".

[7] See, for example Krugman, *Geography and Trade*.

[8] This difficulty with the size argument has already been pointed out in, for example, Crafts, "Exogenous or Endogenous Growth?", p. 760.

[9] On the formation of a pan-European scientific and technological community, see Mokyr, *Gifts of Athena*.

[10] The idea that studies of the Industrial Revolution should focus on smaller geographical units than countries is well known. See, for example, Pollard, *Peaceful conquest* and Hudson, *Regions and industries*.

size intervenes by increasing the potential reward to innovation or by allowing an increased division of labour, one should look at the total number and purchasing power of potential customers for specific production centres. This is the aim of this paper.

Very convincing arguments have been presented showing that the integration of the French domestic market was much more imperfect than the integration the British domestic market.[11] France certainly had an underdeveloped transportation system compared to Britain. It was also riddled with internal institutional barriers. High logistic and transaction costs were a handicap for the French economy, whereas in Britain the rising importance of common carriers led to new methods of distribution more germane to modern production.[12] But this paper will show that, despite these obstacles, some French production centres had access to domestic markets that were at least as large as Britain as a whole and had at least the same aggregate purchasing power. Before 1793, external markets did not make a large difference.

Market integration is often studied using price data, but these are not as useful for measuring market size for two reasons.[13] First, price correlations or other measures of integration can be caused by third-party effects. High correlations between prices in two places do not imply they are supplied by the same centres. Second, price data are available mainly for grain. The Industrial Revolution was obviously not centred on grain production, and price data on textile and hardware goods would be more relevant. They do not exist and, more generally, information on textile and hardware markets is difficult to find.

Yet, such information exists for France just before the Revolution thanks to the "*Tableaux du Maximum*" that were collected in 1794. They give information on trade links between 552 districts in France for fifteen different goods categories. There is no equivalent source for Britain or any other pre-modern economy. They are comparable to the railroad transport databases developed from the late nineteenth century.[14]

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[11] Yet its market integration was growing with important effects: see Weir, "Crises économiques", Hoffman, *Growth in a traditional society*, Daudin, *Commerce et prospérité*.

[12] Szostak, *Role of transportation*.

[13] For examples in the case of France, see the evidence of national market integration before the railroads in Chevet and Saint-Amour, "Marchés du blé" and Ejrnaes and Persson, "Market Integration". For evidence that Chinese grain markets were not less integrated than European grain markets around our period, see Keller and Shiue, "Markets in China and Europe".

[14] These are used to study domestic trade, e.g. in Berry, "Spatial Structure" and Wolf, "Border effects".

The usual proxy for potential market size is the summation of the size of accessible markets divided by trade costs.[15] Using this measure would be difficult because we lack of knowledge of trade costs. This paper approximates the potential number of customers of a production centre by the actual number of customers in regions it supplied. This is a pertinent market size measure because trade set-up costs were large in the eighteenth century. Building and maintaining trade routes, organizing regular transport services, finding trade partners and organizing the dissemination of information were serious impediments for domestic trade.[16] The importance of trade set-up costs, and the increasing returns they imply, helps explain why early modern trade tended to organize itself around nodal points in transport or communication which were the gateways to specific regions.[17] The importance of trade set-up costs also explains why the number of customers a production centre did reach is a good proxy of the number of customers it could potentially reach.

The first part of the paper presents the source and the data. The second part assesses whether the data are plausible by comparing them to other sources and using a logit theoretical gravity equation. The third part uses the results of this gravity equation to compute the expected size of markets for specific supply centres. For all types of high value-to-weight goods, some French supply centres reached 25 million people or more. For all types of textile groups, some French supply centres reached 20 million people or more. Even taking into account differences in real, nominal or disposable income per capita, these supply centres had access to domestic markets that were at least as large as the whole of Britain. Before 1793, external markets probably did not make any difference.

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[15] Harris, “Localization of Industry”. Redding and Venables have shown that this can be derived from a theoretical economic geography model and that it has some explanatory power for cross-country income differences: Redding and Venables, “International Inequality”.

[16] The importance of these costs for contemporaneous international trade is increasingly recognized: Bernard and Jensen, “Why Some Firms Export”, Evenett and Venables, “Export Growth”.

[17] For recent theoretical development of these ideas, and their application to sixteenth- and seventeenth-century Amsterdam , see Lesger, *Amsterdam market*.

1. Le Maximum

1.1 The laws of the Maximum[18]

The French Revolutionary government decided on 4 May 1793 to fight inflation by imposing a maximum price on grain and flour: the *Maximum des grains*. *Départements* (mid-level geographical units of which there were 87 in France) were asked to fix an uniform maximum price in their territory. This legislation had many defects. For example, only output prices were capped: inflation in input prices went unchecked. Furthermore, the *départements* were too large and heterogeneous to be submitted to a single price. As a result, on 29 September 1793, the French government decided to impose price ceilings on wages and 38 types of goods at the district level. There were 3–9 districts per *département* (see Map 1). This was called *le premier Maximum général*. It still had the flaw that maximum prices were fixed according to the interest of each district: like *départements* before them, districts that produced goods fixed prices too high and districts that only consumed these goods fixed prices too low. This had to potential to block trade altogether.

The government quickly decided to solve that problem by setting up *le deuxième Maximum général* in November. This law seems to have been the result of typical governmental hubris. It was trying to mimic the way the French government thought a market economy should work and for that reason Margairaz has called it *une grande illusion libérale*.[19] The maximum price was computed on the basis of production and importation prices in 1790 and transport costs. To compute the "right" price, districts were to send to the *Bureau du Maximum* (part of the *Commission générale des subsistances*) in Paris a standardized list of all the goods they produced or imported from abroad, along with their price in 1790 increased by one-third. Based on these data, the *Bureau du Maximum* made in February 1794 a price list of all the goods produced or imported in France: the *Tableau général du Maximum*. This list was presented to the *Convention* on 23 February 1794 and sent to all districts.[20] Districts were then to use a standardized formula to compute the justified maximum price for

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[18] For the presentation of the Maximum, see Le Roux, *Commerce intérieur de la France*, pp. 21–33 or Caron, *Maximum général*.

[19] Margairaz, "Maximum".

[20] This list looks like a large A5 paperback. There are two copies in the Archives Nationales: A. N. AD/XI/75 and AD/XVIII/C/315. Reproductions are available from the author.

each good “usually sold in their territory”. The selling price was to be equal to the production or importation price, plus transport costs, and wholesale and retail trading profits of 15%. Theses price lists (*Tableaux du Maximum*) were then to be sent to Paris within ten days; they arrived piecemeal throughout the spring and the summer 1794.[21] The law was abrogated in December 1794. Its effect on inflation was probably minimal.

Many goods, but not all, were subject to the *Maximum*. Grains were subject to their own *Maximum des grains*. Fresh fruits and vegetables, animals, shoes, furniture, and earthenware, for example, were not given maximum prices. Some districts added these goods to their *tableaux*, but they are the exception. Silk was initially part of that list, but was dropped in spring 1794 as the government decided that, being a luxury good, it did not warrant price controls. The goods included represented more than two-thirds of French industrial value-added, along with a sizeable part of agricultural value-added.[22] The initial list of twenty goods categories officially included is given in Table 1.

These categories are not completely coherent. For example, raw cotton is part of *épiceries et drogueries* while raw wool or linen are aggregated with wool and linen cloths. Alcohols are part of *épiceries et drogueries* rather than drinks. However, these categories have the advantage of consistency: nearly all districts followed them to set up their *Tableau du Maximum*.

[21] Le Roux, *Commerce intérieur de la France*, p. 46, quoting Lefebvre, *Études orléannaises*, p. 306.

[22] Daudin, *Commerce et prospérité*, pp. 39, 439–459.

TABLE 1: GOODS CATEGORIES

Official categories	Thomas Le Roux's categories (see infra)
1– Fresh and salted meat and fish	1– Food items
2 – Dried vegetables	
3 – Products from living animals	
4 – Drinks	2 – Drinks
5 – "*Épiceries et drogueries*", including consumption goods (e.g. vinegar, honey), first necessity goods (e.g. candles), inputs to industries (e.g. tinctorial products)	3 – Miscellaneous consumption goods 4 – Miscellaneous production goods
6 – Wool and wool cloth	5 – Wool and wool cloth
7– Hemp and ropes	6 – Linen and hemp
8 – Linen thread and ribbon	
9 – Linen cloths	
10 – Cotton threads and cloths	7 – Cotton
11 – Hosiery	8 – Hosiery
12 – National and foreign silks	9 – Silks
13 – Leather and hides	10 – Leather products, hides and hats
14 – Common and fine hats	
15 – Paper	11– Paper
16 – Iron	12 – Iron
17 – Hardware	13 – Hardware
18 – Wood for industry (e.g. shook, white cooperage)	14 – Wood for industry
19 – Fire wood	15 – Fuel
20 – Coal	

1.2 The Tableaux du Maximum[23]

Most districts complied and sent at least some documents to Paris. But not all of them listed all nineteen categories of goods required by the law. Table 2 gives the inventory of the *Tableaux du Maximum* in the *Archives Nationales,* based on Le Roux's work.[24]

TABLE 2: AVAILABLE *TABLEAUX DU MAXIMUM*

Full tableaux (listing all goods categories)	242	44%
Nearly full tableaux (missing one or two minor goods categories, e.g. paper, fuel)	133	24%
Partial tableaux	72	13%
Very partial tableaux (listing very few product categories)	40	7%
Missing tableaux (no information)	65	12%
Total	552[25]	100%

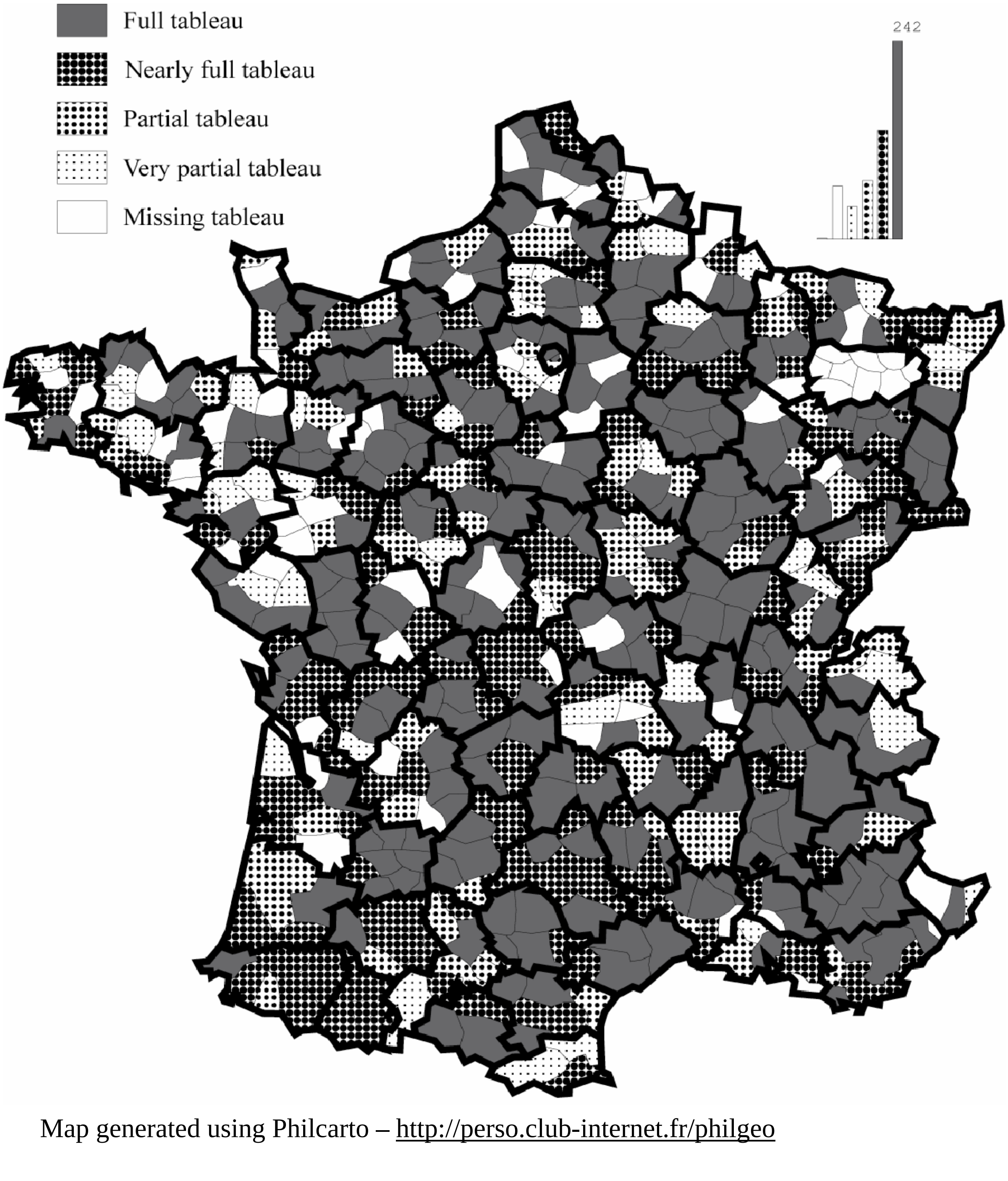
Map 1 shows the geographical coverage of the *tableaux* that can be consulted in Paris.

[23] See Le Roux, *Commerce intérieur de la France*, pp. 35–73.

[24] Ibid., p. 41 along with personal research. The tableaux are to be found in the *Archives Nationales* $F^{12}1516$ to $F^{12}1544^{52}$.

[25] Including Montélimart. Even though it was not annexed to France before 1798, some other districts list it as a supply source.

MAP 1: TABLEAUX DU MAXIMUM IN THE ARCHIVES NATIONALES



Map generated using Philcarto – http://perso.club-internet.fr/philgeo

Apart from the Meurthe *département* (for which *tableaux* are completely missing) and the Pyrennées Orientales *département* (where only a nearly complete *tableau* can be found) at least one full tableau from each *département* is in the *Archives Nationales.* This source therefore gives a good geographical coverage of France.

The *tableaux* are physically very diverse: from small books to large posters, printed or hand-written, from a handful of pages to more than three hundred. Yet most of them provide eight columns with the information requested by the law plus miscellaneous comments.

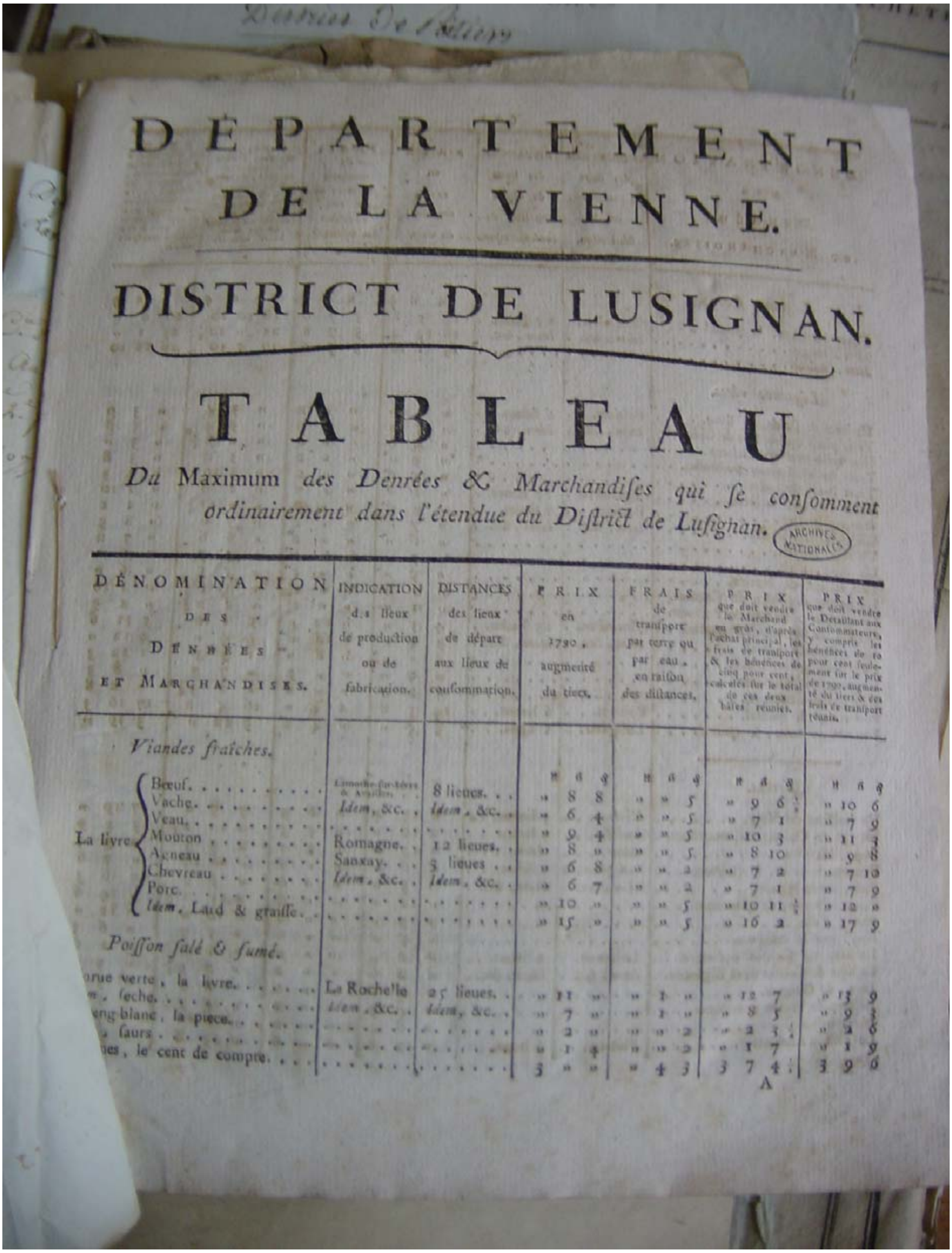
Table 3 presents the content of the *tableaux.* Picture 1 gives the first page of a *tableau* for illustration.

TABLE 3: CONTENT OF THE *TABLEAUX DU MAXIMUM*

The list of goods "usually consumed" in their territory	Where each item of goods came from	The four-thirds of their production price in 1790	Distance over which they had to be transported
Transport costs	Price including authorized wholesale profits (5% of the price including transport costs)	Price including authorized retail profits (10% of the price including transport costs)	Comments (often the price of a smaller amount of goods than the one used for the computation)

The information given by the *tableaux* does not correspond to the situation of France during the spring of 1794. Initial price lists were supposed to give prices from 1790. Districts were supposed to list goods that were "usually" (*usuellement*) consumed in their district. That was presumably understood as goods consumed before the economic troubles that accompanied the Revolution; the purpose of the exercise was to go back to the *status quo ante,* before inflation and the disruption of trade.

PICTURE 1: FIRST PAGE OF LUSIGNAN'S (VIENNE)
TABLEAU DU MAXIMUM



DÉPARTEMENT DE LA VIENNE.

DISTRICT DE LUSIGNAN.

TABLEAU

Du Maximum des Denrées & Marchandiſes qui ſe conſomment ordinairement dans l'étendue du Diſtrict de Luſignan.

DÉNOMINATION DES DENRÉES ET MARCHANDISES.	INDICATION des lieux de production ou de fabrication.	DISTANCES des lieux de départ aux lieux de conſommation.	PRIX en 1790, augmenté du tiers.	FRAIS de tranſport par terre ou par eau, en raiſon des diſtances.	PRIX que doit vendre le Marchand en gros, d'après l'achat principal, les frais de tranſport & les bénéfices de cinq pour cent, calculés ſur le total de ces deux baſes réunies.	PRIX que doit vendre le Détaillant aux Conſommateurs, y compris les bénéfices de 10 pour cent ſeulement ſur le prix de 1790, augmenté du tiers & des frais de tranſport réunis.
Viandes fraîches.						
La livre: Bœuf.	Limoges-ſur-Sèvres & Availles.	8 lieues.	» 8 8	» » 5	» 9 6 ½	» 10 6
Vache.	*Idem*, &c.	*Idem*, &c.	» 6 4	» » 5	» 7 1	» 7 9
Veau.	. . . . . .	. . . . . .	» 9 4	» » 5	» 10 3	» 11 3
Mouton	Romagne.	12 lieues.	» 8 »	» » 5	» 8 10	» 9 8
Agneau	Sanxay.	5 lieues	» 6 8	» » 2	» 7 2	» 7 10
Chevreau	*Idem*, &c.	*Idem*, &c.	» 6 7	» » 2	» 7 1	» 7 9
Porc.	. . . . . .	. . . . . .	» 10 »	» » 5	» 10 11 ½	» 12 »
Idem, Lard & graiſſe.	. . . . . .	. . . . . .	» 15 »	» » 5	» 16 2	» 17 9
Poiſſon ſalé & fumé.						
orue verte, la livre.	La Rochelle	25 lieues.	» 11 »	» 1 »	» 12 7	» 13 9
», ſeche.	*Idem*, &c.	*Idem*, &c.	» 7 »	» 1 »	» 8 5	» 9 3
eng blanc, la pièce.	. . . . . .	. . . . . .	» 2 »	» » 2	» 2 3 ½	» 2 6
» ſaurs.	. . . . . .	. . . . . .	» 1 4	» » 2	» 1 7	» 1 9
ies, le cent de compte.	. . . . . .	. . . . . .	3 » »	» 4 3	3 7 4 ½	3 9 6

A

1.3 The collected data

Historians have long been quite pessimistic about the value of the *tableaux*.[26] Certainly, the prices they list should be treated with caution. Computation errors and typos are probably numerous,[27] transport cost computations partly arbitrary (even if a formula was imposed by the law,[28] it was not easy to compute gross weight and to take into account the exact route taken), and the production prices doubtful. However, if one leaves prices aside, these documents provide an impressive list of the origin of goods consumed in many districts in France. As such, they allow the mapping of extensive supply areas for each goods category.

Thomas Le Roux wrote a remarkable book on the subject based on his Master's thesis under Dominique Margairaz and Denis Woronoff.[29] He collected a large amount of data, most notably the supply source of 62 districts in 14 goods categories (excluding silk). These 14 categories are based on the official 20 categories, some having been merged because they presented a very limited number of items (see Table 1). For each of his 62 districts, he has drawn up a map giving the number of goods categories supplied by each French district.

Thomas Le Roux exploited his data with a very complete cartographical apparatus, but without any statistical tools.[30] To go further, consumption lists were collected for at least one consuming district per *département* (and two districts in Vienne) – except Meurthe and Corsica, for which lists are unavailable. This district was chosen at random among the full *tableaux* of each department, excluding the ones already chosen by Thomas Le Roux when possible. For Pyrénées Orientales, the most complete *tableau*, for Céret, was selected. For each consuming district and each goods category, supplying districts mentioned at least once were recorded.

As a result, we have goods category specific data for 7 of Thomas le Roux's districts and 81 others, for a total of 88. These 88 were supplied by 439 addi-

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[26] Margairaz, “Dénivellation des prix”.

[27] Lefebvre, *Études orléannaises*, p. 306.

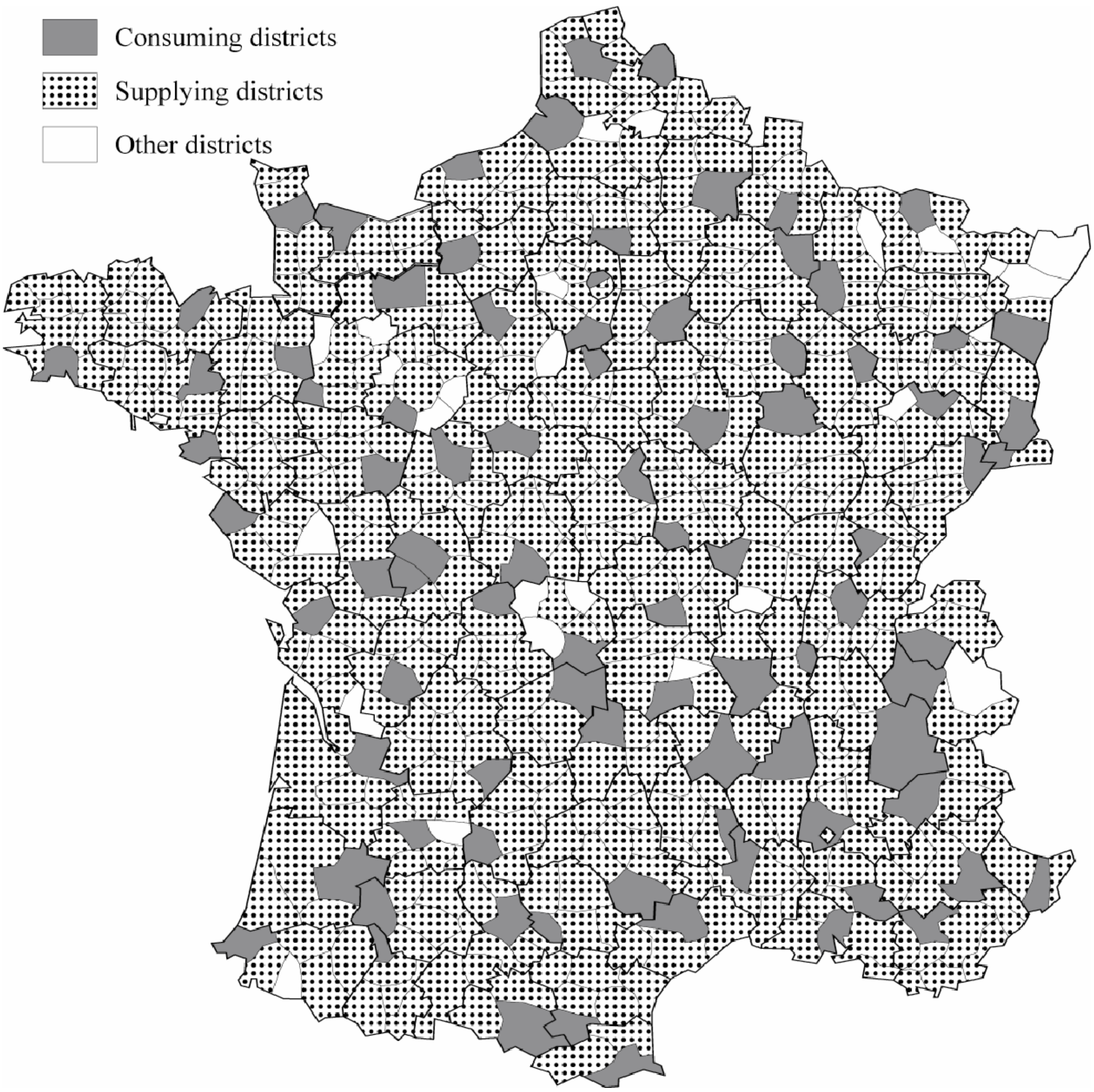
[28] The price was to be, for one quintal and one league: 4 *sous* on main roads, 4 *sous* 6 *deniers* on other roads, 2 *sous* up a river, 9 *deniers* down a river and 1 *sol* 9 *deniers* on a canal. See Le Roux, *Commerce intérieur de la France*, pp. 243–293.

[29] Ibid.

[30] There was certainly an opportunity for further statistical analysis and I contacted Le Roux for a co-authorship, but he is now working on a PhD thesis on industrial pollution in the late eighteenth–early nineteenth century and has misplaced all the data he had collected for his master's thesis.

tional districts. There are only 25 districts for which consumption has not been studied and which did not supply any of the 88 districts. Map 2 represents the sample and Table 4 describes the database and the information it contains.

MAP 2: SAMPLE



Map generated using Philcarto – http://perso.club-internet.fr/philgeo

TABLE 4: DATABASE

	Goods category specific observations
Supplying districts	522 (only 500 actually supply)
Consuming district	88
Goods category	15 (including silk
Information	1 if at least a mention, 0 otherwise
Number of observations	728,640

2. Checking the data

2.1 Potential difficulties

It is possible that the data give information on the zeal of individual *agents nationaux* — the local civil servants that had to collect the information — rather than on the actual flows of goods in late eighteenth-century France. Before exploring the question of market size, it is important to check whether the data are plausible.

The *Tableaux* are the result of three different operations, each of which was an occasion for errors: establishing the production tables in every district; gathering the production tables and completing them in Paris to write the *Tableau général du Maximum*; and setting up the *Tableaux du Maximum* (or consumption tables) in every district.

Not every district had sent its production table. The *Commission générale des subsistances* filled in some of the missing data based on information provided by Parisian traders and established the production and price lists of the most important districts that had not answered (including Nantes, Bordeaux and Lyon).[31] Furthermore, the consuming districts included products that had been left out of the *Tableau général du Maximum*. They used information coming either from direct inquiries in the producing or importing districts or from local traders.

Certainly, the zeal of each *agent national* differed. Some agents listed most individual goods from the *Tableau général du Maximum*. But the size of most *tableaux* would have been much bigger if this had often been the case. In general, it seems that *agents nationaux* tried to list the goods that were usually sold in shops in their district, or sometimes simply in their municipality. They would omit the goods that were brought by peddlers or were bought by consumers in adjoining districts.

Thomas Le Roux has contended that the work was on the whole properly done and that most differences in coverage come from to actual differences in consumption.[32] Comparing the district-level information with other sources allows this to be verified.

[31] Le Roux, *Commerce intérieur de la France*, pp. 58–61.

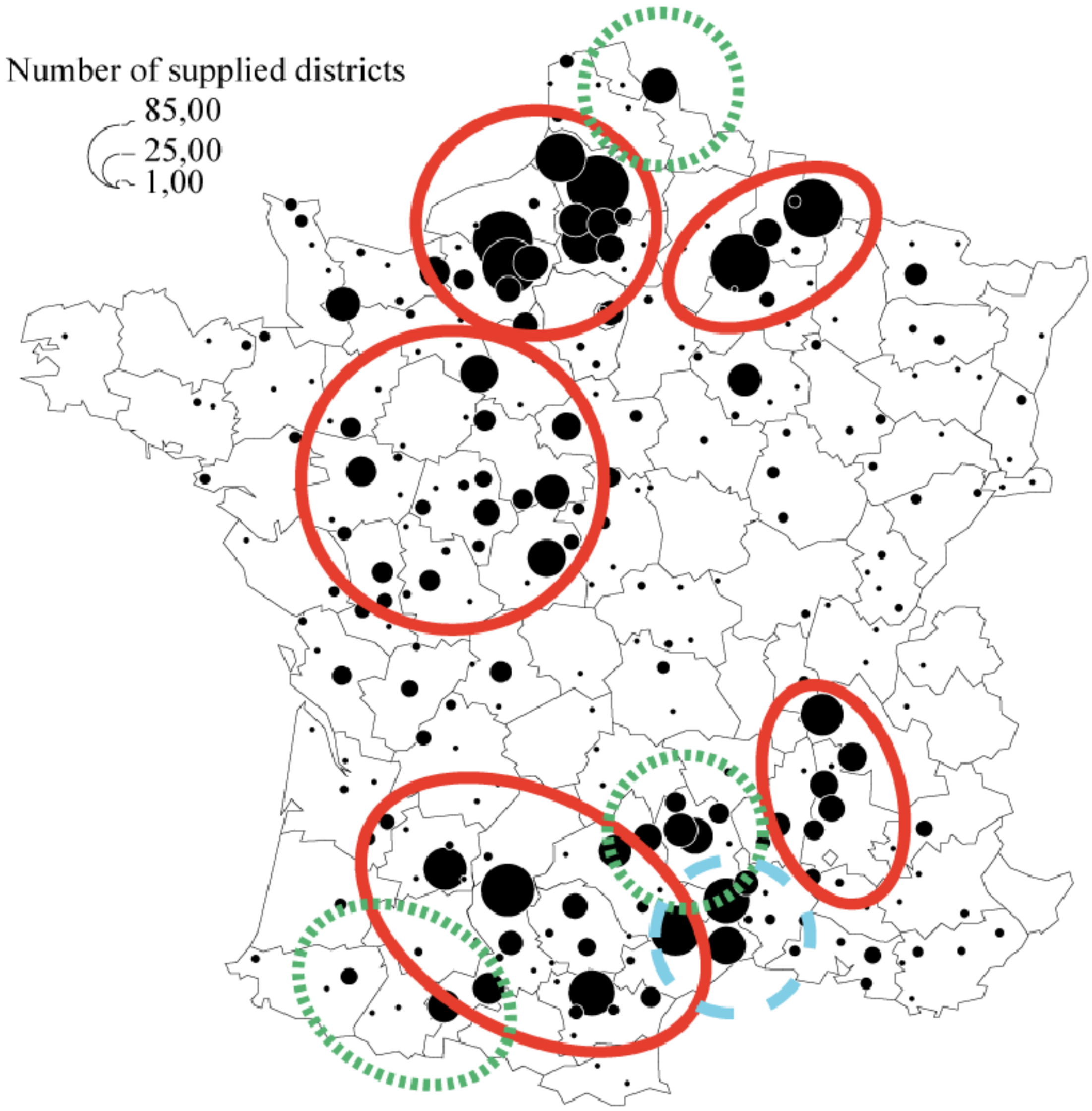
[32] Ibid., pp. 64–73.

2.2 *Are the implied production data plausible?*

The number of consuming districts supplied by each of the 522 supplying districts in each goods category should be a reasonable proxy of the production or importation level in each supplying district. Hence, one can draw "supply maps" and compare them with production maps to check if the information given by the *Tableaux* is plausible.

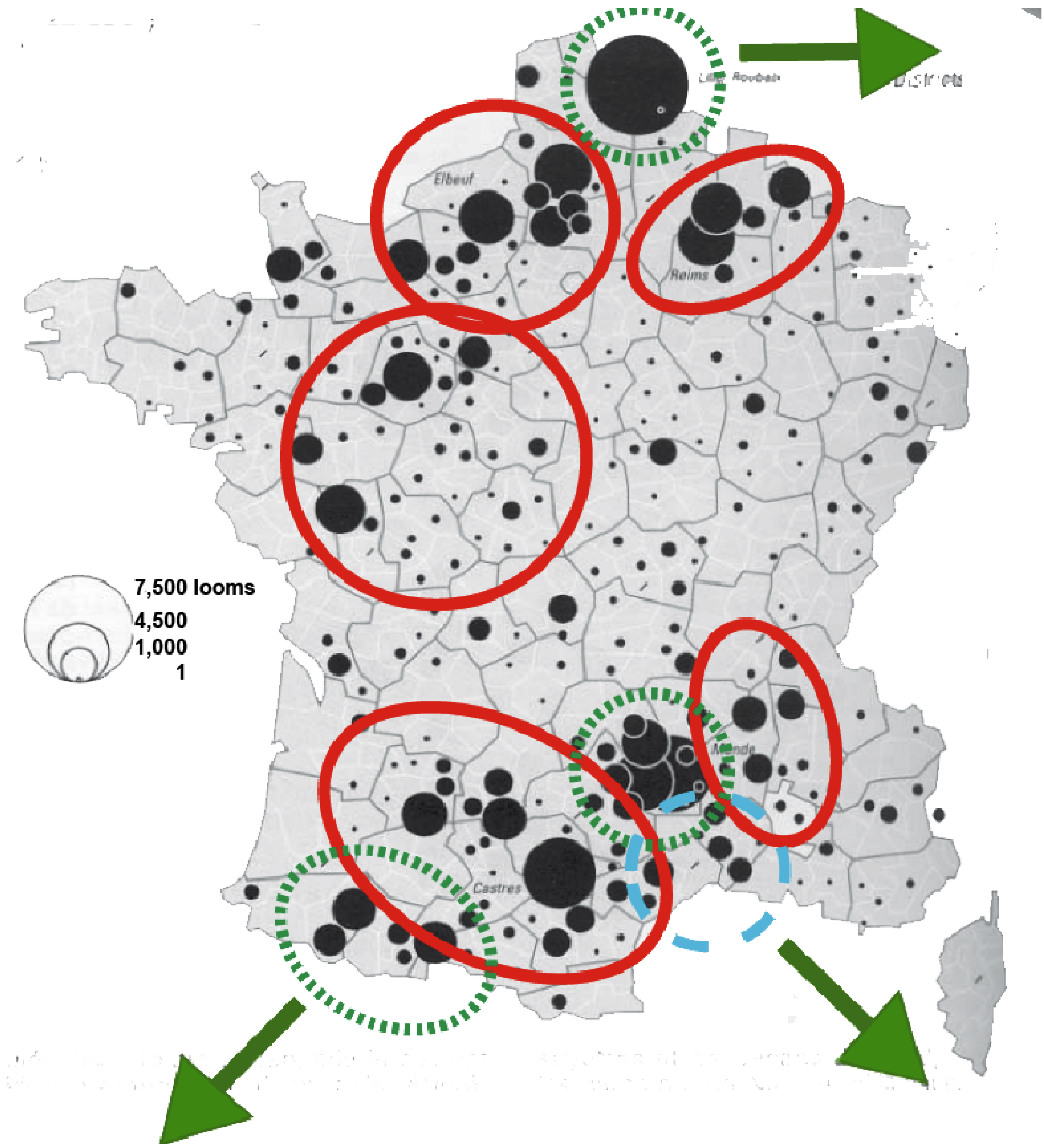
Maps 3 and 4 compare the wool-cloth supply map with a map of the number of woollen looms in 1789–1790.

MAP 3: WOOL CLOTH SUPPLY MAP FROM THE *LE MAXIMUM*



Map generated using Philcarto – http://perso.club-internet.fr/philgeo

MAP 4: NUMBER OF WOOLLEN LOOMS, EXCLUDING HOSIERY, IN 1789–1790[33]



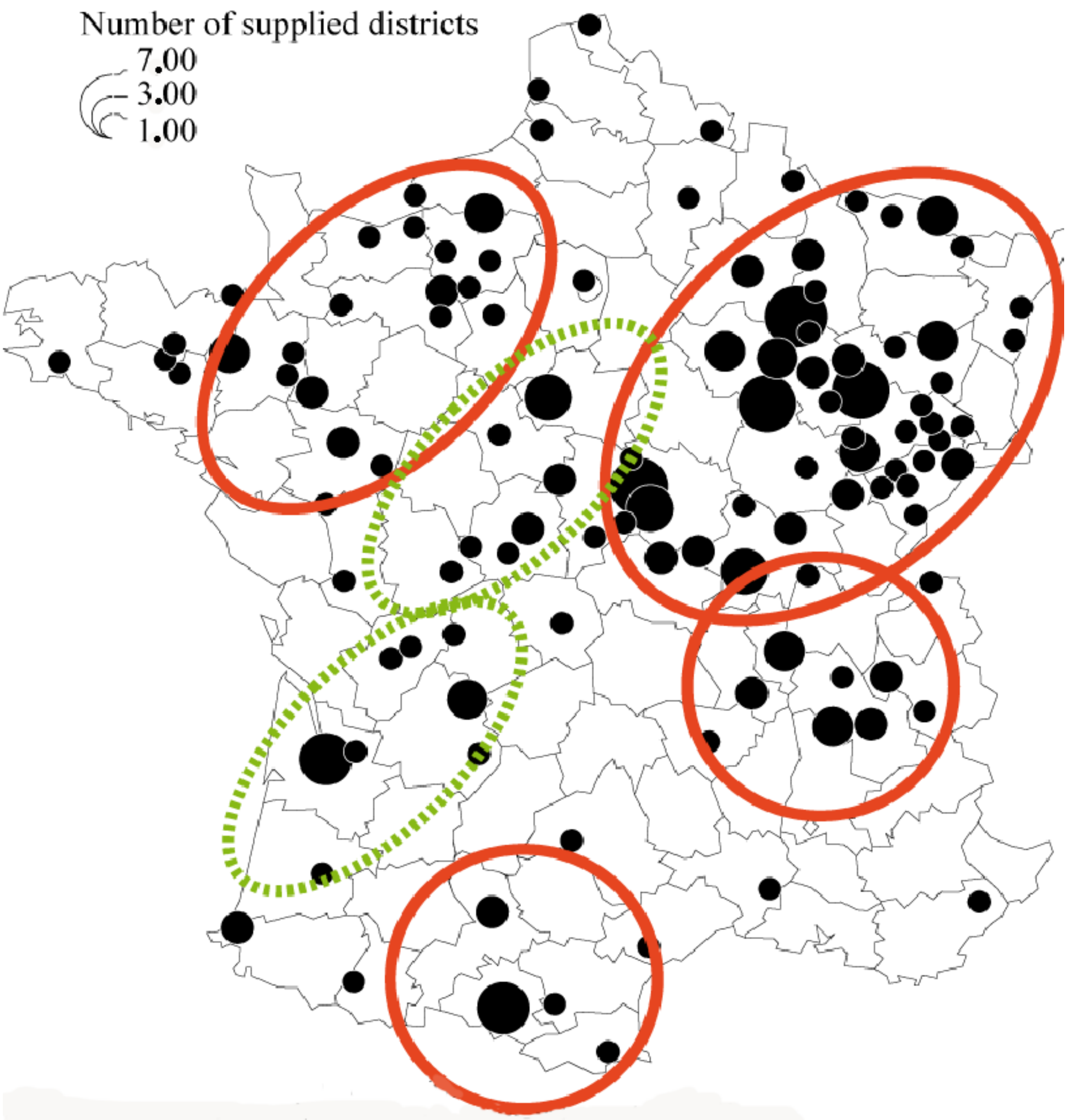
These two maps are similar. Production regions delimited by a plain line are common to both of them. Production regions delimited by a dotted line are present only in the loom map. This can be explained by the fact that the data based on *le Maximum* did not include exports, which decreases the importance of the Lille region, the Languedoc and the Western Pyrenees, which exported to the

[33] The second map comes from Béaur and Minard, eds., *Atlas/Économie*, p. 76.

Austrian Netherlands, the Levant and Spain. Furthermore, the *Maximum* map indicates the distribution centres of the *draps du Languedoc* rather than their production centres, which were slightly to the north (see the production region delimited by a dashed line).

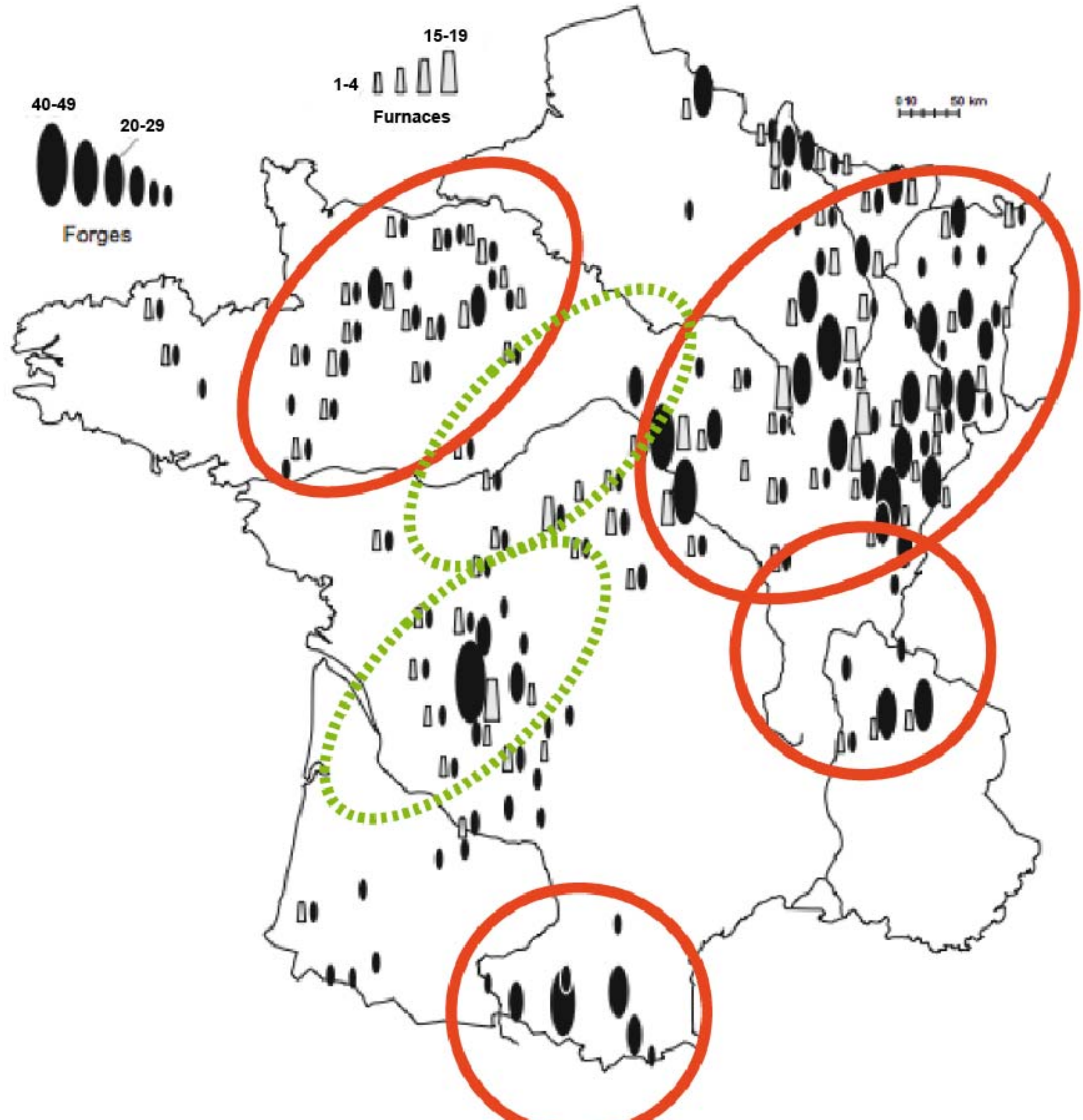
Map 5 and Map 6 compare the iron supply map with a map of furnaces in 1789. These two maps are also similar: the same production areas (identified with plain lines) can be found in both maps. The main difference comes from the dotted areas.

MAP 5: IRON SUPPLY MAP FROM *LE MAXIMUM*



Map generated using Philcarto – http://perso.club-intenet.fr/philgeo

MAP 6: FURNACES AND FORGES IN 1789[34]



Supply maps for the other products are available from the author. They confirm that the proxied production data given by the *Tableaux* are plausible.

[34] The furnace map is from Léon, "La Réponse de l'industrie", p. 234 and refers to 1789.

2.3 Checking bilateral trade data

Gravity models explain trade flows as a function of the mass and proximity of trade partners. They have been very successful at explaining the pattern of trade data in a variety of settings. Conforming to a gravity mode would make the bilateral trade data more believable.

In contrast with usual bilateral trade data, the data in the *Tableaux* do not indicate the value of trade flows, but only their existence. However, under the hypothesis that each *agent national* recorded the existence of a trade flow if it was superior to a district-specific threshold, one can use a logit regression in a usual gravity specification. Logit regressions explain the occurrence of a binary phenomenon based on the hypothesis that the explanatory variables affect the probabilities of the event according to a logistic function.

There is no reason to believe that each *agent national* had the same threshold or even applied the same threshold for each item of goods. Hence, goods-specific consuming district fixed effects must be introduced. Because production capacities and specializations differed between districts, supplying district fixed effects can be introduced as well. Having both supplying and consuming districts fixed effects solves a number of the usual interpretation difficulties with gravity models.[35] These fixed effects will capture all the district characteristics that cannot be measured otherwise.

2.3.1 Measuring mass

One expects that the number of supplied districts would depend on the production capacity of supplying districts and that the number of supplying districts would depend the demand level of consuming districts. Even if the supplying and consuming district fixed effect take into account the effects of different district demand and production capacity, it is interesting to add a measure of demand level and production capacity to check if they have the expected effect. We do not have information on district or departmental income difference. Yet demand levels and production capacity can be proxied by the district-level population and urbanisation. Towns were more than large groups of population. They are both home to specific consumption habits and co-ordinating centres for local production. To check that the data reflect this reality, the gravity equation includes two dummy variables reflecting the existence of a town with be-

[35] See Anderson and van Wincoop, “Trade Costs” and Baldwin and Taglioni, “Gravity for Dummies”.

tween 10,000 and 25,000 inhabitants in the consuming and in the supplying district. Furthermore, a number of towns were gateways for international trade: Marseilles, Bordeaux, Nantes, Lorient, Rouen, Lille and Strasbourg. A dummy signalling them is added in the gravity equation.

District-level population is estimated using estimates of departmental population in 1791.[36] Town sizes come from Lepetit's work on 1794.[37] This chronological discrepancy is not too much of a problem as long as we assume that there were no large differences in the demographic evolution of different districts.

2.3.2 Measuring distance

A central explanatory variable of trade gravity models is distance, used as a proxy for trade costs. It is actually possible to go further and estimate transport costs in eighteenth-century France. Disappointingly, the information given by the important enquiry of *an III* is not useable.[38] But the law of the *Maximum* actually gives a list of transport costs (see note 28) that can be completed by conjectures. Table 5 gives the resulting hierarchy of transport prices.

[36] From Dupâquier, *Population française*, pp. 82–83 (departmental population in 1791). The district population were computed on the assumption that all the districts of a *département* had the same rural population and that the 1794 town population levels can be used for around 1791. 1801 and 1806 censuses and various sources were used to produce estimates of the population of Alpes-Maritimes, Mont-Blanc, Mont-Terrible and Vaucluse. Full details of these computations are available on request.

[37] Lepetit, *Villes dans la France moderne*, pp. 450–453 (list of towns larger than 10,000 inhabitants and their population around 1794).

[38] Rémond, *Circulations marchandes*.

TABLE 5: UNIT TRANSPORT COSTS

Type of transport	Relative cost to 1 km of trails
Trail (1km)	1
Road (1km)	0.889
Up-river (1km)	0.444
Down-river (1km)	0.167
Canals (1km)	0.389
Sea (1km tramping)	0.3
Sea: Between Marseilles and one of Bordeaux, Nantes and Rouen[39]	200
Sea: Between Rouen and either Bordeaux or Nantes	150
Sea: Between Bordeaux and Nantes	100

The road and navigable waterways network is well known. The road network was mainly organised along administrative lines centred on Paris. It was much less useful for economic activity than the network of turnpikes in Britain. There was no equivalent to canal mania in eighteenth-century France and most canals were to be built in the nineteenth century. Thanks to the maps of navigable waterways and *routes de postes* given in the *Atlas de la Révolution Française,* it is possible to document a 552*552 matrix giving transport costs between districts.[40] Computing transport costs between districts less than 60 km apart (as measured by the great-circle distance between district administrative centres in trail-equivalent kilometres) allows the “diagonal” of the 552*552 matrix to be filled. Then, with the help of a network analysis program (UCINET), it is possible to compute the shortest path between each of the 552 districts in both directions.[41] Maps 7 and 8 illustrate the result of these computations in the case of

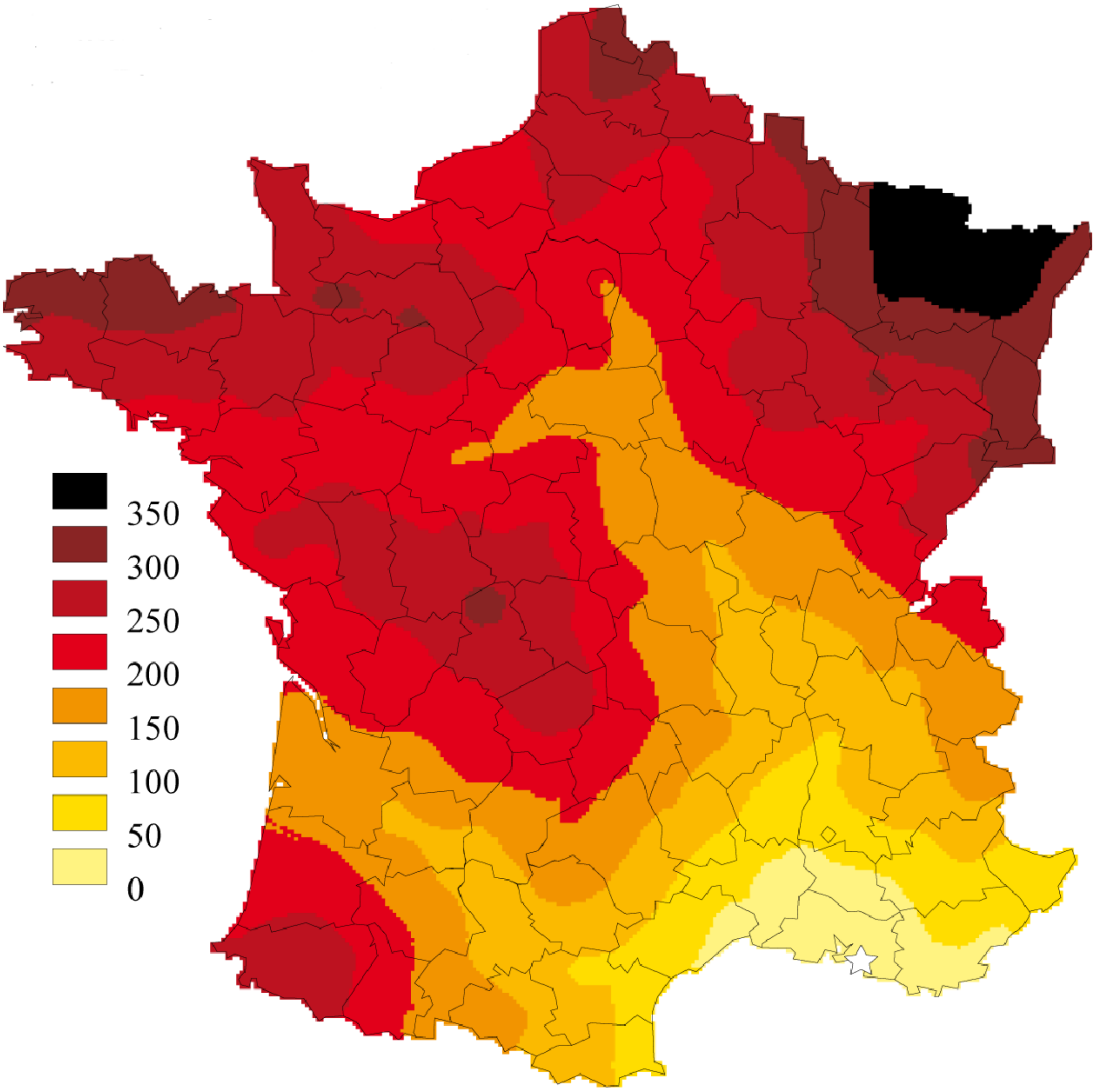
[39] According to data in Carrière, *Négociants marseillais* showing that the cost of transport by direct sea link between Marseilles and Rouen was two-thirds of the cost of the land link. Other sea links are conjectural.

[40] Arbellot, Lepetit, and Bertrand, eds., *Atlas/Routes*.

[41] Borgatti, Everett, and Freeman, *Ucinet*.

transport costs to Paris and from Marseilles. This directional transport cost variable is used in the gravity equation.[42]

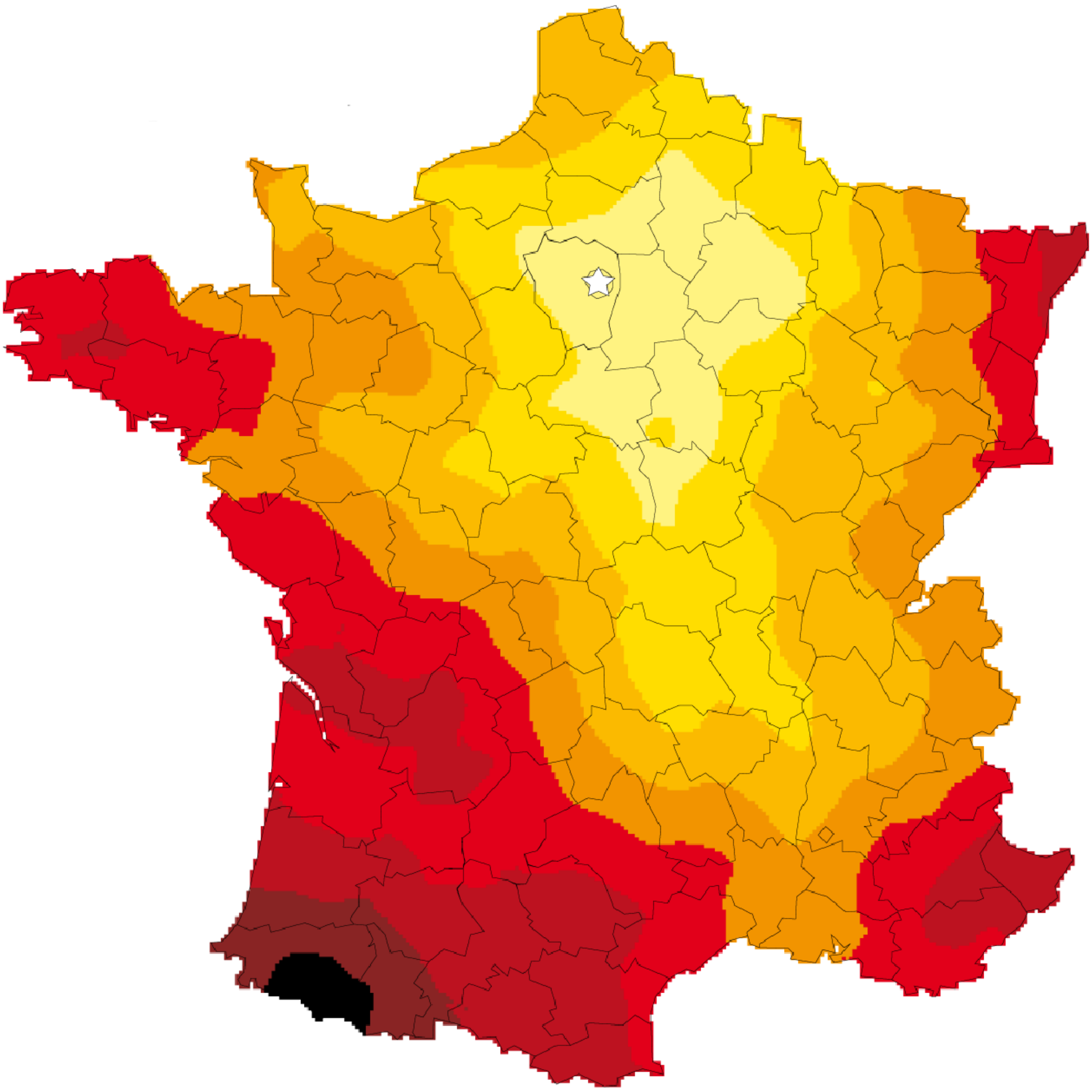
MAP 7: TRANSPORT COSTS FROM MARSEILLES (IN TRAIL-EQUIVALENT KILOMETRES)



Map generated using Philcarto – http://perso.club-internet.fr/philgeo

[42] Internal distance is assumed to be the same for all districts. It is computed using Head and Mayer, "Illusory Border Effects" fourth formula of approximately 0.67*square root(area/π) where the area is assumed to be 1000 sq. km.

MAP 8: TRANSPORT COSTS TO PARIS (IN TRAIL-EQUIVALENT KILOMETRES)



Map generated using Philcarto – http://perso.club-internet.fr/philgeo

Moving goods between two or more waterways, or from a wagon to a river-boat and to a wagon again had additional costs. The gravity equation partially takes them into account by introducing dummy variables indicating whether these transhipment costs could be avoided when two districts were on the same sea, year-round river, seasonal river or canal-linked waterway.[43]

[43] The variables used are as follow. Sea: both districts on the Channel, Atlantic or Mediterranean Sea (according to Le Bouëdec, "Coastal Shipping", p. 96, the Western point of Brittany and Gibraltar were two important boundaries in intra-European coastal trade.) / Year-round river: both districts in all-year round Seine, all-year round Loire or Rhine / river: both districts on Seine, Loire, Adour, Saône or Rhône, Somme, North rivers, Meuse, Moselle &

The resulting transport prices are probably a very rough approximation. Most notably, there were many regional variations in the actual level of costs due to differences in traffic volumes, different fodder prices, differences in the condition of waterways or roads, etc. Price also changed with the season.[44] However, using these data to measure distance is better than simply using great-circle distance as many gravity models do.

2.3.3 Customs union

France did not become a customs union before the Revolution. As the information given by the *Tableaux* is about trade at the very beginning of the Revolution, the pre-Revolutionary customs regime must have had an effect on the trade relations they describe.

Numerous private tolls (still 1,600 in 1789) and local tariffs, especially municipal ones, existed.[45] These were scattered in a relatively uniform way and should not have changed the global geography of trade: therefore they are not taken into account in the gravity equation.

Following the customs reorganisation of 1664 and 1667, French provinces were divided in three categories regarding tariffs. *Étranger effectif* included recently annexed provinces (Alsace, Franche-Comté, Lorraine, Trois-Évêchés, pays de Gex). They were treated as foreign countries and a good entering the country from these places had to pay customs duties like a foreign good. They often enjoyed smaller tariffs on their borders to Switzerland and Germany than on their border with "interior" France. There was a customs union in the *Cinq Grosses Fermes*, or *Étendue* without any internal tariffs (see Map 9). But part of France was neither in the *Cinq Grosses Fermes* nor in *Étranger effectif*. The *Provinces reputées étrangères* (Artois, Bretagne, Flandre, Guyenne, Saintonge, Languedoc, Provence, Dauphiné and Lyonnais) had not been integrated in the national custom union even though they were not recent annexations. They were subject to 21 local tariffs that goods crossing at specific points had to pay each time (*traites*).[46]

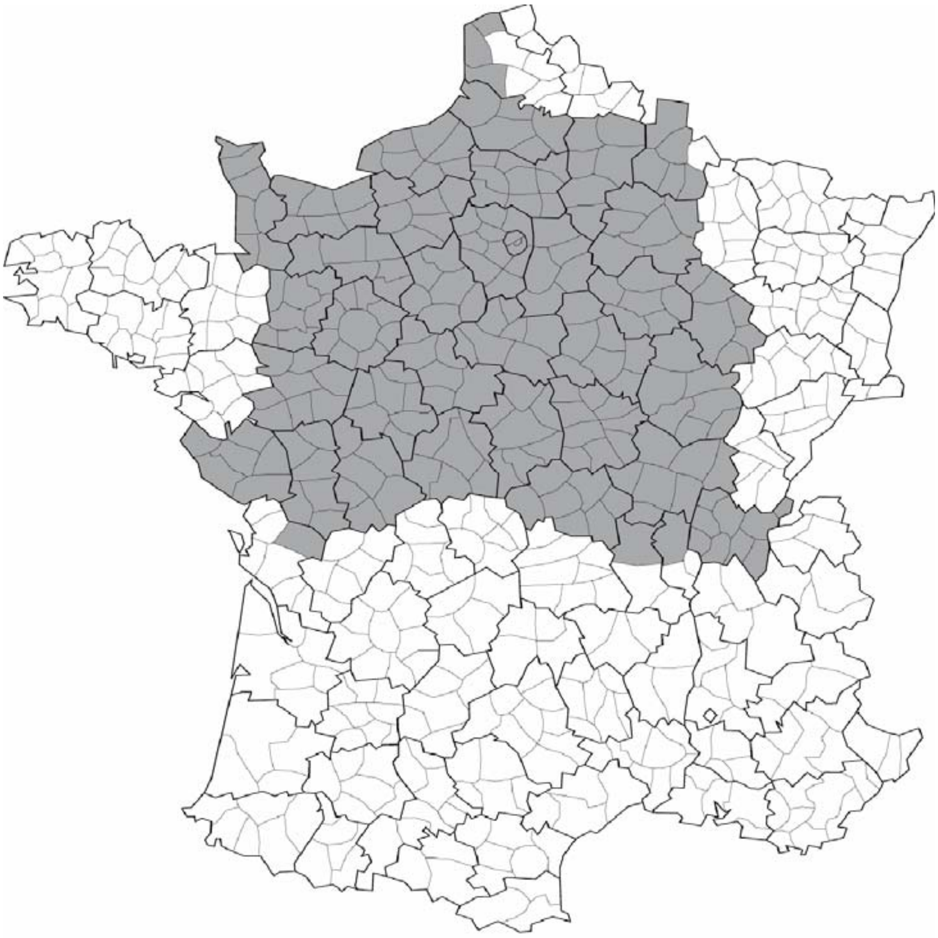
Sarre, Vilaine, Charente, Dordogne or Garonne or their effluents. Canals: One district on Seine and one on Loire; one on Saône/Rhône, one on Loire; one on Canal du Midi, one on Garonne or Canal du Midi.

[44] Szostak, *Role of transportation*.

[45] Conchon, *Le péage en France au XVIII^{e} siècle: Les privilèges à l'épreue de la réforme*.

[46] Mousnier, *Institutions de la France*, pp. 412–420, Bosher, *Single Duty Project*.

MAP 9: DISTRICTS THAT HAD PART OF THEIR TERRITORY IN THE *CINQ GROSSES FERMES*[47]



Map generated using Philcarto – http://perso.club-internet.fr/philgeo

But even if the system was complex – which in itself incurred costs – the amount of customs revenue collected was not large. External tariffs (including those paid on trade between *the Étranger effectif* and the rest of the country) were not very high: the basis was a 5% *ad valorem* for most goods, plus 3.5% for colonial goods to be consumed in France. Outright prohibitions were probably more significant. Total state receipts in external tariffs were only 0.7–0.8% of French Gross Physical Product (GPP). *Traites* (tariffs collected inside *Provinces réputées étrangères* or between them and the *Cinq Grosses Fermes*) represented an additional 0.25% of French GPP. *Aides* (taxes mostly on alcoholic beverages) and *octroits* (a tax on goods entering cities for their consumption) were higher and amounted respectively to approximately 1.4% and 0.35% of French GPP.[48]

[47] Based on Corvisier, *Histoire moderne*, Bosher, *Single Duty Project*.

[48] Mathias and O'Brien, "Taxation in Britain and France", pp. 608, 622, 631–2.

One can assume that trade between *Cinq Grosses Fermes* districts was less expensive. To reflect that, we introduce a *Cinq Grosses Fermes* dummy variable in the gravity equation to differentiate trade links inside the *Cinq Grosses Fermes* from others.

2.3.4 Results

Tables 6, 8 and 9 present the results of the theoretical logit gravity equation based on the gravity equation including all the discussed variables for each goods category.

Table 6 presents the role of interactive variables.

TABLE 6: EXPLAINING TRADE LINKS:
THE ROLE OF INTERACTIVE VARIABLES

*The numbers given are not the coefficients but the associated odds ratios. ***, ** and * denotes that the odds ratio are different from 1 at the 1%, 5% and 10% level. Ratios in parentheses are not statistically significant*

	Transport costs	Cinq Grosses Fermes	Number of non-trivial observations	Quasi-R2
Cotton	0.19***	2.0***	6,873	0.50
Hosiery	0.19***	3.3***	9,309	0.42
Hardware	0.18***	(1.2)	11,484	0.52
Misc. production goods	0.17***	1.4*	13,288	0.59
Misc. consumption goods	0.15***	1.9***	23,496	0.53
Linen and hemp	0.11***	2.9***	21,824	0.51
Wool and wool cloth	0.11***	3.2***	24,112	0.58
Leather products, hides and hats	0.08***	2.9***	24,728	0.54
Iron	0.07***	8.7***	8,814	0.49
Food items	0.07***	2.2***	20,416	0.58
Drinks	0.05***	8.9***	19,448	0.56
Paper	0.04***	2.1***	11,390	0.60
Wood for industry	0.03***	7.1***	14,706	0.73
Fuel (wood and coal)	0.05***	(0.8)	11,088	0.73

The numbers given are odds ratios. They should be interpreted in the following way: the fact that districts A and B were in the *Cinq Grosses Fermes* multiplied the ratio between the probability that A sold cotton cloths to B and the probability that A did not sell cotton cloths to B by two. If the probability of A selling to B was from other factors 25% (odds ratio of 1/3), it is changed into 40% (odds ratio of 2/3). An increase by 1 of the logarithm of the trail-equivalent-km trade costs (i.e. a multiplication by 2.7) between districts A and B multiplies the odds that A sold cotton cloths to B by 0.19. If it was from other factors 25%, it is changed into 6%.

Table 7 gives guidelines for the interpretation of the transport cost coefficient.

TABLE 7: EFFECT OF AN INCREASE IN TRANSPORT COSTS ON THE PROBABILITY OF TRADE LINKS

Change in transport costs		Cotton	Linen and hemp	Paper
+1%	Change in the odds ratio	–1.6%	–2.2%	–3.2%
	New probability if initial probability = 50%	49.5%	49.5%	49.2%
	New probability if initial probability = 10%	9.9%	9.8%	9.7%
+10%	Change in the odds ratio	–15%	–19%	–26%
	New probability if initial probability = 50%	46.1%	44.8%	42.4%
	New probability if initial probability = 10%	8.7%	8.3%	7.6%
+100%	Change in the odds ratio	–69%	–78%	–89%
	New probability if initial probability = 50%	24.0%	17.8%	9.7%
	New probability if initial probability = 10%	3.4%	2.3%	1.2%

As expected, the importance of transport costs is a function of the weight/value ratio of each product category. Also as expected, the odds associated with the *Cinq Grosses Fermes* dummy are mostly significant and quite high. However, it might be the case that this dummy captures part of the better quality of the transport network in Northern France. Transhipment costs coefficients are very often insignificant or of the wrong sign; and they are not reported. It appears they are very badly measured by the proxy used in the model. This might also be linked to an underestimation of maritime or fluvial transport costs or to the small number of consuming districts; if a consuming district is on a river, part of that effect is going to be captured by the district-specific dummy rather than in the transhipment variable.

Table 8 presents the coefficient of consuming district characteristics in the gravity equation. It does not report the 88 coefficients of the district-specific dummy variables, but a global view of their importance can be had from the decrease of the quasi-R2 when all consuming district variables are removed. The most important determinant of consumption intensity is the size of the population. Towns between 10,000 and 25,000 do not seem to entail more diversity in consumption than what the population itself predicts. Towns larger than 25,000 (there are not many of them among the 88 consuming districts) seem to have more diverse supply sources for a number of items, the most spectacularly for fuel. The negative effect on the diversity of miscellaneous consumption goods by supply source is probably meaningless. On the whole, consuming district characteristics do not explain much of the variance in trade links.

TABLE 8: EXPLAINING TRADE LINKS: THE ROLE OF CONSUMING DISTRICT CHARACTERISTICS

	Log of the population	Town between 10,000 and 25,000	Town larger than 25,000	Decrease in the quasi-R2 if consuming district variables are removed
Cotton	1.9**	(1.1)-	(1.1)	0.07
Hosiery	(1.2)	2.7*	4.1***	0.08
Hardware	3.8***	(0.2)	(0.4)	0.08
Misc. production goods	2.7***	(1.3)	(0.7)	0.13
Misc. consumption goods	3.3***	(0.2)	0.1*	0.10
Linen and hemp	2.1***	(0.2)	6.1***	0.10
Wool and wool cloth	(1.4)	(1.8)	3.1***	0.08
Leather products, hides and hats	1.9**	(0.1)	13.7***	0.14
Iron	3.1***	(0.1)	(0.8)	0.15
Food items	(1.3)	(0.0)	(0.3)	0.07
Drinks	(1.5)	(0.0)	(0.8)	0.14
Paper	5.4***	(0.3)	(1.3)	0.13
Wood for industry	4.7***	(0.2)	(1.0)	0.13
Fuel (wood and coal)	(0.4)	(5.0)	155.3***	0.07

Table 9 gives the role of supplying district characteristics in the gravity equation. They explain a larger part of the differences in trade links. This is can be interpreted as a sign that consumption patterns are more homogeneous than production patterns. This is to be expected, as there is more specialization in production than in consumption.

TABLE 9: EXPLAINING TRADE LINKS: THE ROLE OF SUPPLYING DISTRICT CHARACTERISTICS

	Log of the population	Town between 10,000 and 25,000 (not importing)	Town of more than 25,000 (not importing)	Importing town	Decrease in quasi-R2 if supplying district variables removed
Cotton	0.1***	(1.2)	2609.3***	2494.7***	0.37
Hosiery	0.5***	15.5***	201.7***	9.2***	0.22
Hardware	5.4***	(0.1)	(0.4)	(0.0)	0.41
Misc. production goods	15.3***	(0.4)	(0.1)	(0.1)	0.46
Misc. consumption goods	(1.6)	5.9***	(1.1)	479.7***	0.37
Linen and hemp	3.2**	(0.0)	3.6***	(0.3)	0.30
Wool and wool cloth	6.5***	(0.0)	3.6***	5.3***	0.43
Leather products, hides and hats	(1.5)	27.0***	13.6***	9.1***	0.15
Iron	15.7***	(0.3)	8.5***	(3.5)	0.05
Food items	(2.6)	(0.6)	5.6**	44.1***	0.27
Drinks	(1.7)	(0.0)	(0.0)	(0.0)	0.22
Paper	(0.2)	1243.7***	(9.3)	4813.7***	0.16
Wood for industry	(1.0)	(0.0)	(0.0)	(0.0)	0.10
Fuel (wood and coal)	(1.8)	(0.1)	(0.0)	(1.3)	0.08

However, Table 9 must be interpreted with some care. Supply centres that did not supply anyone with a goods category are dropped from the gravity analysis, as their dummy explains the existence of a link completely. Hence Table 9 only compares small supply centres with large ones. To study the characteristics of all supply centres compared to non-supply district, one can run another logistic regression: Table 10 presents its results. The explanatory power of the regression is very small, as demographic variables are of limited use in predicting which kind of specialization each district will have. Yet Table 10 shows that the presence of an urban centre has a decisive role in whether a district will distribute its goods at large or not, which demonstrates the distributive role of towns.

TABLE 10: EXPLAINING WHY A DISTRICT SUPPLIES A GOOD

	Log of the population	Town between 10,000 and 25,000 (not importing)	Town of more than 25,000 (not importing)	Importing town	Number of supplying districts (out of 552)	Quasi-R^2
Cotton	3.5***	(1.6)	4.6***	Full	79	0.1
Hosiery	(1.2)	3.1***	11.2***	3.7***	107	0.1
Hardware	(1.4)	(1.5)	3.5***	3.5***	132	0.0
Misc. production goods	(1.0)	7.0***	11.0***	Full	151	0.1
Misc. consumption goods	(1.1)	4.9***	8.5***	Full	267	0.1
Linen and hemp	(1.4)	3.7***	2.6***	6.4***	248	0.1
Wool and wool cloth	(1.0)	2.5***	4.1***	3.1**	274	0.0
Leather products, hides and hats	(1.1)	4.6***	3.8***	6.5***	281	0.1
Iron	(1.1)	1.6*	3.5***	3.1**	113	0.0
Food items	1.4*	2.8***	2.8***	6.8***	233	0.0
Drinks	(1.4)	1.6**	3.6***	3.0**	221	0.0
Paper	(0.8)	2.6***	3.0***	3.4***	134	0.0
Wood for industry	(1.1)	(1.4)	(1.6)	2.9**	171	0.0
Fuel (wood and coal)	1.8***	1.8***	(0.7)	(1.4)	132	0.0

Table 9 shows that, among supplying districts, urban centres also played a role in determining the number of districts supplied. This role was more important than in determining the diversity of consumption. The only production centres which importance was not influenced by urban centres were those producing hardware, miscellaneous consumption goods (including honey, olive oil, alcohol), drinks (mainly wine), wood and fuel. Apart from hardware, this is reasonable as most of these products were agricultural. Marseilles, classified as an importing town, was also a production centre in its own right, which explains the importance of importing towns for paper and food (mainly fish) supply. The Rouen district both imported cotton cloth from Great Britain and produced it. It was also an important paper production centre, which explains the high effect of importing towns in that goods category. The counter-intuitive negative role for the district's population in the case of cotton and hosiery is difficult to interpret, but might be linked to the fact that the whims of the specialization pattern in these goods are not resolved by a large number of suppliers for these goods. Anyway, these effects are countered by a very important positive role for urban centres.

On the whole the results of the gravity equation are what one would expect. This reinforces trust in the data, which can be used to measure market size.

3. Measuring the size of French markets

The easiest way to measure the size of the market for a specific good coming from a specific district would be simply to sum the population of all the districts that have declared they are consuming it. This is not possible as *tableaux du Maximum* do not exist for every consuming district. However, it is possible to extrapolate from the existing data the odds that each district is consuming goods of a specific origin. Summing the population of each consuming district weighted by these odds yields an expected market size for each supplying district. For example, if Marseilles were predicted to have a 90% probability of supplying every French district in various consumption goods, its expected market size would be equal to 90% of the French population.

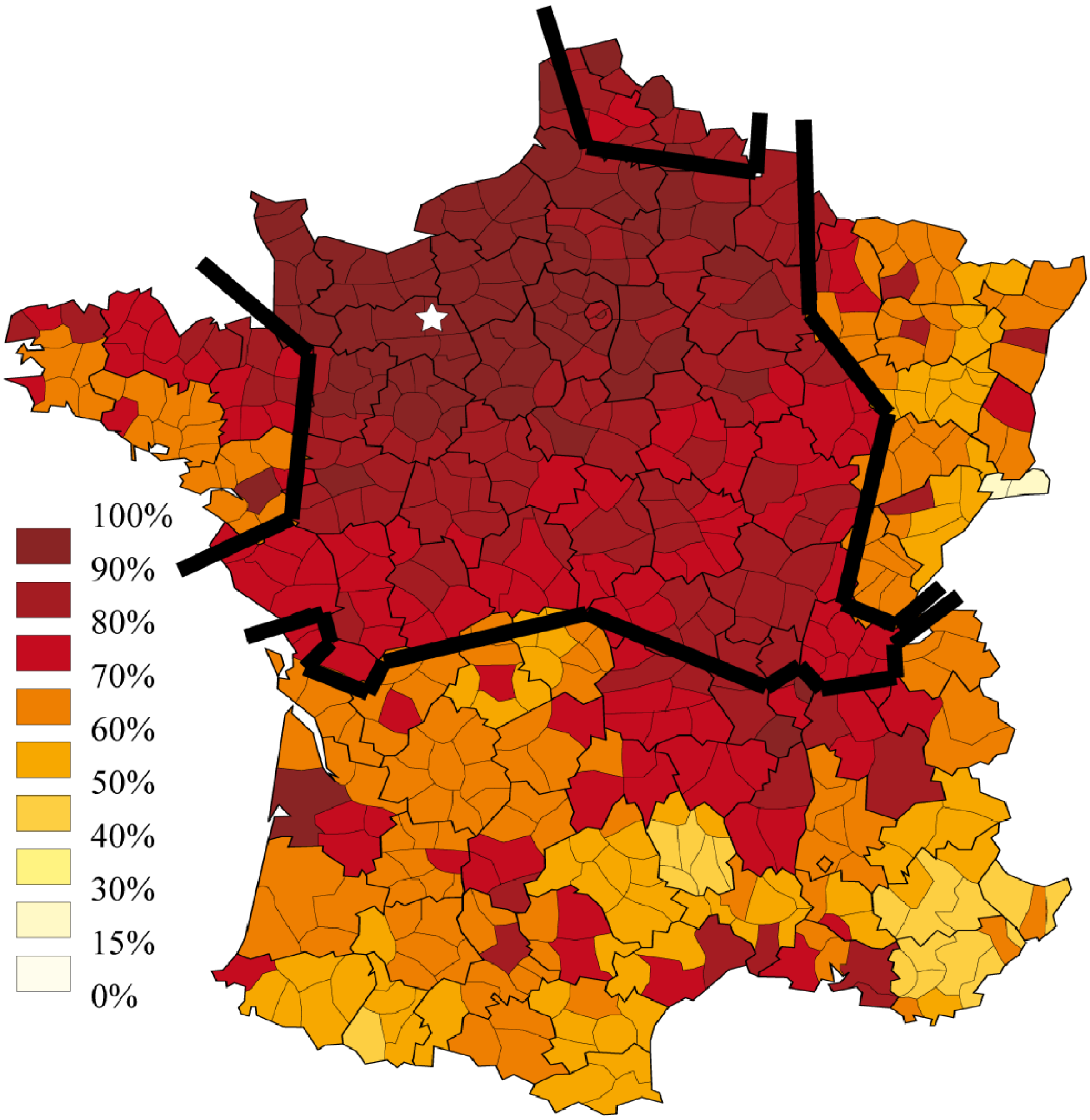
Whether one should use the consuming district fixed effect dummies for this exercise is debatable. If they reflect simply the whims of the local administrators, they cannot provide any useful information. But they might contain some information on unobserved local characteristics and hence be useful for prediction by extending their effects to their whole department. The paper will present the results without including them, but the following conclusions are robust to the inclusion or not of these district dummies.

A new gravity equation is run without the consuming district dummies. Its results are very similar to the preceding ones and are not repeated. As expected, this model has less explanatory power. The measurable characteristics of the consuming districts are more often significant, but cannot replace fully the information provided by the consumer district dummies. Transport costs have less of an effect, suggesting that consumer district dummies were indeed capturing part of the remoteness factor of some districts and not simply the whims of their *agents nationaux*.

Using these results to predict consumption for all the 552 French districts, it is possible to determine the supplying area of each district. Maps 10 and 11 give the expected area being supplied by L'Aigle (Orne) in hardware goods and by Angoulême (Charente) in paper goods.[49] Proximity is the determinant factor in determining distribution areas. Yet, the effects of urbanization, population and the *Cinq Grosses Fermes* can also be identified in these maps.

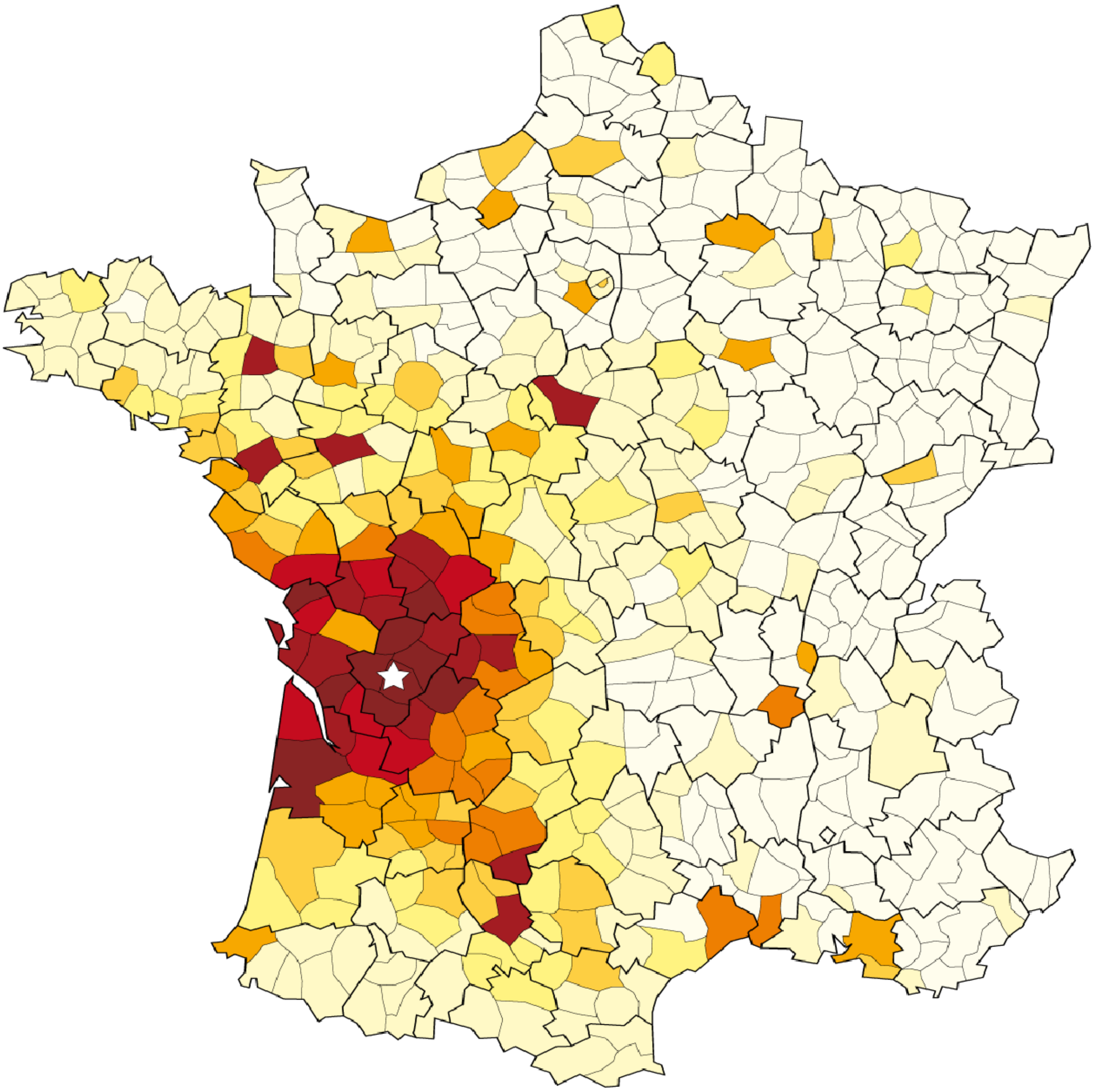
[49] L'Aigle was the place where pin factory so famously described by Adam Smith was to be found: Smith, *Wealth of Nations*, Peaucelle, "Pin making example". Thank you to Robert Allen for pointing out this fact to me.

MAP 10: PROBABILITY OF A DISTRICT BEING SUPPLIED IN HARDWARE GOODS BY L'AIGLE



Map generated using Philcarto – http://perso.club-internet.fr/philgeo

Map 11: Probability of a district being supplied in paper goods by Angoulême



Map generated using Philcarto – http://perso.club-internet.fr/philgeo

From this information, it is possible to compute the 95% confidence interval of the expected market size of the main supplying districts. The best estimations and the confidence intervals are shown in Table 11, Table 12, and Table 13.

TABLE 11: POPULATION OF THE LARGEST EXPECTED MARKETS IN MILLIONS (HIGH VALUE-TO-WEIGHT)

Misc Production goods	Marseille (Bouches-du-Rhône)	**27.5** [25.7–28.1]
	Rouen (Seine-Inférieure)	**26.0** [23.9–27.1]
	Strasbourg (Bas-Rhin)	**22.0** [19.3–24.0]
	Paris (Seine)	**21.6** [18.9–23.8]
	Montpellier (Hérault)	**18.1** [15.3–20.8]
Hardware	Saint-Étienne (Loire)	**24.9** [22.4–26.5]
	L'Aigle (Orne)	**21.9** [19.3–24.0]
	Paris (Seine)	**20.0** [17.1–22.4]
	Thiers (Puy-de-Dôme)	**19.5** [16.4–22.1]
	Rouen (Seine-Inférieure)	**17.4** [14.5–20.2]
Misc. consumption goods	Marseille (Bouches-du-Rhône)	**27.4** [25.6–28.1]
	Aix (Bouches-du-Rhône)	**21.7** [19.0–23.8]
	Montpellier (Hérault)	**20.4** [17.6–22.7]
	Rouen (Seine-Inférieure)	**19.8** [17.1–22.2]
	Bordeaux (Gironde)	**19.0** [16.3–21.5]

TABLE 12: POPULATION OF THE LARGEST EXPECTED MARKETS IN MILLIONS (TEXTILES AND LEATHER)

Cotton	
Rouen (Seine-Inférieure)	**25.5** [23.3–26.9]
Troyes (Aube)	**21.8** [18.9–24.1]
Hennebont (Morbihan)	**17.9** [14.8–20.8]
Amiens (Somme)	**17.2** [14.1–20.0]
Villefranche-Rhône (Rhône)	**14.5** [11.2–17.6]

Hosiery	
Orléans (Loiret)	**19.8** [16.6–22.4]
Troyes (Aube)	**13.5** [10.5–16.5]
Rouen (Seine-Inférieure)	**12.3** [9.2–15.4]
Angers (Maine-et-Loire)	**9.7** [6.8–13.1]
Amiens (Somme)	**9.1** [6.6–12.0]

Linen and hemp	
Bernay (Eure)	**21.3** [18.7–23.4]
Lille (Nord)	**20.6** [18.0–22.9]
Rouen (Seine-Inférieure)	**13.9** [11.0–16.8]
Alençon (Orne)	**11.6** [9.0–14.4]
Château-Gontier (Mayenne)	**11.5** [8.6–14.5]

Leather products, hides and hats	
Paris (Seine)	**16.4** [13.6–19.2]
Lyon (Rhône)	**10.2** [7.8–12.8]
Rouen (Seine-Inférieure)	**5.0** [3.2–7.5]
Niort (Deux-Sèvres)	**5.0** [3.0–7.6]
Marseille (Bouches-du-Rhône)	**4.5** [2.8–6.8]

Wool and wool cloth	
Amiens (Somme)	**27.6** [26.0–28.1]
Rouen (Seine-Inférieure)	**25.7** [23.7–26.9]
Reims (Marne)	**25.1** [23.0–26.5]
Sedan (Ardennes)	**25.0** [22.9–26.5]
Louviers (Eure)	**22.7** [20.3–24.6]

TABLE 13: POPULATION OF THE LARGEST EXPECTED MARKETS IN MILLIONS (LOW VALUE-TO-WEIGHT)

Drinks	
Beaune (Côte-d'Or)	**9.5** [7.1–12.2]
Mâcon (Saône-et-Loire)	**6.5** [4.4–9.1]
Épernay (Marne)	**6.3** [4.3–8.8]
Orléans (Loiret)	**6.2** [4.0–8.8]
Auxerre (Yonne)	**5.9** [3.9–8.4]

Paper	
Angoulême (Charente)	**8.1** [5.7–11.0]
Tournon (Ardèche)	**4.0** [2.4–6.3]
Rouen (Seine-Inférieure)	**3.4** [1.7–5.9]
Thiers (Puy-de-Dôme)	**3.0** [1.6–5.4]
Montargis (Loiret)	**2.6** [1.2–4.9]

Fuel (wood and coal)	
Saint-Étienne (Loire)	**1.2** [0.5–2.8]
Bayeux (Calvados)	**1.1** [0.3–3.6]
Orléans (Loiret)	**1.1** [0.3–3.4]
Campagne de Lyon (Rhône)	**0.9** [0.5–2.4]
L'Aigle (Orne)	**0.9** [0.3–3.1]

Wood for industry	
Soissons (Aisne)	**2.5** [1.3–4.6]
Clermont (Oise)	**1.8** [0.8–3.6]
Orléans (Loiret)	**1.4** [0.4–3.7]
Alençon (Orne)	**1.3** [0.4–3.4]
Mâcon (Saône-et-Loire)	**1.3** [0.4–3.5]

Food items	
Dieppe (Seine-Inférieure)	**16.4** [13.4–19.1]
Marseille (Bouches-du-Rhône)	**12.1** [9.4–15.1]
Bergues (Nord)	**10.8** [8.1–13.8]
Boulogne (Pas-de-Calais)	**9.7** [7.2–12.7]
Montivilliers (Seine-Inférieure)	**9.5** [6.6–12.7]

Iron	
Saint-Dizier (Haute-Marne)	**3.0** [1.6–5.2]
Joinville (Haute-Marne)	**2.6** [1.3–4.9]
Châtillon-sur-Seine (Côte-d'Or)	**2.6** [1.3–4.9]
La Charité (Nièvre)	**2.5** [1.1–5.0]
Bordeaux (Gironde)	**2.2** [1.1–4.4]

The largest expected markets of all but the lowest value-to-weight goods in France were larger than the whole of Britain (9.9 million inhabitants in 1790)[50] at the 95% confidence level. The implicit hypothesis of that comparison is that British producers supplied all their domestic consumers. This seems plausible for the highest value-to-weight goods, but it might be the case that remote parts of Britain were not so supplied. Some of the supply centres with the largest markets specialized in the redistribution of imports, especially in the case of cotton and miscellaneous consumption goods (including colonial goods). Rouen was an important redistribution centre for many textiles and hardware imports from Britain, even though the district of Rouen was also an important production centre. In the case of cotton, the district of Hennebont, in Brittany, included the town of Lorient through which Asian goods were imported. And yet the majority of the supply centres mentioned in these tables were inland producers. Troyes and Amiens were not importation centres and they had a market for cotton textiles as large or larger than Britain. Some French products in sectors that were important for the Industrial Revolution (e.g. cotton and hardware) indeed had domestic markets as large or larger than Britain.

Population might not be the right comparison metric, however, as French consumers certainly had less purchasing power than British consumers. Real GDP per head was 70% higher in Britain than in France in 1791 and nominal GDP per head was 75% higher.[51] According to David Landes, one key difference between Britain and France in explaining different levels of technical innovation was the aggregate disposable income.[52] Setting the subsistence level according to Maddison's estimates at 400 1990 $, disposable real income per capita was 110% higher in Britain than in France.[53] The comparison in nominal disposable income terms is more difficult, as we do not know what the price of the subsistence basket was in France and in Britain. However, if we make the assumption that the income level of the poorest category of the population (cottagers, poor and vagrants in England and Wales, agricultural day labourers and

[50] Extrapolated from Maddison, *World Economy*, Crafts, *British Economic Growth*.

[51] Extrapolated from Maddison, *World Economy*, Crafts, *British Economic Growth*, Toutain, "Le produit intérieur brut" and Dupâquier, *Population française*, Veverka, "Government Expenditure", quoted in Officer, "GDP for the United Kingdom" Details of the computation are available from the author.

[52] Landes, *Unbounded Prometheus*, pp. 47–8. Thank you to Patrick O'Brien for pointing me to that reference.

[53] From Maddison, *Chinese Economic Performance*, discussed in Milanovic, Lindert, and Williamson, "Ancient Inequality".

servants in France) was equal to the price of the subsistence basket, then disposable nominal income per capita was 85% higher in Britain than in France.[54]

Table 14 indicates the number of French markets that were larger than Britain as a whole at the 95% confidence level using these different criteria. Even using the real disposable income criterion, there were French markets larger than Britain. Of course, the number of French markets which were smaller than Britain at the 95% confidence level was much higher.

TABLE 14: NUMBER OF FRENCH MARKETS LARGER THAN BRITAIN AT THE 95% CONFIDENCE LEVEL

Criterion	Population	Real income	Nominal income	Nominal disposable income	Real disposable income
Wool and wool cloth	13	6	6	5	4
Misc. production goods	12	4	4	4	2
Misc. consumption goods	10	4	3	2	1
Hardware	8	3	2	2	1
Cotton	5	2	2	2	1
Linen and hemp	3	2	2	1	0
Hosiery	2	0	0	0	0
Leather products	1	0	0	0	0
Food items	1	0	0	0	0

[54] Morrisson and Snyder, “Income Inequality of France”, Lindert and Williamson, “England’s Social Tables”.

4. Discussion

The data gathered by the French government in 1794 are an exceptional gateway to the study of French domestic trade at the end of the eighteenth century. The information they give is plausible and compatible with other sources. They show that numerous French producers had access to domestic markets that were as large or larger than Britain as a whole during this period. Considering the number of economic models that have been proposed which put market size at the centre of growth in general and the Industrial Revolution in particular, this is a startling result.

It is true that other possibly important differences in total markets might have played a role. Higher inequality in France might have restricted the potential for the formation of a large market in pertinent products.[55] However, the level of inequality in France was not much larger than in Britain. For 1788, Morrison and Seynder calculated a Gini coefficient of 0.59, equal to England and Wales in 1801, but slightly higher than in England and Wales in 1759.[56] This difference was probably too small to play an important role.

What about access to international markets? Actually, Britain did not have an advantage over France in the late eighteenth century in its number of potential international customers. In the late 1780s, both countries had access to the full extent of European and world markets: French trade networks reached as many potential consumers as British trade networks. This is very different from the situation after 1793 when France was mostly cut off from intercontinental trade because of British naval supremacy. External trade statistics show that French products were available in the same markets as English products. Trade flows primarily give information on the scale of French and British production centres rather than on the numbers of their potential customers. French exports (including re-exports) in 1787 were £15.5 million and British exports in 1784–1786 were £13.5 million. French exports in industrial goods were £7 million and British industrial exports were £11 million.[57] This £4 million difference was less than 5% of French industrial production.[58] However, it cannot be shown

[55] Murphy, Shleifer, and Vishny, "Income Distribution", Zweimüller, "Impact of Inequality".

[56] Morrisson and Snyder, "Income Inequality of France".

[57] Arnould, *De la balance du commerce*, Davis, *Industrial revolution*, Daudin, *Commerce et prospérité*.

[58] Toutain, "Le produit intérieur brut".

conclusively here that differences in external markets were not crucial for some production centres.

More importantly, perhaps, our comparison between France and Britain is only really valid for high value-to-weight goods. In the case of iron and coal, we verify that French markets were smaller than Britain as a whole. Considering the fact that they were bulky goods, this is not surprising. It would be more interesting to compare them with their actual markets in Britain. In their case, lower transport costs in Britain could have been decisive in giving access to a larger market to British producers, but we do not have enough information to compute their actual British market sizes. And yet, our conclusions are valid for textiles and hardware, two staples of the Industrial Revolution in which innovation played an important role in the late eighteenth century.

The fact that British producers in high-innovation goods had markets that were the same size or smaller than the markets of French producers during the Industrial Revolution obviously does not mean that Britain should not have experienced industrialization first. Rather, it shows that size-innovation relationships do not explain the cross-sectional sequence of the Industrial Revolution in Europe. Market integration in a pre-industrial setting might still be useful in understanding the relatively rapid French growth during the eighteenth century. Adam Smith certainly could not have understood the emergence and form of the Industrial Revolution by describing a French pin factory based on an extreme division of labour rather than innovation or capital. He was still showing an important path to higher productivity.

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