FERTILITY CONVERGENCE THROUGH INTERNAL MIGRATION: FRANCE IN THE 19TH CENTURY*

Guillaume Daudin[a], Raphaël Franck[b], Hillel Rapoport[c]

Very Preliminary – Do Not Quote or Circulate

Abstract

The early decline in French fertility remains a perennial puzzle to economists as France was a relative laggard in urbanization, mortality decline, education and social insurance. We analyze how internal migrations within the 90 French *départements* affected the convergence in fertility rates between 1871 and 1911. We compute migration rates between two departments over time, as opposed to the overall migration rate, and look for the effect of fertility in the resident and birthplace departments on fertility in respectively the birthplace *département* of emigrants and the residence *département* of immigrants. We use bilateral transport costs as an instrumental variable to solve for the endogeneity of migration choices. Our results suggest a role for the transmission of fertility norm in explaining the convergence of fertility rates in France.

Keywords : 19th century France, Demographic transition, internal migrations, diffusion of cultural norms

JEL Codes: J13, N33, O15

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[a] Lille-I (EQUIPPE) - Sciences Po (OFCE)., gdaudin@mac.com

[b] Bar Ilan University, Department of Economics, 52900 Ramat Gan, Israel. Email: raphael.franck@biu.ac.il

[c] Harvard University, Center for International Development, Cambridge MA, USA Email: hillel_rapoport@hks.harvard.edu

1. Introduction

It is still debated whether the decline in fertility rates is linked to a country's shift from a so-called “Malthusian economy” to a modern economy (see, e.g, (Galor 2005a), (Galor 2005b), Guinnane 2011 for a discussion). This is because there is no agreement on the causes of the demographic transition, which first occurred in France in the late 18th century (Weir 1994). In fact, this early decline in French fertility remains a perennial puzzle to economists as France was a relative laggard in urbanisation, mortality decline, education and social insurance (Guinnane 2011). An interesting, but unsubstantiated, explanation is that it might have stemmed from the quick diffusion of the contraceptive techniques criticized by the moralists of the day (Bergues et al. 1960).

If anything, the growth rate of the French economy during the 19th century was smaller than that of England or Germany (Maddison 2001) but the French fertility rate continued to decline. The average Coale Fertility Index (see i*nfra*) of the French *départements*[1] was indeed worth 0.403 in 1811, 0.333 in 1851 and 0.243 in 1911 (Bonneuil 1997). However, there were substantial differences in the fertility rates of the various *départements* in the early 1800s which progressively disappeared during the 19th century. Indeed the standard deviation of the Coale Fertility Index between the French *départements* decreased from 0.106 in 1811 to 0.074 in 1851 and 0.038 in 1911 (Bonneuil 1997; J. Dupâquier 1988).

This paper proffers an explanation for the decline and convergence of the fertility rates in France by taking into account the specific patterns of migrations of the French population during the 19th century. Unlike the inhabitants of other European countries, e.g., Germany, Great Britain, Italy or Sweden, French emigrants did not move to the USA. Instead, most French migration during the 19th century took place within France, whereby French migrants left the countryside to settle in industrial areas.

So far, research on the impact of migration movements in 19th century France has focused on the role of these migrant networks on marriages (see e.g. (Bonneuil, Bringé, and Rosental 2008)) or wealth transmission (see, e.g., (Jérôme Bourdieu et al. 2000)) but has not analyzed the possibility that migration may have contributed to the convergence in fertility rates by conveying cultural norms. It was indeed during the 19th century that France progressively became a fully integrated country from a cultural point of view. Before, a substantial share of the population still did not speak French in regions like Brittany (in the West) or in Provence (in the South) and this

[1] *Départements* are administrative divisions of the French territory created in 1790.

language barrier reflected further cultural and behavioural differences, including in matters of fertility (see (Braudel 1986), vol. 1, pp 88-94) .

This article examines the relationship between migration and fertility norms by focusing on the convergence in fertility rate in France between 1861 and 1911. For this purpose, it relies on data from the French Census to obtain information on fertility and socio-economic variable which it combines with data on bilateral migrations from the "TRA" dataset, also known as the *Enquête des 3000 familles* (Survey of the 3000 Families) that provides information based on parish registers on the place of birth and death of all the individuals whose last names start by the three letters "T", "R" and "A" ((Jacques Dupâquier and Kessler 1992), (Bourdelais 2004), (J. Bourdieu and others 2004), (Jacques Dupâquier 2004)).

As such this study builds on the observation that migration and diaspora networks can reduce information costs and notably facilitate transactions between the migrants' host and home countries through the diffusion of technology and institutions, like democracy (Spilimbergo 2009). It thus provides a different perspective on the link between migration opportunities and the quality/quantity of children trade-off among prospective parents as it appears in the brain-drain literature (see, e.g. (Commander, Kangasniemi, and Winters 2004) for a survey). For instance studies by (Chen 2009) and (Mountford and Rapoport 2011) argue that parents may decide to raise better-educated and fewer children if the skill premium is higher in the potential destinations. In fact, this study is closely related to (Beine, Docquier, and Schiff 2008)'s paper which examines a cross-section of developing and developed countries during the 20th century and suggest that fertility choices in migrant-sending countries are influenced by the transfer of fertility norms prevailing in the host countries.

Our results suggest that the decline in fertility in 19th century France can be traced to the transmission of cultural norms and not to socio-economic variables. Indeed, by controlling for literacy, they notably show that the transmission of cultural norms through migrations mattered more than the potential returns from education. They also suggest that urbanization and industrialization had a very limited effect in lowering fertility. Instead our results show that the decline in fertility in 19th century France can be mainly explained by the emigrants who moved to *départements* of low fertility and who transmitted this new cultural norm to those who remained in their *départements* of origin.

The rest of this article is as follows. Section 2 presents the data. Section 3 presents the empirical strategy. Section 4 gives our results. Section 5 concludes.

2. Data

This section presents our data. Table 1 provides definitions and descriptive statistics for our variables.

Table 1: Descriptive statistics

Variable Name \	Obs.	Mean	Std dev	Min	Max
Dependent variable					
Inhabitants' Residence Norm	405	0.266	0.056	0.158	0.57
Fertily Norms and Share of Emigrants					
Emigrants' Residence Norm	405	0.246	0.032	0.163	0.34
Immigrants' Birthplace Norm	389	0.314	0.041	0.223	0.52
Natives' Residence Norm	405	0.263	0.051	0.164	0.52
Inhabitants' Birthplace Norm	405	0.315	0.068	0.189	0.60
Share of Emigrants	405	1.168	0.084	1.028	1.84
Share of Immigrants	370	0.118	0.070	0.006	0.673
Emigrants' residence norm * Share of emigrants	405	0.807	0.081	0.395	0.97
Immigrants' birthplace norm*Share of immigrants	389	0.875	0.068	0.434	0.99
Emigrants' residence norm, instrumented	405	0.245	0.025	0.162	0.32
Immigrants' birthplace norm, instrumented	405	0.317	0.027	0.221	0.39
Natives' residence norm, instrumented	405	0.263	0.051	0.163	0.52
Immigrants' birthplace norm, instrumented	405	0.315	0.068	0.192	0.59
Share of emigrants, instrumented	405	1.170	0.085	1.028	1.86
Emigrants' residence norm, instrumented*Share of emigrants	405	0.805	0.081	0.397	0.96
Immigrants' birthplace norm, instrumented*Share of immigrants	405	0.877	0.068	0.423	0.99
Education, health and the workforce					
Life Expectancy at Age 30	405	38.37	6.268	30.29	51.87
Infant Mortality (between birth and 5 years, in %)	405	0.203	0.104	0.019	0.49
Urban (i.e. % residents living in municipalities with more than 2,000 inhabitants)	405	0.290	0.166	0.084	1
Industries (% of the working population in the industrial sector)	405	0.196	0.134	0.001	0.68
Professionals (% of professionals (e.g. lawyers, doctors...) in the working population)	405	0.024	0.013	0.001	0.08
Female Education (% 5-19 year old females in school)	405	0.531	0.107	0.137	0.79

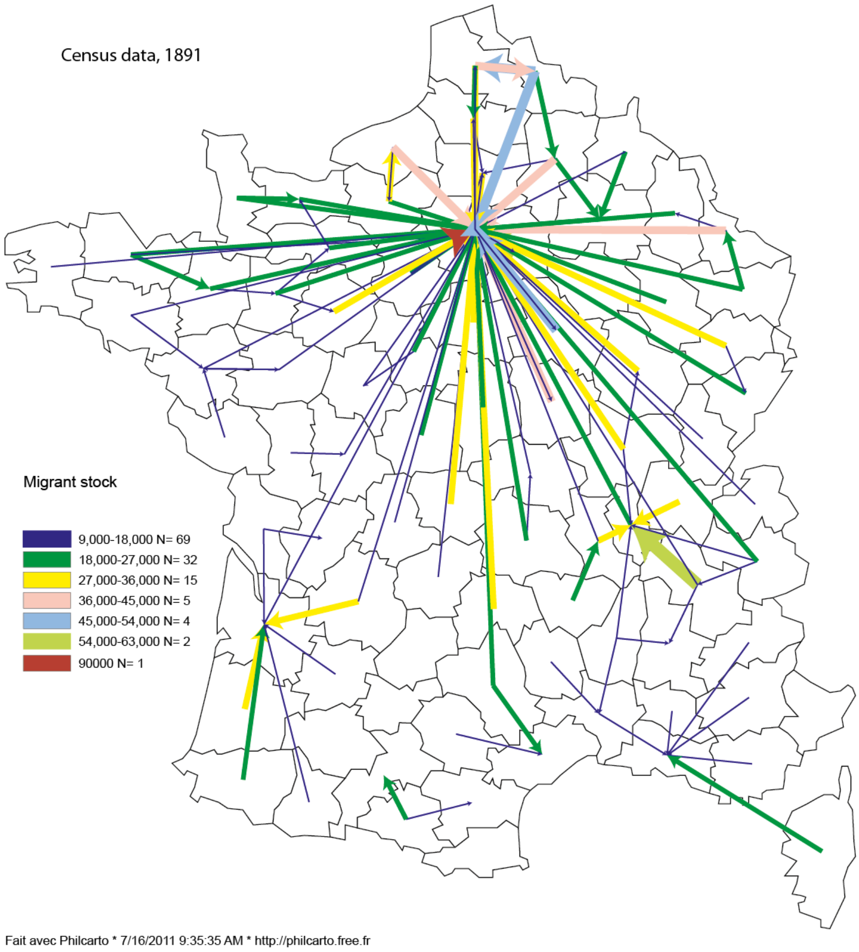
2.1. Migration in 19th century France

The *département* of origin of all the inhabitants in each *département* is provided in the printed returns of the French census of 1891, 1901 and 1911.[2] Figure 1 maps these data in 1891 over the French territory. For the sake of readability, we do not report all the 7,832 observations (=89*88, as there are 89 *départements*) of the migrant stocks but only those which are larger than 10% of the largest stock, i.e., the

[2] See (Béaur and Marin 2011) for a presentation of the French census. The issues of the census can be accessed through the following website: http://acrh.revues.org/index2890.html.

128 stocks larger than 9,000 as the largest stock was formed by the 90,000 inhabitants of the *Seine département* born in the neighbouring *Seine-et-Oise département*). This map shows that the Seine (Paris) is the main destination for internal migrants in France, along with Gironde (Bordeaux) in the South-West, Rhône (Lyon) and Bouches-du-Rhône (Marseilles).

Figure 1: Bilateral migrant stocks, Census data, 1891



To extend our dataset so as include information from 1861 onwards, we use data on bilateral migrations from the “TRA” dataset, also known as the *Enquête des 3000 familles* (Survey of the 3000 Families). By relying on parish registers, the "TRA" dataset provides information on the place of birth and death of all person whose names starts by the three letters "T", "R" and "A" ((Jacques Dupâquier and Kessler 1992), (Bourdelais 2004), (Jacques Dupâquier 2004)).

The geography of internal migration in France can be reconstructed from the "TRA" data, even though they are not necessarily representative of the movements of the French population as a whole at the *département* level (Blanchet and Kessler

1992).[3] This is because the bilateral migration TRA data can be transformed to reflect the total number of emigrants and immigrants at the *département* level.

The first step is to compute the implied bilateral migrant stocks in any given year from the TRA data. For this purpose, we compare the place of birth to the place of death and assume that migration happens at age 20. This is obviously an approximation, but our results are not sensitive to the choice of another age. This provides us with $m_{ij,t}^{TRA}$ which is the number of migrants from *département* i living in département j in each year t (with t=1861, 1872, 1881, 1891, 1901 and 1911) in the TRA dataset.

The second step is to gather the number of domestic immigrants and emigrants from each *département* from the census. These data are published in the 1891, 1901 and 1911 issues of the French census. In the issues of the census published in 1861, 1872 and 1881, the number of immigrants is given as the number of individuals in each *département* who were born in another *département*. We can then compute the number of emigrants using information on birth rates, mortality rates, the number of inhabitants and the number of emigrants published in the next issue of the census.[4] This provides us with $m_{i.,t}^{Census}$ and $m_{.j,t}^{Census}$which are respectively the total number domestic emigrants from each *département* i and immigrants in each *département* j for 1861, 1872 and 1881.

Third, we transform the TRA dataset by applying a marginal standardization algorithm (see (Smith 1976) and (Cox 2006)'s software) so that the distribution of immigrants (respectively, emigrants) in (from) a given *département* from (in) all the other *départements* given by the TRA dataset is kept but the actual numbers are adjusted so that the total number of immigrants (respectively, emigrants) in (respectively from) each *département* is equal to the figures in the census. [5] In other

[3] There is a general debate on the validity of the TRA data at the *département* level. Most studies find that they can be used to assess patterns of migrations, fertility and nuptiality in France (e.g. (Abramitzky, Delavande, and Vasconcelos 2011; Bonneuil, Bringé, and Rosental 2008)

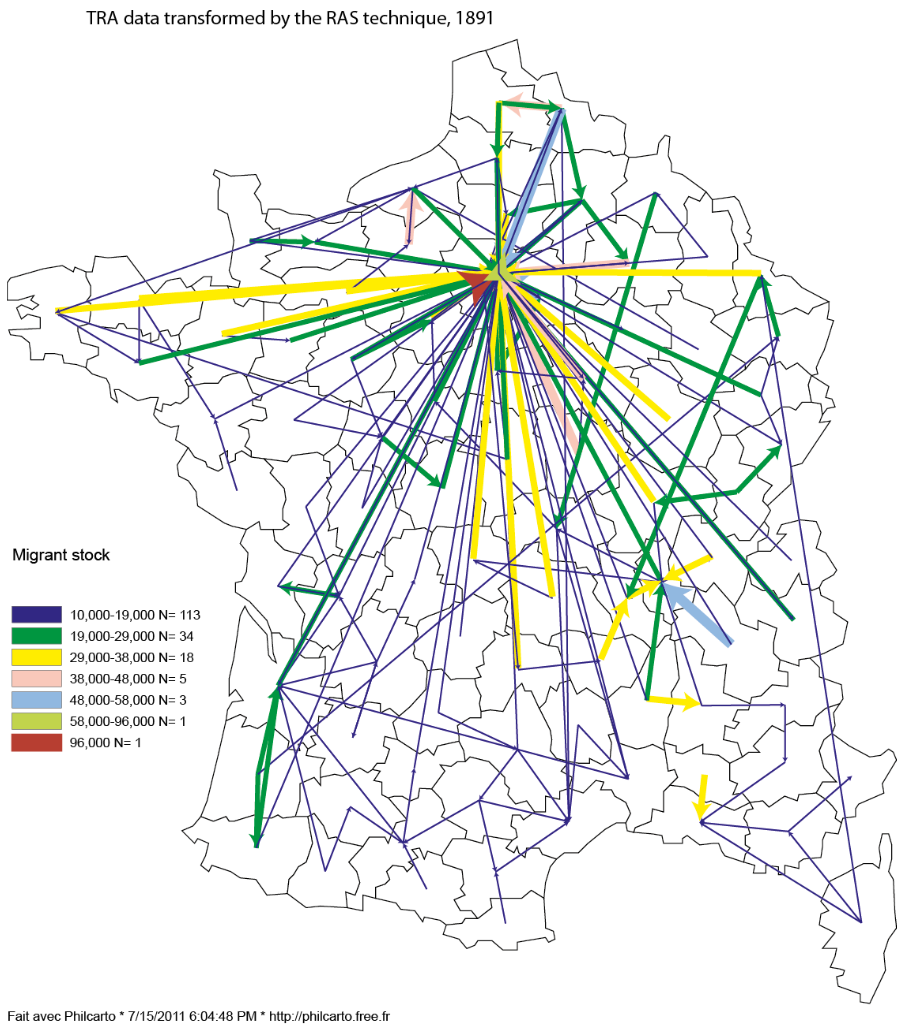
[4] For simplicity we ignore emigration to foreign countries – which was anyway small - and the small number of emigrants from Alsace-Lorraine (which was seized by Germany after 1871) by assuming they were a fixed proportion of emigrants throughout the country.

[5] This procedure is also known as biproportional matrices, iterative proportional fitting, raking or the RAS technique. It is meant to reconcile the bilateral matrix composed of $m_{ij,t}^{TRA}$with its margins composed of $m_{i.,t}^{Census}$ and $m_{.j,t}^{Census}$, or find the $m_{ij,t}^{RAS}$ such as $\sum_i m_{ij,t}^{RAS} = m_{.j,t}^{Census}$ and $\sum_j m_{ij,t}^{RAS} = m_{i.,t}^{Census}$ and $m_{ij,t}^{RAS}$ is "close" to $m_{ij,t}^{TRA}$. The algorithm works by multiplying by a scalar alternatively the lines and the columns of the matrix so that $\sum_i m_{ij,t}^{k^{th}\ iteration} = m_{.j,t}^{Census}$ or $\sum_j m_{ij,t}^{k^{th}\ iteration} =$

words, this procedure keeps the ratio[6] between, for example, the odds of an immigrant in *département* A to be an emigrant from *département* B instead of being from C and the odds of an immigrant in *département* D to be an emigrant from *département* B instead of being from C.

These transformed TRA data are our main measure of bilateral migration for all the years in our sample. For the three years – 1891, 1901 and 1911 – where we can compare them to the actual data from the census, we find that there is a close correspondence between the actual data from the census and the transformed TRA data. This can be seen when we compare Figure 1 to Figure 2, where we map the transformed TRA data for 1891.

Figure 2: Bilateral migrant stocks, TRA data transformed by the RAS technique, 1891



$m_{i.,t}^{Census}$. This goes on till the sums of both the lines and column are nearly equal to the pre-defined margins.

[6] This ratio is called the odds-ratio or cross-product ratio. See (Smith 1976), p. 672-3.

2.2. Fertility rates in France

2.2.1. The Coale Fertility Index

To measure fertility rates in each French *département*, we use (Coale 1969)'s Fertility Index I_f, which is a standardized contribution of the nuptiality pattern to fertility levels. It is based on the fertility levels of the Hutterites, a strict religious group in the North of the USA with a high level of fertility so that a childless population would have a Coale Fertility Index equal to 0 and a population with the fertility rates of the Hutterites would have a Coale Fertility Index equal to 1.

We use data from (Bonneuil 1997)'s study which provides values of the Coale Fertility Index for each department every five years between 1806 to 1906, which we extend for the purpose of this study to 1911 using data from the 1911 French census. It must be noted that the Coale Fertility Index in this study includes the fertility of all women and is as such a modified version of the traditional Coale Fertility Index which is usually only restricted to the fertility of married women.

The Coale Fertility Index I_f is thus computed as follows

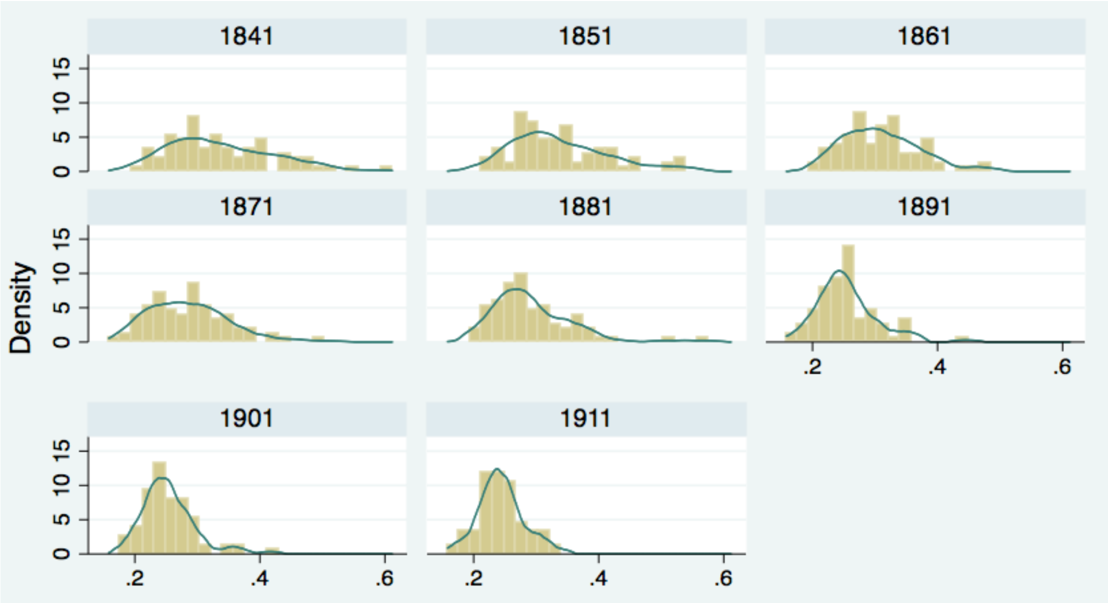
$$I_f = \frac{\sum_{i=1}^{I} F_i^L . W_i^L}{\sum_{i=1}^{I} H_i . W_i^L} . \frac{\sum_{i=1}^{I} H_i . W_i^L}{\sum_{i=1}^{I} H_i . W_i} = I_g . I_m$$

where W_i is the age distribution of the female population, W_i^L is the number of women in age group i, F_i^L is the rate of childbearing among women in the ith age interval, H_i represents the fertility rates observed for the Hutterites, I_g is the index of fertility, i.e., the ratio of the number of births to the number that would occur if all women had Hutterite fertility and I_m is the index which indicates the impact of the nuptiality pattern.

As an illustration, we provide in Figure 3 a histogram of the distribution of the logarithm of the Coale Fertility Index between 1841 and 1911. It shows that during this period, the average fertility rate in France decreased as can be seen by a shift to the left of the mode, the mean and the median of the distribution. But more importantly, Figure 3 shows that the standard deviation of the distribution progressively declined: there was a convergence of the fertility levels between the French *départements* throughout the period[7].

[7] This convergence is not explained by a general decline of fertility bounded by 0 and can still be observed when the logarithm of the fertility rate is considered.

Figure 3: Fertility distribution among *départements*, 1841-1911.



2.2.2. Has geography anything to do with it?

To explain the causes of the convergence in fertility across the French départements, we start our empirical analysis by checking if geography can explain part of the convergence. For that, we run a couple of regressions using spatial econometrics models with spatially lagged dependent variable, spatial and time period fixed effects. They are meant to assess whether the decline in fertility rates can be explained by geographic proximity or not. For this purpose, we use two measures of distance which are reported in Columns 1 and 2 of Table 2. In Column 1, we assess whether the convergence in the fertility rates is driven by geographic proximity since our distance is based on the inverse of the "great circle" which measures the Euclidean, i.e., “crow-fly”, distance between the main administrative town (*chef-lieu*) of each *département* while we test in Column 2 whether this convergence can be explained by the proximity induced by the development of the railways and the ensuing decline in transport costs.

Table 2: Spatial auto-regression (spatially lagged dependent variable)

	(1) Inverse of the Great Circle	(2) Inverse of the Transport Cost
	Dependent variable is log(Inhabitants' Residence Norm)(t)	
log(Infant Mortality) (t)	0.077	0.075
	[0.013]***	[0.013]***
log(Life Expectancy at Age 30) (t)	-0.333	-0.331
	[0.035]***	[0.034]***
log(Urban) (t)	-0.093	-0.092
	[0.015]***	[0.015]***
log(Industries) (t)	0.023	0.023
	[0.006]***	[0.006]***
log(Professionals)(t)	0.018	0.018
	[0.009]*	[0.009]*
W*log(Fertility)	0.206	0.092
	[0.166]	[0.047]**
R^2	0.4736	0.4768
Adjusted R^2	0.3723	0.3761
Observations	602	602

Note: *** indicates significance at the 1%-level, ** indicates significance at the 5%-level, * indicates significance at the 10%-leve.l

The results in Table 2 suggest that the spatial effect only exists in the regression reported in Column 2, i.e., when the geographic proximity is measured through the inverse of transport costs. This suggests that the convergence in fertility rates seems to be explained by a transport-cost sensitive phenomenon rather than a distance-sensitive phenomenon.

2.2.3. Fertility rates of Emigrants, Immigrants and Natives

While our dependent variable assesses the fertility of all the inhabitants of a *département* at a given date, our explanatory variables are designed to account for the two potential channels of the cultural transmission of fertility norms through migration.

First, emigrants may influence the fertility of their native *département* because of the information which they transmit to the inhabitants of their native *département*. Second, immigrants may have an effect on the fertility of the *département* where they reside because they keep the fertility norm of their *département* and affect the fertility behaviour of the native inhabitants of the *département*.

These two potential channels may be tested in two different ways, thus yielding four potential explanatory variables. On the one hand, it could be that the residence (respectively birthplace) fertility norm of emigrants (immigrants) has an effect which is different from the residence or birthplace fertility norms of the other inhabitants of the *département*. In that case, we would expect that this effect is larger if the share of emigrants or immigrants is larger, and we would interact the fertility norm with this share. On the other hand, it could be that their effect is of the same nature as the norm of the other inhabitants. If so, the relevant explanatory variable is the average of residence (respectively, birthplace) fertility norm of emigrants (immigrants) with the fertility norm of other natives (inhabitants) of the *département* weighted by the respective share of emigrants (immigrants) and natives (inhabitants).

Table 3 summarizes the potential effects of these four explanatory variables. For simplicity we also report the explained variable in this table and provide formal definitions for all the variables.

Table 3: Fertility norm variables

	Residence	**Birthplace**
Inhabitants	Explained variable $Inhabitants'\ residence\ norm_{i}$ $f_{i,t}$= Fertility rate in *départment i* at time *t*	$Inhabitants'\ birthplace\ norm$ $= \frac{\sum_j m_{ji,t} \cdot f_{j,t}}{\sum_j m_{ji,t}} = HBN_{i,t}$
Natives	$Natives'\ residence\ norm_{i,t}$ $= \frac{\sum_j m_{ij,t} \cdot f_{j,t}}{\sum_j m_{ij,t}} = NRN_{i,t}$	
Emigrants	$Emigrants'\ residence\ norm_{i,t}$ $= \frac{\sum_{j \neq i} m_{ij,t} \cdot f_{j,t}}{\sum_{j \neq i} m_{ij,t}} = ERN_{i,t}$	
Immigrants		$Immigrants'\ birthplace\ norm$ $= \frac{\sum_{j \neq i} m_{ji,t} \cdot f_{j,t}}{\sum_{j \neq i} m_{ji,t}} = IBN_{i,t}$

Note: we use the following notations

$p_{i,t}$ Population of *départment i* at time *t*

$m_{ij,t}$ Stock of migrants born in *départment i* living in *départment j* at time *t*

2.3. Education, health and the workforce

Our empirical analysis takes into account the socio-economic factors, such as higher levels of educational achievement among women, improvements in healthcare, industrialization and urbanization, which might have contributed to the convergence of fertility rates in France between 1851 and 1911.

For this purpose, we rely on (Bonneuil 1997)'s computations of life expectancy at age 30 for the individuals living in each *département* during the 1851-1901 period which we extend to 1911 by relying on the data from the French Census. We also rely on the successive issues of the French Census to compute a measure of infant mortality, which assesses the share of children who died before age 1 in each *département*, and a measure of education, which assesses the share of female population age 5 to 19 who attended primary or secondary schools.

Moreover we use the successive issues of the French census to compute measures of economic development. These include a measure of urbanization, which assesses the share of individuals living in urban municipalities in each *département*, and measures of the share of the workforce working in the industrial sector and in the service sector that is made of professionals, e.g., lawyers, doctors, in each *département*.

3. Empirical methodoloy

3.1. Baseline model

The baseline model estimates the log-linear relation between the fertility of the inhabitants of a *département* and the fertility norms of immigrants and emigrants, controlled by socio-economic variables. It accounts for the fertility norms of the emigrants' residence and of the immigrants' birthplace and includes interaction terms between the fertility norms and the shares of emigrants and immigrants as it is possible that the effect of fertility norm of emigrants and immigrants is larger if they are more numerous. Once this interaction variable is introduced, the shares of emigrants and immigrants must also be included in the regression so as to compute the marginal effects of the emigrants' residence fertility norm and of the immigrants' birthplace fertility norm

$$\log\left(f_{i,t}\right) = a_0 \log\left(f_{i,t-1}\right) + a_1.\log\left(ERN_{i,t}\right) + a_2.\log\left(ERN_{i,t-1}\right) + a_3.\log\left(IBN_{i,t}\right) + a_4.\log\left(IBN_{i,t-1}\right) + a_5.\left(\frac{\sum_{i\neq j} m_{ji,t}}{\sum_i m_{ji,t}}\right) + a_6.\left(\frac{\sum_{i\neq j} m_{ji,t-1}}{\sum_i m_{ji,t-1}}\right) + a_7.\left(\frac{\sum_{i\neq j} m_{ji,t}}{\sum_i m_{ji,t}}\right).\log\left(ERN_{i,t}\right) + a_8.\left(\frac{\sum_{i\neq j} m_{ji,t-1}}{\sum_i m_{ji,t-1}}\right).\log\left(ERN_{i,t-1}\right) + a_9\left(\frac{\sum_{j\neq i} m_{ji,t}}{\sum_j m_{ji,t}}\right) + a_{10}.\left(\frac{\sum_{j\neq i} m_{ji,t}}{\sum_j m_{ji,t}}\right).\log\left(IBN_{i,t}\right) + a_{11}.\left(\frac{\sum_{j\neq i} m_{ji,t-1}}{\sum_j m_{ji,t-1}}\right).\log\left(IBN_{i,t-1}\right) + b_1.Socioeconomic\ variables_{i,t} + b_2.Socioeconomic\ variables_{i,t-1} + département\ and\ time\ fixed\ effects + \varepsilon \quad (1)$$

with $f_{i,t}$ the inhabitants' residence norm, i.e., the fertility rate in *département i* in year *t*, $ERN_{i,t}$, the emigrants' birthplace norm, $IBN_{i,t}$, the immigrants' birthplace norm.

$\frac{\sum_{i \neq j} m_{ji,t}}{\sum_i m_{ji,t}}$ the share of emigrants among natives of *département* j and $\frac{\sum_{j \neq i} m_{ji,t}}{\sum_j m_{ji,t}}$ the share of immigrants among inhabitants of *département* i.

Equation (1) includes both the lagged dependent and independent variables. This is because we cannot know a priori whether the migrants' fertility norms and the socio-economic variables have an immediate and/or a delayed effect on the fertility of each *département*.

As a robustness check, we use an alternative specification to Equation (1) which relies on the natives' residence fertility norm and the inhabitants' birthplace fertility norm instead of the emigrants' and immigrants' birthplace. Because of the construction of the natives' residence fertility norm and the inhabitants' birthplace fertility norm variables, this alternative specification assumes that emigrants (immigrants) have the same influence on fertility as other natives (inhabitants). In such a specification, the interaction variables are not needed since the shares of emigrants and immigrants are already taken into account in the computation of the fertility norms.

$$\log(f_{i,t}) = a_0 \log(f_{i,t-1}) + a_1.\log(NRN_{i,t}) + a_2.\log(NRN_{i,t-1}) + a_3.\log(HBN_{i,t}) + a_4.\log(HBN_{i,t-1}) + b_1.Socioeconomic\ variables_{i,t} + b_2.Socioeconomic\ variables_{i,t-1} + département\ and\ time\ fixed\ effects + \varepsilon \quad (2)$$

with $HBN_{i,t}$ the inhabitants' birthplace norm and $NRN_{i,t}$ the natives' residence norm.

At this stage, a few remarks on the specification of the above regressions are in order. Our approach exploits census data at a regional level and is therefore very much reminiscent of Princeton Project on the Decline of Fertility in Europe undertaken from the 1960s and 1970s by Ansley Coale (see http://www.opr.princeton.edu/archive/pefp/, (Coale and Watkins 1986)). However its conclusions, which downplayed the role of socio-economic variables in the European fertility decline, have been criticized by economists, e.g., by the recent studies of ((Brown and Guinnane 2007) and (Guinnane 2011)). Our approach takes these criticisms into account in our econometric specification.

First, our empirical analysis relies on aggregated data. This approach may reduce the efficiency of the estimator because "grouping observations discards information" (Brown and Guinnane 2007), p. 581)) if the underlying disaggregated data are heterogenous. However this strategy does not bias the estimator. Thus, when analyzing our results, we pay attention not only to the statistical significance of our explanatory variables, which mostly remain significant as we show below, but also the size of the coefficients.

Second our model estimates fertility change by estimating a balanced panel using time- and *département*- fixed effects which corrects for unobserved heterogeneity between *départements*.[8] Taking these fixed effects as given, we could either use a model in differences or in level. It is indeed unclear whether changes (respectively, levels) in fertility have a log-linear relation with changes in (the level of) the explanatory variables (see (Brown and Guinnane 2007) for a discussion). Since we do not want to constrain the model a priori, we rely on the functional form in Equations (1) and (2). If the actual model is in difference, then we should find in Equation (1) that a_0=0, a_1=-a_2 and a_3=-a_4, where a_0 is the coefficient associated with the lagged dependent variable, a_1 and a_2 are the coefficients associated with the Emigrants' Residence Norm at time t and t-1, while a_3 and a4 are the coefficients associated with the Immigrants' Birthplace Norm. Similarly, if the model is in difference, then we should find in Equation (2) that a_0=0, a_1=-a_2 and a_3=-a_4, where a_0 is the coefficient associated with the lagged dependent variable, a_1 and a_2 are the coefficients associated with the Natives' Residence Norm at time periods t and t-1, while a_3 and a_4 are the coefficients associated with the Inhabitants' Birthplace Norm.

3.2. Endogeneity issues

Equations (1) and (2) can be estimated with OLS, which rests on the assumption that all covariates are independent of the error term. However, endogeneity might be an issue because migration can be influenced by cultural proximity as measured by fertility norms. In that case, the emigrants' residence fertility norm will be linked to the explained variable in a way unrelated to cultural diffusion.

We solve for endogeneity using transport costs as instrumental variables. In this respect, it must be noted that transport costs are time-varying, because the railroad network and the passenger price ratio between the railroad and the road evolve throughout the century. In the case of France between 1851 and 1911, it is unlikely that transports costs were linked to other factors of cultural diffusion, such as newspaper and books.[9] These were high value-to-weight goods: their diffusion should not have been influenced by the railroads. If anything, it seems that the French

[8] (Brown and Guinnane 2007), p. 588) recommend that approach and note that it was not usually used by studies from the Princeton Project

[9] On the diffusion of newspapers and in particular, on the importance of regional newspapers outside Paris, see, e.g., (Manevy 1955), (Bellanger 1969) and (Albert 1972).

railroad network was developed independently of cultural diffusion and migration. Indeed from the 1840s onwards, the French state influenced the design of the railroad network in order to connect Paris to the main economic centres of the country. This design, which originally comprised 7 lines, was named *L'Etoile de Legrand* (Legrand's star) after the name of the then under-secretary of public works (Caron 1997).

In order to compute the predicted migration stocks, we first assess the transport costs between each of the 89 *départements* through a three-stage procedure. First, we use (Caron 1997)'s rail network map to determine the available transportation links between adjacent *départements*. Second, we compute the great-circle distance between the administrative centres of these adjacent *départements*. Since rail prices were regulated by the State (see (Toutain 1967), p. 277) so that there was a constant road or rail price per kilometer throughout France, this strategy provides the transport cost between adjacent *départements*. Third, we apply a short-route finding algorithm taken from a network analysis program (UCINET) to compute the cheapest route and hence the transport costs between each of the 89 *départements* ((Borgatti, Everett, and Freeman 2006)).

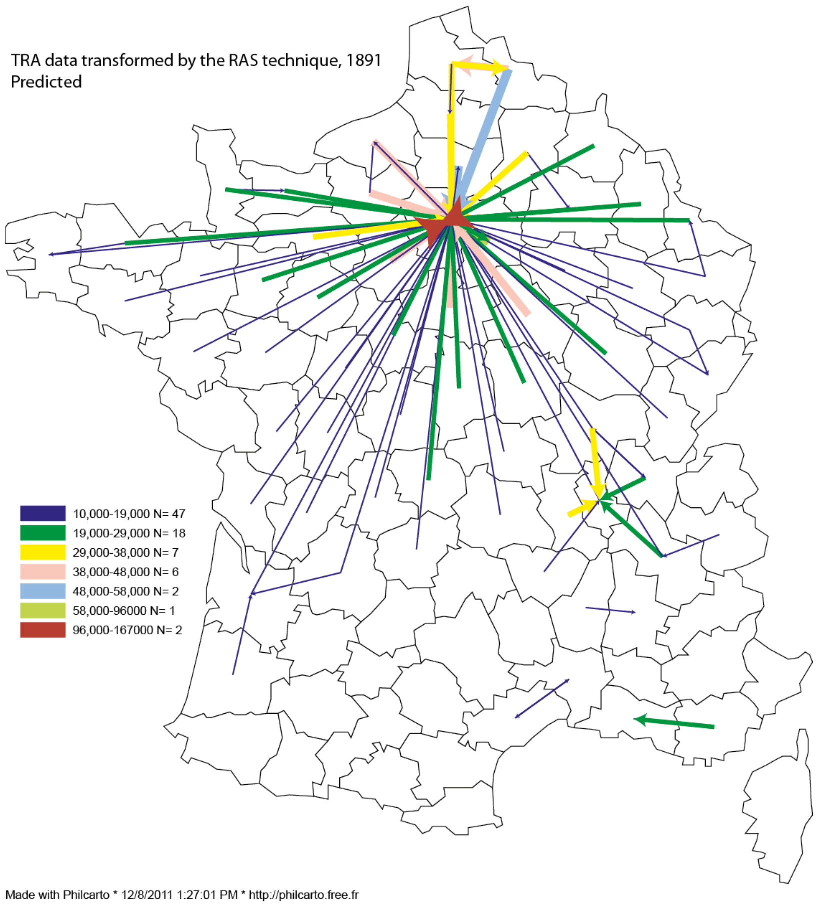
We then use lagged transport costs and départements fixed effects to estimate a cross section theoretical gravity model for each year.

$$\log(m_{ij,t}) = a + b.\log(transport\ costs) \\ + \text{departure and arrival } \textit{départements} \text{ fixed effect} + \ \varepsilon$$

This is estimated according to the standard Poisson Pseudo Maximum Likelihood to solve for the existence of zero migrant stocks and heteroskedasticity. (Silva and Tenreyro 2006). This approach yields predicted migration stocks whose descriptive statistics are presented in Table 1. In Figure 4, we provide a graph of these predicted bilateral migrants stocks in 1891, which closely match the migrants stocks that were mapped in Figure 2 and Figure 3.[10]

[10] Our method to overcome endogeneity follows (Spilimbergo 2007)'s approach to estimate the diffusion of cultural norms. This procedure does not however exactly correspond to the standard two stages least square regression, as the instrumental variable, i.e., the predicted migration stocks, is computed over *n x (n-1)* observations, instead of *n* like the variable of interest.

Figure 4: Predicted bilateral migrant stocks, TRA data transformed by the RAS technique, 1891



4. Results

Table 4 contains the regression results of the first-stage regressions for the predicted migrant stocks, which we will use as our IV to check the robustness of Equations (1) and (2). As could be expected, these 'first-stage' regression results suggest that migrant stocks decline with increasing transport costs.

Table 4: Predicted migrant stocks

Year	1861	1872	1881	1891	1901	1911
Log(transport costs)	-1.5*** (0.0008)	-1.4*** (0.0007)	-1.5*** (0.0006)	-1.5*** (0.0006)	-1.6*** (0.0006)	-1.6*** (0.0005)
Origin-*département* & destination-*département* fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo R2	0.69	0.62	0.62	0.59	0.59	0.57
Number of observations	6970	7055	7055	7055	6885	6715

Note: These first-stage regressions of the IV regressions reported in Columns 3 and 4 of Table 5 predict the number of migrant stocks. The number of observations is the number of migrant stocks included in each regression. *** indicates significance at the 1%-level, ** indicates significance at the 5%-level, * indicates significance at the 10%-leve.l

We then explore the impact of migrants on the convergence of the fertility rates in the French departments in Table 5 by including our measures on the fertility levels of emigrants, immigrants and natives. In Columns 1 and 3 of Table 5, we estimate Equation (1) while we estimate Equation (2) in Columns 2 and 4. In Columns (1) and (2), we report the OLS regression results while we report the IV regression results in Columns (3) and (4). We note, following our discussion in Section 3.1, that the regression results in Table 5 suggest that the relationship between the fertility rate and the explanatory variables is in level.

Furthermore, we present supplementary results in additional tables. Table 6 reports the marginal probabilities of the main explanatory variables, i.e., the fertility norms and the share of migrants, in Table 5. In Table 7 and Table 8, we report tests of linear restrictions which assess whether each variable and its lagged values have an overall effect which is significantly different from 0. This is because we seek to determine whether the variables have an overall effect, which may be interpreted as their long-term impact, on the decline and convergence in the fertility rate. This leads us to report in Table 7 and Table 8 the results of a t-test rather than a F-test for each variable and its lagged value. Of course, both tests are equivalent but the t-test allows for an easier interpretation of the results since it directly provides the positive or negative sign of the overall effect in addition to its level of statistical significance.

Table 5: Determinants of the Fertility Decline in France, 1871-1911.

	(1)	(2)	(3)	(4)
	OLS	OLS	IV	IV
	Dependent variable is log(Inhabitants' residence norm) (t)			
log(Inhabitants' residence norm) (t)	0.0101	0.196	0.0139	0.0215
	[0.0699]	[0.142]	[0.0715]	[0.135]
log(Emigrants' residence norm) (t)	0.422***		0.913***	
	[0.120]		[0.214]	
log(Emigrants' residence norm) (t-1)	0.111		0.273	
	[0.142]		[0.203]	
log(Immigrants' birthplace norm) (t)	-0.108		0.127	
	[0.114]		[0.168]	
log(Immigrants' birthplace norm) (t-1)	-0.116		-0.268	
	[0.101]		[0.201]	
log(Emigrants' residence norm) (t) * (Share of Emigrants)(t)	-1.482**		-2.402**	
	[0.715]		[1.129]	
log(Emigrants' residence norm) (t-1) * (Share of Emigrants)(t-1)	-0.747		-1.672*	
	[0.955]		[0.983]	
log(Immigrants' birthplace norm) (t) * (Share of Immigrants)(t)	1.381		0.806	
	[0.877]		[0.651]	
log(Immigrants' birthplace norm) (t-1) * (Share of Immigrants)(t-1)	1.637		2.789***	
	[1.290]		[0.674]	
Share of Emigrants (t)	-2.464**	0.0541	-3.718**	0.0763
	[1.068]	[0.0573]	[1.642]	[0.0542]
(Share of Emigrants) (t-1)	-0.680	-0.00144	-2.189	0.0383
	[1.393]	[0.0544]	[1.447]	[0.0434]
Share of Immigrants (t)	2.137*	-0.134	1.343	-0.148
	[1.180]	[0.0985]	[0.832]	[0.111]
(Share of Immigrants) (t-1)	1.649	0.00375	3.409***	-0.0113
	[1.541]	[0.0572]	[0.904]	[0.0361]
log(Natives' Residence Norm) (t)		1.101***		1.100***
		[0.0166]		[0.0125]
log(Natives' Residence Norm) (t-1)		-0.232		-0.0227
		[0.154]		[0.143]
log(Inhabitants' Birthplace Norm) (t)		0.000466		0.00868
		[0.00957]		[0.00838]
log(Inhabitants' Birthplace Norm) (t-1)		0.00103		-0.000174
		[0.0122]		[0.0107]
log(Female Education) (t)	-0.0470	0.0130	-0.0362	0.0152**
	[0.0506]	[0.00957]	[0.0401]	[0.00698]
log(Female Education) (t-1)	0.00322	0.00394	0.00947	-0.0110**
	[0.0338]	[0.00746]	[0.0265]	[0.00467]
Infant Mortality (t)	0.0663*	2.16e-05	0.0884***	0.00805
	[0.0368]	[0.00884]	[0.0299]	[0.00643]
Infant Mortality (t-1)	0.0961	0.0149	-0.00676	0.0135*
	[0.0970]	[0.00950]	[0.0660]	[0.00759]
Life Expectancy at Ae 30 (t)	-1.529***	-0.0246	-1.426***	0.0638
	[0.302]	[0.0452]	[0.254]	[0.0414]
Life Expectancy at Age 30 (t-1)	0.112	0.0387	-0.372	0.0717*
	[0.521]	[0.0559]	[0.377]	[0.0397]
log(Industries) (t)	-0.0161**	0.00373*	-0.00653	0.00212
	[0.00745]	[0.00205]	[0.00767]	[0.00196]
log (Industries) (t-1)	-0.0260**	0.000522	-0.0158*	-0.000759
	[0.0120]	[0.00164]	[0.00927]	[0.00122]
log(Professionals) (t)	-0.0155	-0.00163	-0.00919	-0.000952
	[0.0193]	[0.00221]	[0.0141]	[0.00167]
log(Professionals) (t-1)	-0.0142	-0.00345	-0.0117	-0.00223
	[0.0150]	[0.00234]	[0.0125]	[0.00161]
log(Urban) (t)	0.139*	0.0140*	0.138*	0.0101
	[0.0786]	[0.00831]	[0.0753]	[0.00668]
log(Urban) (t-1)	-0.0318	-0.00964	-0.0451	-0.00544
	[0.0387]	[0.00763]	[0.0396]	[0.00690]
Constant	4.294**	0.0801	6.578***	-0.308
	[1.986]	[0.221]	[1.650]	[0.207]
Within R2	0.733	0.989	0.781	0.993
Adjusted R2	0.710	0.989	0.764	0.992
F-stat	92.20	1973.32	84.56	6263.01
Prob>F-stat	0.000	0.000	0.000	0.000
Départements fixed effects	Yes	Yes	Yes	Yes
Number of clusters	74	74	81	81
Observations	370	370	405	405

Note: Robust standard errors clustered at the departement-level in brackets *** indicates significance at the 1%-level, ** indicates significance at the 5%-level, * indicates significance at the 10%-level.

Table 6: Marginal effects of Fertility Norms and Shares of Migrants (from Table 5)

	Marginal effects in OLS regression (Column 1-Table 5)	**Marginal effects in IV regression (Column 3-Table 5)**
log[Emigrants' residence norm] [t]	0.202***	0.557***
	[0.0698]	[0.119]
log[Emigrants' residence norm] [t-1]	0.0162	0.0603
	[0.109]	[0.172]
Share of Emigrants [t]	-0.366**	-0.326**
	[0.171]	[0.132]
Share of Emigrants [t-1]	0.317	-0.0176
	[0.193]	[0.215]
log(Immigrants' birthplace norm) [t]	0.0542	0.216*
	[0.0738]	[0.125]
log(Immigrants' birthplace norm) [t-1]	0.0565	0.0110
	[0.0862]	[0.155]
Share of Immigrants [t]	0.522*	-1.871
	[0.295]	[1.275]
Share of Immigrants [t-1]	-0.182	-0.214
	[0.266]	[0.191]

Note: Standard errors in brackets. *** indicates significance at the 1%-level, ** indicates significance at the 5%-level, * indicates significance at the 10%-level.

Table 7 Determinants of the Fertility Decline in France: Tests of linear restrictions (from Table 5)

	Linear tests of hypotheses			
	(1)	(2)	(3)	(4)
	OLS	OLS	IV	IV
H0: log(Emigrants' residence norm) (t) * (Share of Emigrants)(t) + log(Emigrants' residence norm) (t-1) * (Share of Emigrants)(t-1)=0	-2.230**		-4.804**	
	[0.935]		[2.259]	
H0: log(Immigrants' birthplace norm) (t) * (Share of Immigrants)(t) +log(Immigrants' birthplace norm) (t-1) * (Share of Immigrants)(t-1)=0	3.018**		3.595***	
	[1.155]		[0.747]	
H0: log(Natives' residence norm) (t) +log(Natives' residence norm) (t-1)=0		0.869***		1.077***
		[0.163]		[0.149]
H0: log(Inhabitants' birthplace norm) (t) +log(Inhabitants' birthplace norm) (t-1)=0		0.00150		0.0085
		[0.0115]		[0.0104]
H0: log(Female Education) (t) +log(Female Education) (t-1)=0	-0.0438	0.0169**	-0.0267	0.0042
	[0.0419]	[0.00740]	[0.0317]	[0.00551]
H0: Infant Mortality (t) +Infant Mortality (t-1)=0	0.1620	0.0150	0.0816	0.0215*
	[0.101]	[0.0108]	[0.0746]	[0.0113]
H0: Life Expectancy at Ae 30 (t) +Life Expectancy at Age 30 (t-1)=0	-1.417**	0.0141	-1.799***	0.135**
	[0.580]	[0.0649]	[0.450]	[0.0619]
H0: log(Industries) (t) +log (Industries) (t-1)=0	-0.0422**	0.00425	-0.0223	0.00136
	[0.0162]	[0.00314]	[0.0145]	[0.00257]
H0: log(Professionals) (t) +log(Professionals) (t-1)=0	-0.0297	-0.0051	-0.0208	-0.0032
	[0.0271]	[0.00379]	[0.0226]	[0.00258]
H0: log(Urban) (t) +log(Urban) (t-1)=0	0.107	0.0044	0.0924	0.0047
	[0.0828]	[0.0126]	[0.0816]	[0.00918]

Note: Standard errors in brackets. *** indicates significance at the 1%-level, ** indicates significance at the 5%-level, * indicates significance at the 10%-level.

Table 8 Long-term effects of Fertility Norms & shares of Migrants: Tests of linear restrictions (from Table 6)

	Linear tests of hypotheses	
	Marginal effects in OLS regression	Marginal effects in IV regression
	(Column 1-Table 5)	(Column 3-Table 5)
H0: log(Emigrants' residence norm) (t) +log(Emigrants' residence Norm) (t-1)=0	0.218**	0.617***
	[0.102]	[0.216]
H0: Share of emigrants (t) + Share of emigrants (t-1)=0	-0.0494	-0.344*
	[0.182]	[0.199]
H0: log(Immigrants' birthplace norm) (t) + log(Immigrants' birthplace norm) (t-1)=0	0.111	0.242
	[0.0972]	[0.207]
H0: Share of immigrants (t) + Share of immigrants (t-1)=0	0.341	-2.086
	[0.511]	[1.364]

Note: Standard errors in brackets. *** indicates significance at the 1%-level, ** indicates significance at the 5%-level, * indicates significance at the 10%-level.

The results in Table 5 to Table 8 suggest that socio-economic factors have little or no statistical and economic effect on the convergence of fertility rates in France. While we find in some regressions, as could be expected, that lower infant mortality, and industrialization decreased fertility, the results are not robust enough for us to argue that these sole factors could explain in the long-run the decline in fertility rates. If anything, one of our tests (in Column 2 of Table 7) suggests the counter-intuitive result that a higher rate of female education has a positive and significant, albeit small, effect on the levels of fertility but this finding is also found to be not robust in the other specifications.

In fact, life expectancy is the only socio-economic variable in our results with a large, significant but positive effect on fertility: this result cannot thus explain the convergence in fertility rate. While it has been argued that increased life expectancy may boost fertility rates by increasing the need for old-age insurance, we find that this was not the case in 19th century France. This finding is actually in line with studies which argue that increased life expectancy may make human capital more productive over a longer time period, thus leading individuals to delay their decision to have children and to have fewer children in whom they invest more human capital.

In addition, the results in Table 5 to Table 8 suggest that the convergence in fertility rates can be explained by the transmission of cultural norms via the emigrants' and immigrants' fertility norm. We notably find in Table 8 that the Emigrants' Fertility

Norm has, as expected, an overall positive effect on fertility rate. In other words, the higher the number of emigrants in a *département* with a high fertility rate is, the higher the increase in the fertility rate in their *département* of origin. However the tests in columns 1 and 3 of Table 7 suggest that (Emigrants' Fertility Norm) * (Share of Emigrants), i.e., the interaction variable between the fertility norm of emigrants and the share of emigrants, has a negative effect on the fertility rate in the emigrants' *département* of origin. This result suggests that there is a selection effect, such that in a given *département*, emigrants with low fertility rates are more likely to move to *départements* with low fertility rates while those who remain behind are more likely to have a high number of children, thereby increasing the fertility rate of the emigrants' *département* of origin. Finally Table 8 shows that the share of emigrants has no overall effect but Table 6 indicates that it may a short-term negative effect: these two potentially conflicting observations may simply reflect the fact that a high share of emigrants may delay nuptiality in the *département* of origin.

Furthermore the results in Table 8 suggest that, separately, the share of immigrants and the immigrants' fertility norm do not have any effect on fertility rates. However the tests in Columns 1 and 3 of Table 7 indicate that the interaction variable between the share of immigrants and the immigrants' fertility norm has a positive and large effect on fertility, thus suggesting that the immigrants' fertility norm has an impact only conditional on the number of migrants. This may be because the impact of immigrants is only felt when they are sufficiently numerous to form a sizeable diaspora network in their *département* of destination.

Our results that the convergence in fertility rates in France can mainly be traced to the transmission of cultural norms is corroborated by the histograms of the Inhabitants' Residence Norm variable in Figure 5 to Figure 8. In Figure 5 and Figure 6, we graph the predicted values of the Inhabitants' Residence Norm variable in the OLS and IV regressions reported in Columns 1 and 3 of Table 5, while in

Figure 7 and Figure 8, we graph their counterfactual values in both of these regressions under the assumption that there had been no transmission of the fertility norms through migrations in France during the period, i.e., by setting all of the values of the Emigrants' Residence Norm, Immigrants' Birthplace norm, (Immigrants' Birthplace Norm)*(Share of Immigrants) and Emigrants' Fertility Norm) * (Share of Emigrants) variables at time t and t-1 to zero. It must be noted that we can only compute the counterfactual values of the Inhabitants' Residence Norm variable over the 1871-1911 period because of the lagged values of the variables in the regressions.

In both Figure 5 and Figure 6, the level of fertility predicted by regressions 1 and 3 of Table 3 is shown to diminish but also, and most importantly to progressively converge, just like in Figure 1. Conversely,

Figure 7 and Figure 8 show that there is no change in the mean and standard deviation of the counterfactual fertility levels. This suggests that the convergence in the fertility rates in France is mainly due to the emigrants who pass on the fertility norms of their destination *département* back to those who stayed in their *département* of origin.

Figure 5: Estimated fertility convergence - OLS, 1871-1911

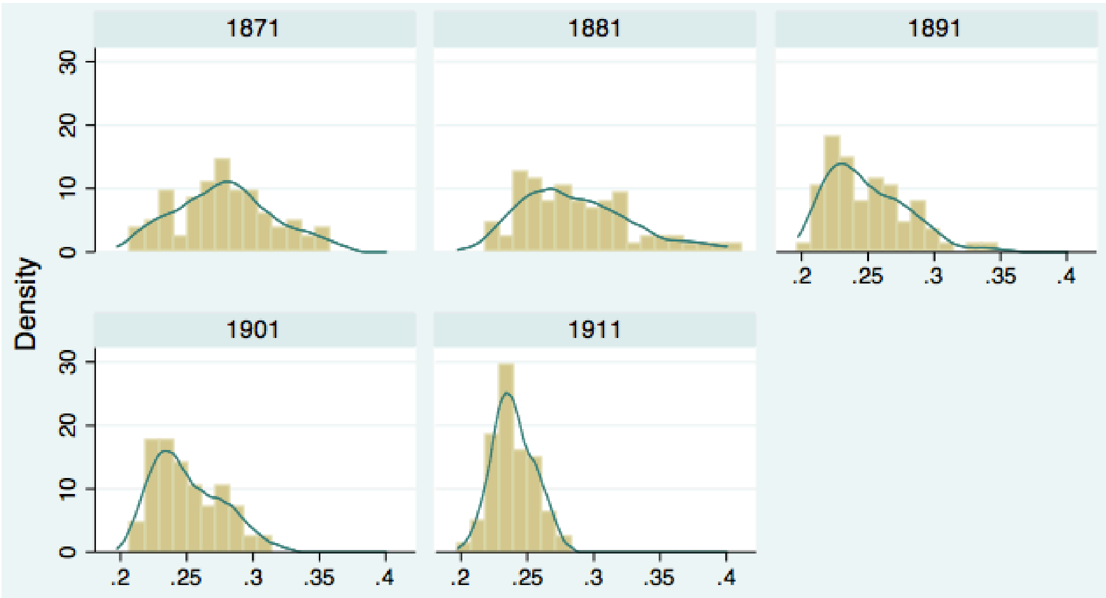


Figure 6: Estimated fertility convergence – IV, 1871-1911

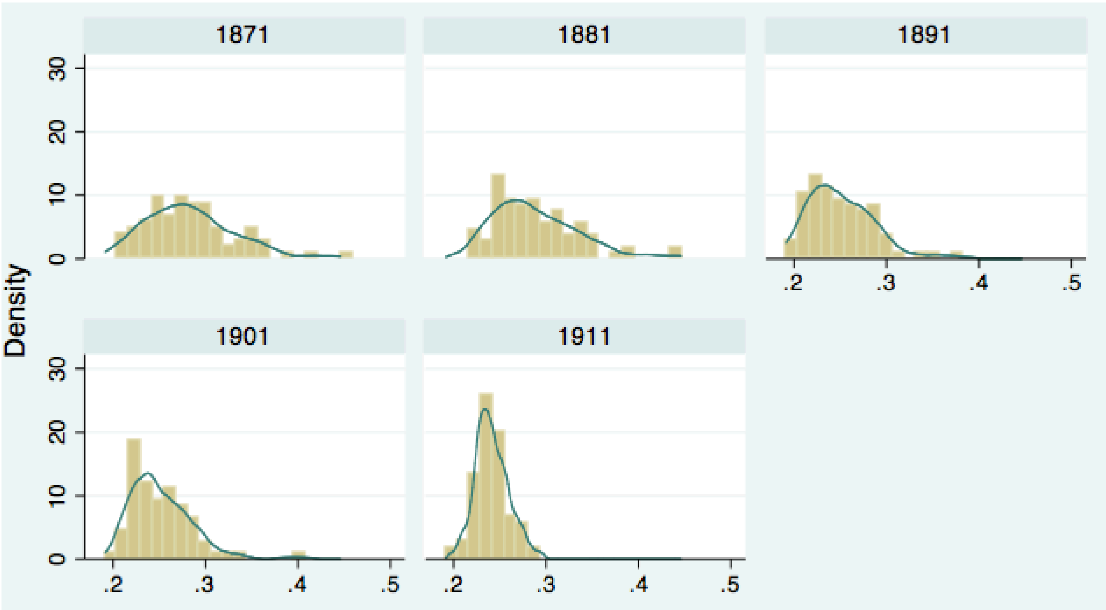


Figure 7: Fertility convergence: a counterfactual without migrations - OLS, 1871-1911

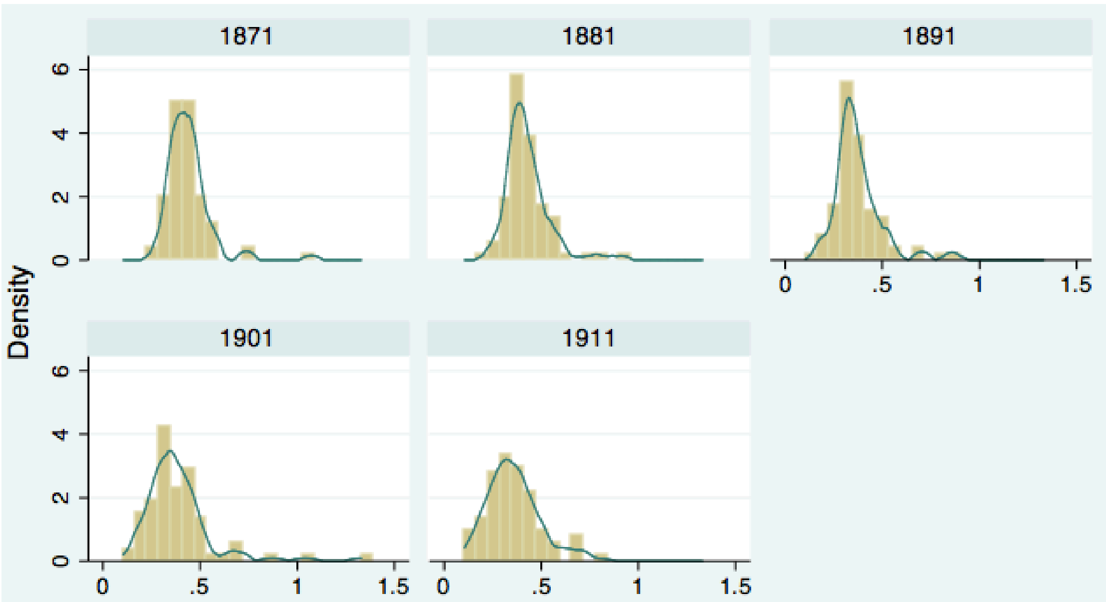
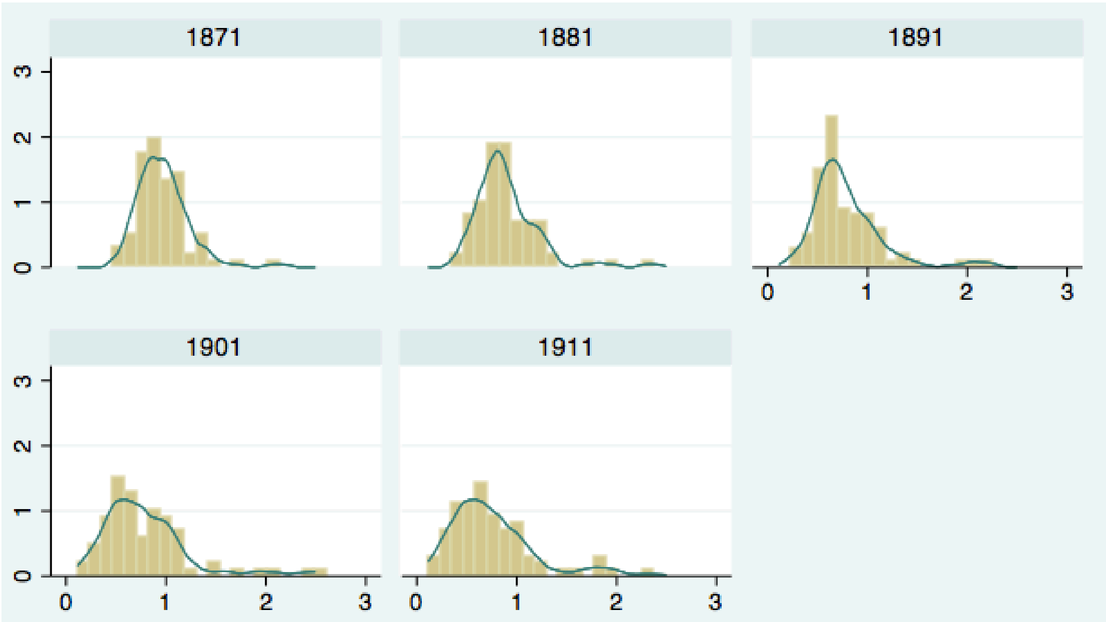


Figure 8: Fertility convergence: a counterfactual without migrations - IV, 1871-1911



5. Conclusion

To be added.

References

Abramitzky, Ran, Adeline Delavande, et Luis Vasconcelos. 2011. « Marrying Up: The Role of Sex Ratio in Assortative Matching ». *American Economic Journal: Applied Economics* 3 (3) (juillet): 124-157. doi:10.1257/app.3.3.124.

Albert, P. 1972. « «La presse française de 1871 à 1940» ». *Histoire générale de la presse française* 3: 258.

Béaur, Gérard, et Béatrice Marin. 2011. « La Statistique Générale de la France – Présentation ». *L'Atelier du Centre de recherches historiques*. La Statistique Générale de la France (mars 17). http://acrh.revues.org/index2891.html.

Beine, M., F. Docquier, et M. Schiff. 2008. « International Migration, transfers of norms and home country fertility ». *IZA Discussion Paper* (3912).

Bellanger, C. 1969. *Histoire générale de la presse française: De 1871 à 1940*. Vol. 3. Presses universitaires de France.

Bergues, Hélène, Philippe Aries, Etienne Helin, Louis Henry, Riquet, Alfred Sauvy, et Jean Sutter. 1960. *La prévention des naissances dans la famille: ses origines dans les temps modernes*. Presses universitaires de France.

Blanchet, Didier, et Denis Kessler. 1992. La mobilité géographique, de la naissance au mariage. Dans *La société française au XIXe siècle: Tradition, transition, transformation*, éd par. Jacques Dupâquier et Denis Kessler, 362-369. Paris: Fayard.

Bonneuil, N. 1997. *Transformation of the French demographic landscape, 1806-1906*. Clarendon Press England.

Bonneuil, N., A. Bringé, et P.A. Rosental. 2008. « Familial components of first migrations after marriage in nineteenth-century France ». *Social History* 33 (1): 36–59.

Borgatti, S. P., M. G. Everett, et L. C. Freeman. 2006. *UCINET 6 Social Network Analysis Software v. 6.125*. Cambridge, MA: Havard Analytic Technolgies.

Bourdelais, P. 2004. « L'enquête des 3000 familles: un premier bilan (introduction) ». *Annales de démographie historique*: 5–6.

Bourdieu, J., et others. 2004. Défense et illustration de l'enquête des 3 000 Familles. L'exemple de son volet patrimonial. Dans *Annales de démographie historique*, 19–52.

Bourdieu, Jérôme, Gilles Postel-Vinay, Paul-André Rosental, et Akiko Suwa-Eisenmann. 2000. « Migrations et transmissions inter-générationnelles dans la France du XIXe et du début du XXe siècle ». *Annales. Histoire, Sciences Sociales* 55 (4) (juillet 1): 749-789.

Braudel, F. 1986. *L'identité de la France, Paris*. Arthaud.

Brown, John C, et Timothy W Guinnane. 2007. « Regions and time in the European fertility transition: problems in the Princeton Project's statistical methodology1 ». *The Economic History Review* 60 (3) (août 1): 574-595. doi:10.1111/j.1468-0289.2006.00371.x.

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

Chen, H.J.U. 2009. « A brain gain or a brain drain? Migration, endogenous fertility, and human capital formation ». *Economic Inquiry* 47 (4): 766–782.

Coale, A.J. 1969. « The decline of fertility in Europe from the French Revolution to World War II ». *Fertility and family planning: a world view*: 3–24.

Coale, A.J., et S.C. Watkins. 1986. *The decline of fertility in Europe: the revised proceedings of a conference on the Princeton European Fertility Project*. Princeton University Press Princeton.

Commander, S., M. Kangasniemi, et L.A. Winters. 2004. The brain drain: curse or boon? A survey of the literature. Dans *Challenges to Globalization: Analyzing the Economics*, par Richard E. Baldwin et L. Alan Winters.

Cox, Nicholas. 2006. *MSTDIZE: Stata module to produce marginal standardization of two-way tables*.

Dupâquier, J. 1988. *Histoire de la population française*. Vol. 1. Presses universitaires de France.

Dupâquier, Jacques. 2004. « L'enquête des 3000 familles ». *Annales de démographie historique*: 7-18.

Dupâquier, Jacques, et Denis Kessler, éd. 1992. *La société française au XIXe siècle: tradition, transition, transformations*. Paris: Fayard.

Galor, O. 2005a. « The demographic transition and the emergence of sustained economic growth ». *Journal of the European Economic Association* 3 (2-3): 494–504.

———. 2005b. « From stagnation to growth: unified growth theory ». *Handbook of economic growth* 1: 171–293.

Guinnane, Timothy W. 2011. « The Historical Fertility Transition: A Guide for Economists ». *Journal of Economic Literature* 49 (3) (septembre): 589-614. doi:10.1257/jel.49.3.589.

Maddison, A. 2001. *The world economy: a millennial perspective*. Organization for Economic.

Manevy, R. 1955. *La presse de la III. République*. J. Foret.

Mountford, A., et H. Rapoport. 2011. « The brain drain and the world distribution of income ». *Journal of Development Economics* 95 (1): 4–17.
Silva, J.M.C.S., et S. Tenreyro. 2006. « The log of gravity ». *The Review of Economics and Statistics* 88 (4): 641–658.
Smith, K.W. 1976. « Marginal standardization and table shrinking: Aids in the traditional analysis of contingency tables ». *Social Forces* 54 (3): 669–693.
Spilimbergo, Antonio. 2007. « Democracy and Foreign Education ». *IMF Working Paper* (07/51).
———. 2009. « Democracy and Foreign Education ». *American Economic Review* 99 (1) (février): 528-543. doi:10.1257/aer.99.1.528.
Toutain, Jean-Claude. 1967. « Les transports en France de 1830 à 1965 ». *Économies et sociétés* Série AF (9): 1-306.
Weir, D.R. 1994. « New estimates of nuptiality and marital fertility in France, 1740–1911 ». *Population Studies* 48 (2): 307–331.