COPING WITH SUSTAINED LOW FERTILITY IN FRANCE AND THE NETHERLANDS

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4. SUSTAINED LOW FERTILITY AND SPATIAL POPULATION DISTRIBUTION IN FRANCE

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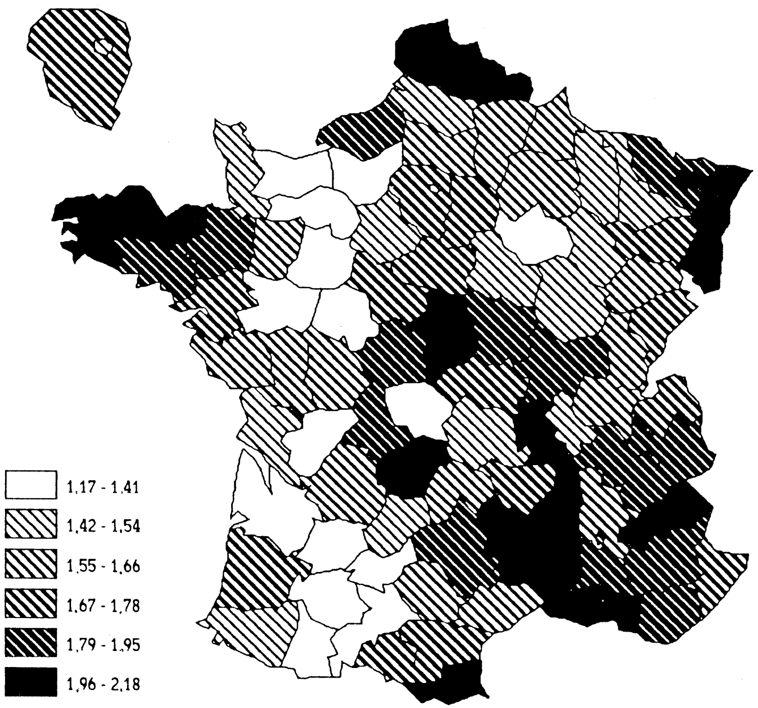
The spatial distribution of the population in a country may change over time for many different reasons: demographic, economic, political, etc. We will try here to assess more precisely what the effect could be of sustained low fertility on the regional distribution of the French population, and how net migration could counteract the fertility differences between spatial units. The demographic effect of mortality differences between regions will not be examined here, as we know (see table I in the annex) that these have not changed since 1968 (Noin, Thumerelle and Kostrubiec, 1986).
We start by assessing the differences in fertility between the various départements in France and observing their past evolution. Particular attention will be devoted to the convergence assumption which states that spatial differences in fertility levels are decreasing. We will also examine, in more detail, the evolution of other fertility characteristics, such as the mean age of mothers at their children's birth, to see if this convergence hypothesis holds for all fertility variables. The stability of the evolution of such indicators during the past will give us an indication of their usefulness for making population projections. We will also assess the stability of differences between departmental net migration and their links with departmental fertility.

We will try to see if a convergence to zero net migration flows between spatial units will occur in the near future.
The second part of this contribution examines another important aspect of spatial distribution. Are the differences between rural and urban areas according to their size and geographical distribution decreasing over time? Special attention will be paid to the largest urban areas (more than 100 000 inhabitants) for which fertility data have been published; correlations will be analyzed between the evolution of fertility and other socioeconomic characteristics.

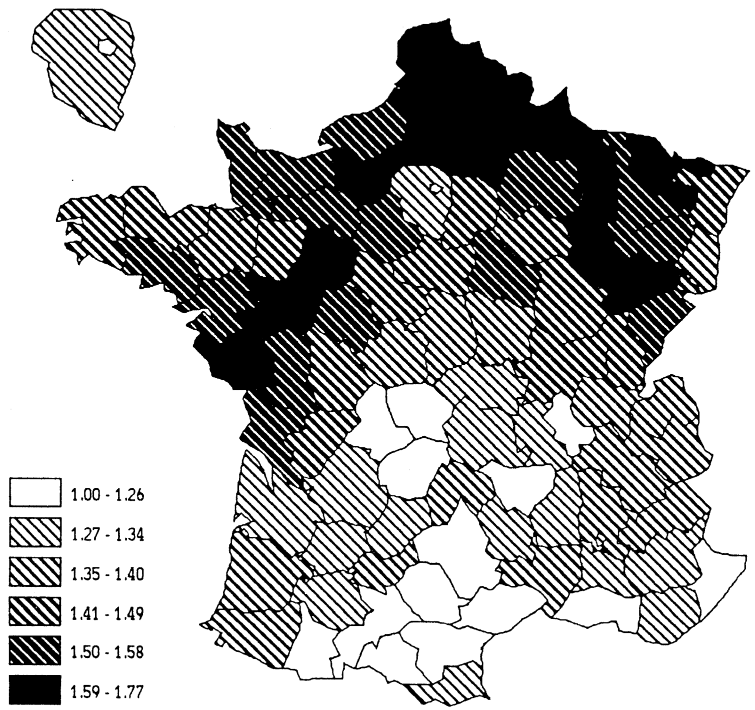
Figure 4.1. Gross reproduction rates in 1861



4.1 | Departmental fertility differentials

Previous researchers have examined departmental fertility differentials for the period until 1962 (Le Bras, 1971; Tugault, 1975). We will summarize their results first and present the population projections they have made. We will then describe the evolution of these fertility differentials for the more recent period, 1968 to 1982, and check whether they confirm the previous forecasts.

Figure 4.2. Gross reproduction rates in 1962



4.1.1. One hundred years of past evolution

We will start with a summary of the departmental fertility differentials at the two extremes of this period: 1860-1862 and 1961-1963[1]. Figures 4.1 and 4.2 compare the values of the gross reproduction rates[2] by département for 1861 and 1962. They suggest important changes in fertility differentials across the territory. In 1861, the areas of high gross reproduction rates were located in Brittany, in the northern part of France, in the central part of France (except for the Creuse and the Puy-de-Dôme), in the Alps, in the Alsace, and in Provence-Côte d'Azur. With the exception of Nord-Pas-de-Calais, all these areas are among the low fertility zones for 1962. The fertility map at this time (figure 4.2) shows a 'fertile crescent' around all but the southern side of the Paris region. A modification of the picture of regional fertility took place in the second half of the nineteenth century (Tugault, 1975), and the map remained quite the same from the 1890s (Le Bras, 1971).

To give a more complete view of the evolution of this fertility pattern, we will follow the approach used by Le Bras (1971). We will use seven fertility rates for five-year age groups for each département from 1921 to 1962. To assess all the dimensions of such a fertility pattern, Le Bras used principal component analyses, with a euclidean distance calculated on the rates. Table 4.1 gives the percentages of total variance for each of the four first axes given by such an analysis. We can easily see that the two first axes explain the major part of inertia (between 96.26% and 97.93%). To give an empirical interpretation to these theoretical axes, he then examined their correlation with the two main summary measures of the distribution of fertility rates: the previously observed gross reproduction rate (GRR) and the mean age at motherhood, (MAM), also called mean age at childbearing. The correlation coefficients between GRR and the first axis, and MAM and the second axis always have a high value and clearly show that the first axis is to be related to GRR and that the second axis is to be related to MAM. These two quantities give us the two theoretically independent dimensions of fertility in France and, consequently we can say that fertility has only two dimensions, the others being negligible. If the convergence hypothesis holds true for this past period, we should observe a regular

1 In the remainder of this article, these short periods will be summarized by the year of the corresponding census, here 1861 and 1962.

2 This fertility index gives the average number of live daughters that would be born to a hypothetical female birth cohort which would be subjected to the set of current age-specific fertility rates, on the assumption that mortality before the end of the reproductive age is zero.

Table 4.1. Percentages of variance explained by the four first axes for nine census periods and inertia forecasted for two periods

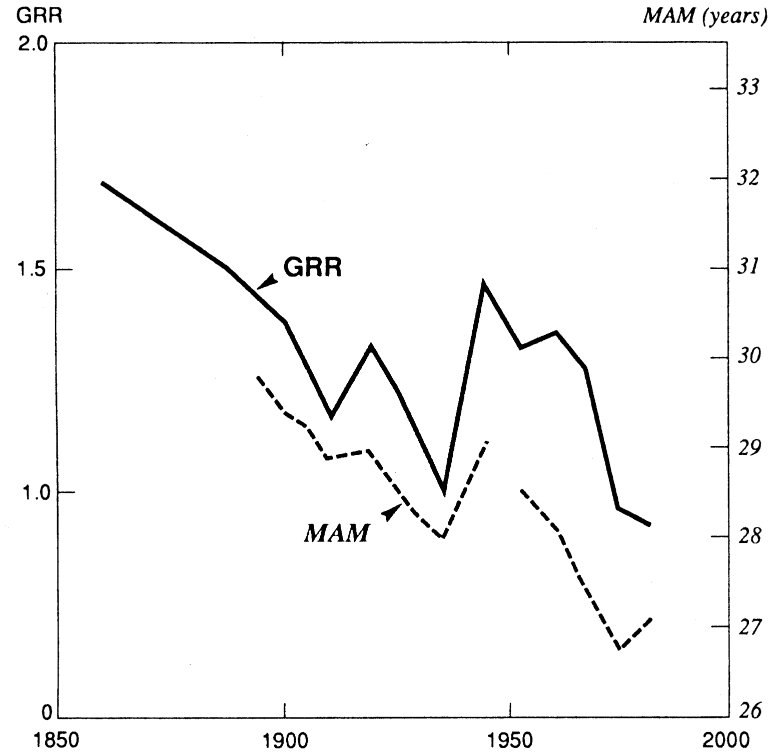
	Axes 1		Axes 2		3	4
Periods	Observed	Le Bras forecast	Observed	Le Bras forecast		
89 départements						
1920-1922	65.8		30.5		2.4	0.9
1930-1932	65.4		31.6		2.0	0.6
1935-1937	70.5		26.7		1.8	0.5
1945-1947	67.7		29.4		2.1	0.4
1953-1955	72.0		25.9		1.3	0.4
1961-1963	70.6		26.3		2.1	0.6
94 départements						
1967-1969	75.0	75.0	20.9	20.0	3.0	0.7
1974-1976	72.0	80.0	22.6	15.0	3.6	1.1
1981-1983	70.9		23.8		4.2	0.7

Source: H. Le Bras and our calculations.

decrease of the standard deviation[3] of GRR and MAM. Figure 4.3 gives the evolution of these mean indices and figure 4.4 the evolution of their standard deviation. As noted by Le Bras, for the period 1921 to 1962, the variation of the standard deviations of GRR is small compared to the variation of the mean values, and "it seems more advisable to consider them as remaining constant". In that case the convergence hypothesis does not hold for these GRR. Conversely, for the same period of time, we can observe a very important decrease in the standard deviation of the ages of mothers. It is easy to adjust a straight line

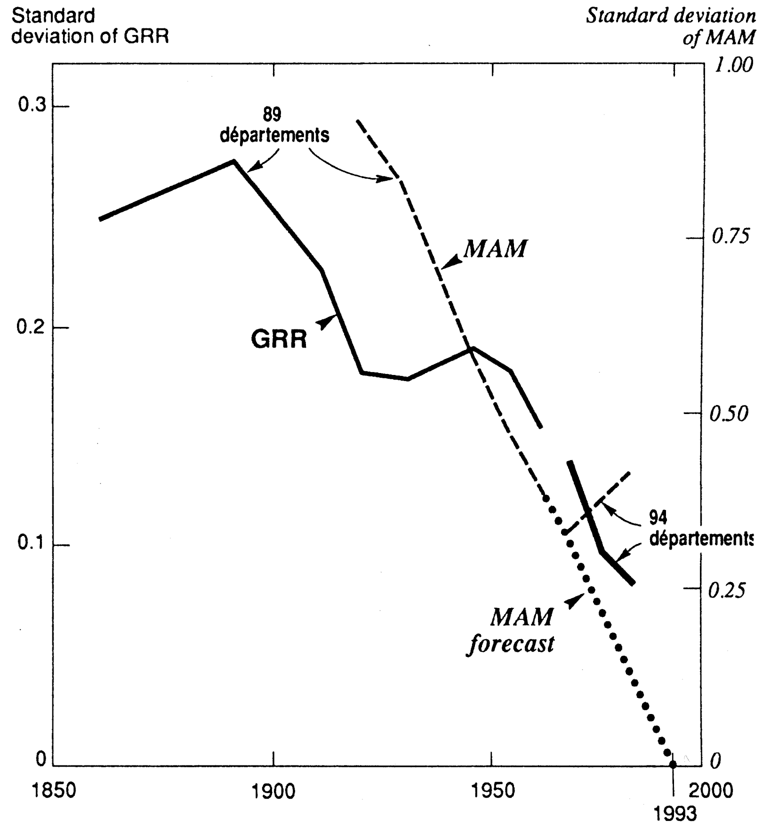
3 The results remain quite similar when looking at the coefficient of variation, which eliminates the effect of changes in the mean values of these indices.

Figure 4.3. Evolution of the French gross reproduction rates and of the mean ages at motherhood, from 1861 to 1982



on these standard deviations according to time, and to "predict that in 1993 every difference due to the ages of mothers will have disappeared" (Le Bras, 1971, p. 114). That the percentage of variance explained by the second axis did not yet begin to decrease, lies in the "diminution of the correlation between the GRR and the MAM (table 4.2) and in the slight decrease of correlation between the GRR and the first axis" (Le Bras, 1971, p. 118). In that case the convergence hypothesis seems to hold true for the MAM values.

Figure 4.4. Evolution of the standard deviation of departmental gross reproduction rates and mean ages at motherhood, from 1861 to 1982



Using the results of his analysis, Le Bras was then able to make a population forecast of these regional differences in fertility, whatever the evolution of the national values would be. The percentage of inertia for the two first axes was predicted for 1968 (when the paper was written these numbers were not yet published) and for 1974 (see table 4.1). According to this forecast, the MAM differences between départements will become less and less important, and will entirely disappear in 1993. The relative differences in GRR will slightly decrease, but this factor will be the only one remaining. The correlation between

Table 4.2. Correlation coefficients between gross reproduction rates and mean ages of mothers at birth of their children, 1921 to 1982

	1921	1931	1946	1954	1962	1968	1975	1982
Correlation between GRR and MAM	0.519	0.355	0.340	0.132	0.048	0.133	-0.151	-0.277

MAM and GRR will become slightly negative, because a greater number of départements with a high fertility of young women will have a high GRR. We are now able to observe with more recent data if this forecast holds true.

4.1.2. Recent evolution of fertility differentials

The available data concern three new census periods: 1968, 1975, and 1982. It should be noted that there was a change in the number of départements from 1968; from this year on there were 95 départements[4], the old Seine and Seine et Oise being disaggregated into seven new départements. For this reason the results given here are not entirely comparable with the previous ones, but we feel that the results of a factor analysis will not be greatly affected by these changes.

Figures 4.5 and 4.6 give the values of the gross reproduction rate in 1968 and 1982. The 'fertile crescent' is still easily discernible, and there are no major changes between these two figures and the one for 1962, which was shown earlier.

Let us conduct a similar factor analysis as before. Table 4.1 gives the percentages of variance for the four first axes. We can see that the two first axes continue to explain the major part of variance (from 95.9% in 1968 to 94.7 in 1982), although the third axis increases its share (growing from 2.1% in 1962 to 4.2% in 1982).

The predicted changes appear to be perfectly observed in 1968 with an increase of 4.4% in the percentage explained by the first axis (the same as predicted) and a decrease of 5.4% in the percentage of the second axis (6.3% predicted). However, for 1975, this forecast was unable to predict the actual changes: the percentage explained by the first axis did not have the predicted increase of 5%, but a decrease of 3%; the predicted decrease of 5% for the second axis became an increase of 1.5%. The following observation in 1982 continues this evolution, contrary to the forecast.

Let us now observe the evolution of the standard deviation of MAM (figure 4.4), that we can compare to its mean value (figure 4.3). Again we can see that this standard deviation is very near to the one predicted for 1968, but that in later years it did not decrease, but increased significantly. Again the forecast failed to predict such a change.

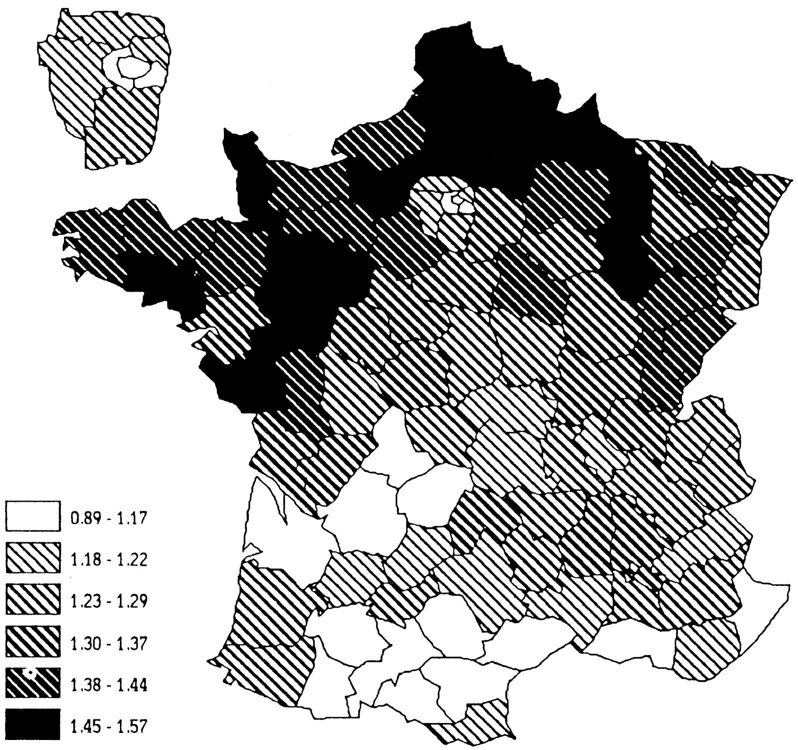
It is not possible now to say that in 1998 every difference due to mean ages of mothers will have disappeared. The 1990 data will tell us if this increase continued or came to an end. We can also observe from figure 4.4 that the relative stability observed in the past for the standard deviation of GRR is no longer present. We see a very important decrease in this standard deviation, which, if the evolution between 1968 and 1975 continues, will lead to a convergence of all departmental GRR's by 1993! The analysis of the last twenty years tends to sustain the convergence hypothesis, that was rejected from the observation of the forty previous years. In this case it may be interesting to see if, in periods prior to 1921, we also did not observe an important decrease in the GRR's standard deviation. We provide these results in figure 4.4, for the period 1861 to 1911. We can see that this decrease basically occurred from 1891 to 1911, with about the same pace as the recent period. There seems to be some cyclical trend in the overall reduction of the GRR's standard deviation: an initial increase from 1861-1891, that could be due to important differences between départements in the decrease of their GRR, and a second increase from 1931-1954, which could be due to a different postwar increase of GRR's values (figure 4.3).

We must now check if the final prediction, that the correlation between the GRR and MAM will become negative for this period, is true. We can observe in table 4.2 that such a forecast holds true: the départements with a higher GRR are those with a lower MAM. The correlation became negative in 1975 and continued to do so until 1982, showing an increase in absolute values.

To give a more general view of the evolution of departmental fertility, table 4.3 shows the correlation coefficients between GRR, MAM, the standard deviation of ages of mothers (SAM), the percentage of non-marital births (ILL), and the three first axes of the factor analysis. We can observe that the first axis is highly correlated with GRR, but that this correlation decreases slowly during the observed period. The second axis is highly correlated with MAM at the beginning of the period, but this correlation quickly decreases over time. The third axis, which is of increasing importance, is correlated with the standard deviation SAM, and this correlation increases substantially during the period. This indicates a number of new changes in ages of mothers in specific areas in the country, as we will show later.

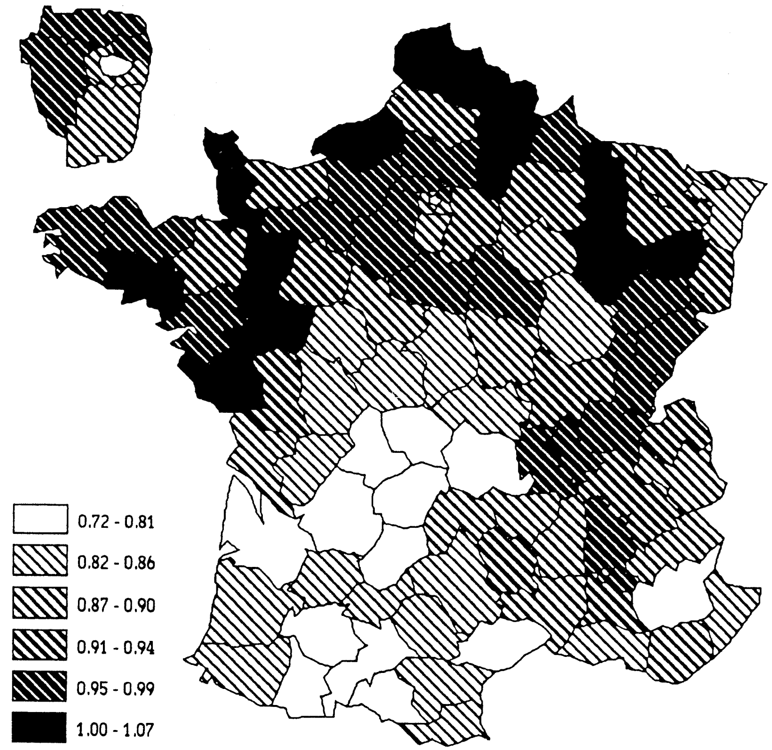
4 Corsica will be omitted here, since data on population given by censuses are largely incorrect, especially up to 1975, so that we will include 94 départements.

Figure 4.5. Gross reproduction rates in 1968



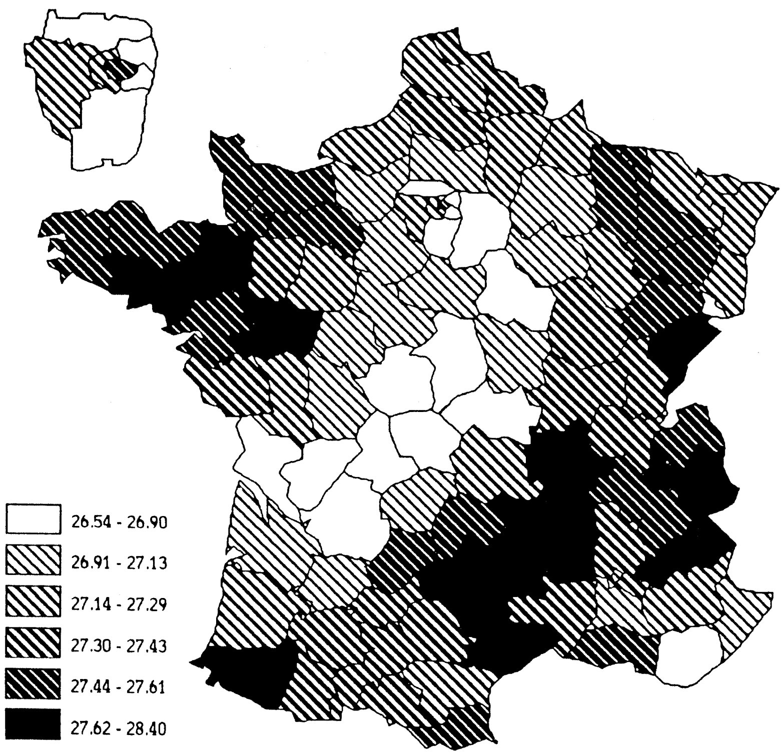
The percentage of non-marital births is slightly correlated with these three axes. However, we can observe that a positive and increasing correlation with the standard deviation SAM, leads to a correlation of this variable with the third axis, close to 0.6 in the last period of observation.
The départements with a high range in fertility rates are also départements with a high proportion of non-marital births (e.g. the Paris region and Lyon). The other correlations between the different indices are almost always low, showing that these characteristics of fertility are in many cases independent of one another.

Figure 4.6. Gross reproduction rates in 1982



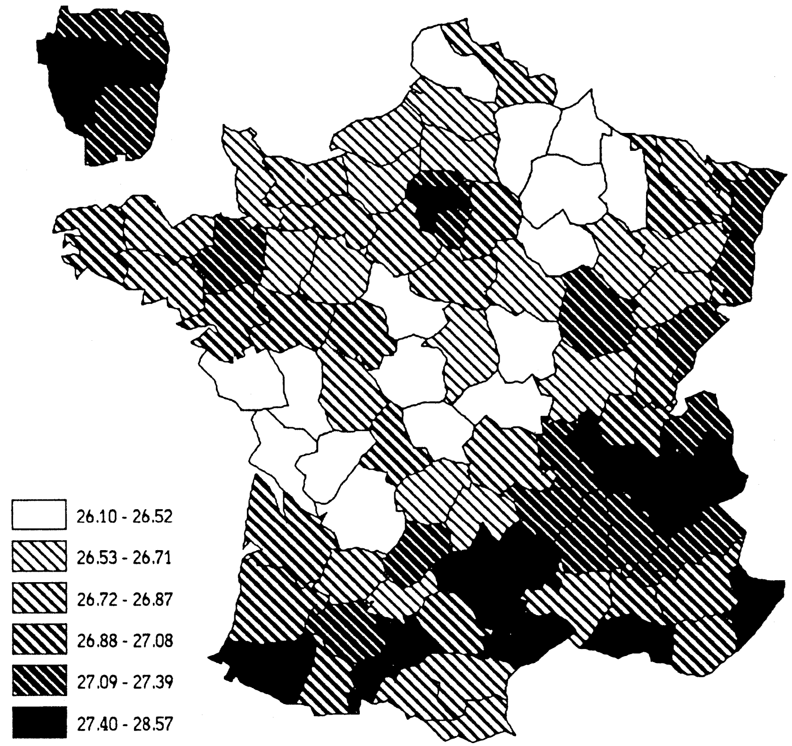
Like the previous comparison of the maps, giving the GRR in 1968 and that in 1982, we will conclude this section with a comparison of the maps, giving the MAM and the standard deviation SAM for those years for the French départements (see figures 4.7 and 4.8). In 1968, France was clearly divided: a central part from south-west to north with very low MAM values, and a western and south-eastern part with high MAM values. The 1982 map shows important changes. The south-eastern part remained fairly similar, but the western one had a very important decrease of MAM values. However, all the départements in the Paris region witnessed a major increase in their MAM values.

Figure 4.7. Mean ages of mothers at motherhood in 1968



To more clearly understand the significance of these changes, it is necessary to show the simultaneous evolution of the standard deviation of the age of mothers, SAM.
Figures 4.9 and 4.10 give this evolution from 1968 to 1982. The northern and eastern part of France consistently have the highest standard deviations of ages of mothers, but the Paris region and also Lyon, with low standard deviations in 1968, join this group in 1982. This indicates changes occurring in these metropolitan areas, where some women have their children at a relatively young age, while others do not give birth until they are relatively old. Changes such as these appear to be quite important. In the future they may be observed in

Figure 4.8. Mean ages of mothers at motherhood in 1982



other parts of the country as well. However, it should be noted that areas surrounding the Paris region show a drop in their SAM's standard deviation. In other words, they do not (yet) show the changes occurring in metropolitan areas. We will try to give a more general interpretation of these changes in the conclusion, but we must first discuss the evolution of net migration.

Table 4.3. Correlation coefficients between gross reproduction rate, mean age of mothers at birth, standard deviation of the ages of mothers, percentage of non-marital births, and the three first axes of the factor analysis (1968, 1975, 1982)

	1968				1975				1982			
	GRR	MAM	SAM	ILL	GRR	MAM	SAM	ILL	GRR	MAM	SAM	ILL
1st axis	0.992	0.063	0.374	-0.272	0.962	-0.386	0.396	-0.167	0.913	-0.633	-0.000	-0.173
2nd axis	0.063	0.961	-0.290	-0.467	-0.219	0.865	0.217	0.383	-0.361	0.726	-0.014	0.158
3rd axis	0.105	0.118	0.767	0.475	0.155	0.192	0.736	0.592	0.178	0.221	0.920	0.567
Gross reproduction rate (GRR)	1.000	0.133	0.439	-0.251	1.000	-0.151	0.460	-0.160	1.000	-0.277	0.182	-0.102
Mean age of mothers at birth (MAM)		1.000	-0.094	-0.476		1.000	-0.141	-0.214		1.000	0.214	0.084
Standard deviation of the ages of mothers (SAM)			1.000	0.320			1.000	0.363			1.000	0.555
% non-marital births (ILL)				1.000				1.000				1.000

4.2 | Departmental net migration and links with fertility

We will now try to see if the convergence hypothesis holds with the observed migration patterns. If this hypothesis holds true for this phenomenon, we should see an important decrease in the variance of net migration rates for départements, which leads to a perfect equilibrium with a zero value for this variance, and zero net migration rates for each département.

4.2.1. Evolution of net migration rates

To investigate whether France is becoming a spatially balanced country, different measures of disequilibrium may be used. A first measure is the mean net departmental migration rate. If this mean decreases over time, this may be indicative of a path to equilibrium.

Table 4.4 gives the evolution of mean net migration rates from 1954 to 1990. The table reveals an increase between 1954 and 1962, and a continuous decrease in later years. This pattern is one of convergence.

However, a convergence towards zero of the mean net migration rate may mask important departmental differences.

As net migration is an algebraic quantity that could be either positive or negative, a zero mean may occur while important differences remain within such rates. Thus it may be useful to see if the standard deviation of these rates remains at a high level or is also decreasing. Table 4.4 also presents these standard deviations. We can see that from 1962 onwards this standard deviation decreases regularly, supporting the convergence hypothesis.

However, the time at which the mean migration rate will be zero is quite different from the time at which the standard deviation will be zero. Application of a linear evolution hypothesis for the last observed periods of time, shows that this moment will be around the year 2005 for the mean migration rate and around the year 2085 for the standard deviation of these rates. That is, 80 years later.

Another way to look at this convergence is to compare the correlation of the net migration rates for one period with those of the previous period. A high correlation between these departmental rates, with a decreasing mean and standard deviation as observed, will indicate a steady convergence, without important changes in the relative values of the departmental net migration rates. These correlations are presented in table 4.4. The correlations remain at a relatively high level for the periods 1968-1975 and 1982-1990, indicating a stability in the relative position of départements. However, this correlation was at a relatively low level for the period 1975-1982. This corresponds to the economic crisis of the years 1974 and later, and indicates important changes in net migration rates that remained roughly the same during the following period.

Such a dependence between migration rates and economic events diminishes the usefulness of the previous results, which were based mainly on demographic

Table 4.4. Mean and standard deviation of net migration rates of French départements and correlations with the net migration rate of the previous period and the gross reproduction rate at the beginning of the period

Period	1954-1962	1962-1968	1968-1975	1975-1982	1982-1990
Mean net migration rates	0.290	0.471	0.278	0.217	0.158
Standard deviation of net migration rates	0.893	0.982	0.762	0.579	0.537
Correlation with net migration rates of the previous period	-	0.865	0.871	0.645	0.916
Correlation with GRR at the beginning of the period	-	-	-0.187	-0.330	-0.339

trends. We will try to see if a dependence between net migration rates and fertility levels for départements, can improve this.

4.2.2. Links between net migration and gross reproduction rate
We have previously shown (Poussou *et al.*, 1988; Garden *et al.*, 1988) that, in the past, there were links between net departmental migration and its past GRR. If this relation still exists, the past GRR of a département can be used to predict its present net migration rate. These correlations are presented in table 4.4. They are always negative, but at a low level, especially for the first period 1968-1975. For the two following periods, the introduction of the GRR from the previous census date will permit a better estimation of the net migration rate (NM) for the intercensal period.
The following are the regression results for the two periods:

$$\underset{}{NM\ 82} = \underset{(2.512)}{1201} + \underset{(7.515)}{0.445\ NM\ 75} - \underset{(-2.353)}{1.161\ GRR\ 75} \quad \text{with } R^2 = 0.450$$

$$\underset{}{NM\ 90} = \underset{(2.675)}{0.689} + \underset{(21.293)}{0.882\ NM\ 82} - \underset{(-2.790)}{0.786\ GRR\ 82} \quad \text{with } R^2 = 0.852$$

The values in parentheses are the results of Student t-tests. We can see from the correlations shown in table 4.3, that once squared, they give $R^2 = 0.416$ compared with $R^2 = 0.450$ for the first regression and $R^2 = 0.839$ compared with $R^2 = 0.852$ for the second regression. Therefore, the introduction of the GRR does not result in an important increase in R^2. Apparently, we need a more economic analysis to predict the net migration rates.

4.3 | Urban-rural fertility differentials

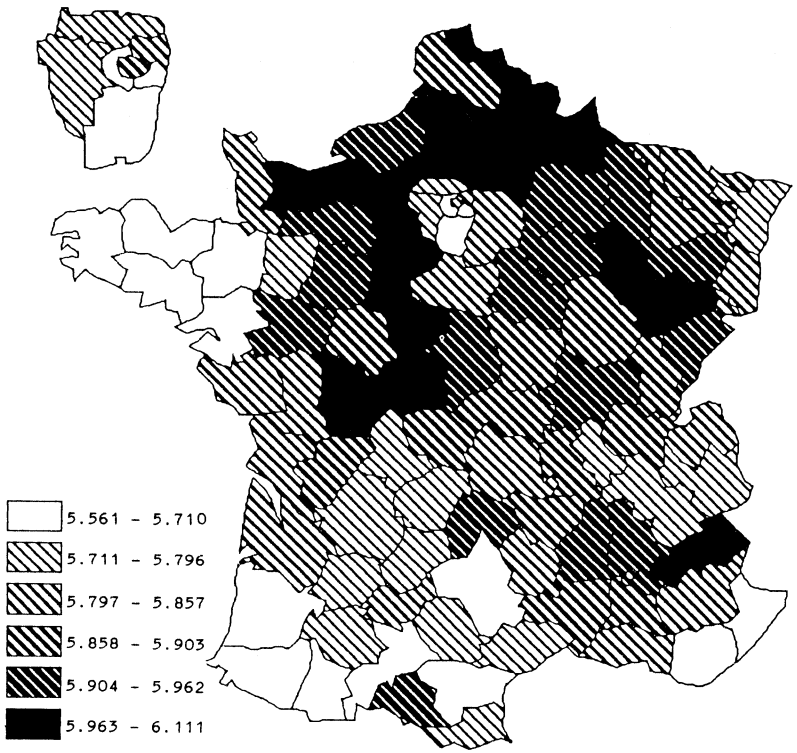
4.3.1. Recent evolution of fertility according to settlement size
The fertility level in France has been higher in rural than in urban areas since the end of the XIXth century. Prior to 1860, the situation was the reverse. The gross reproduction rate is inversely related to the size of communities or urban areas (Calot and Deville, 1971, Tugault, 1975). However, as shown in table 4.5, the deviations between fertility index values according to settlement size are becoming less and less important (Sautory, 1987). The highest values are now observed in small towns, with a population between 5,000 and 50,000 in-

Table 4.5. Evolution of fertility according to the size of communities or urban areas

Size of communities or urban areas (by thousands of inhabitants)	Mean gross reproduction rate 1968	1975	1982	Index with base 100 for France 1968	1975	1982
<2 (rural)	2.76	1.99	1.87	107	102	99
2- 5	2.77	2.08	1.87	107	106	104
5- 10	2.78	2.11	1.99	107	108	106
10- 20	2.81	2.12	1.98	109	109	105
20- 50	2.77	2.08	1.97	107	106	105
50- 100	2.66	1.99	1.92	103	102	103
100- 200	2.70	2.03	1.88	104	104	100
200- 2000	2.50	1.88	1.86	97	97	99
Paris agglomeration	2.15	1.78	1.81	83	91	96
Mean for France	2.59	1.95	1.88	100	100	100

Extracted from: O. Sautory, 1987, Fécondité à la ville et à la campagne. In: *Données Sociales*, INSEE, pp. 276-281.

Figure 4.9. Standard deviation of the ages of mothers at motherhood in 1968

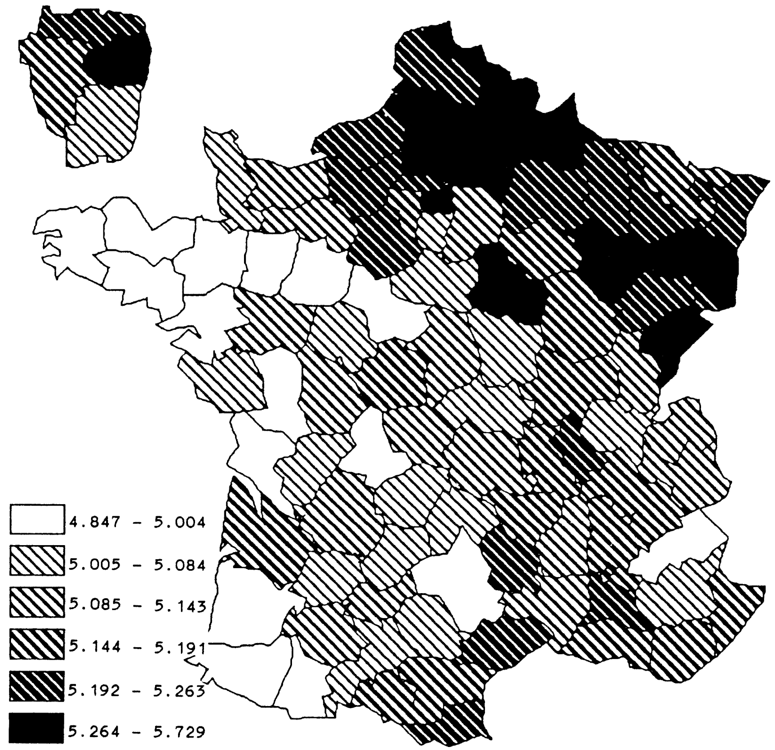


habitants, whereas the extreme values for rural communes (fewer than 2,000 inhabitants) and the Paris agglomeration have both converged to the mean value for France.

The decrease in fertility for rural communities is generally explained by the decrease of the population of farming families in rural areas, who traditionally had more children (26% of rural population in 1982, 44% in 1962). It can also be explained by a lower fertility of young women under age 25 in rural communities, compared to small towns (Sautory, 1987).

The fertility pattern according to settlement size is identical to the mean model (as presented in table 4.5) in 16 of the 21 continental French regions in 1982.

Figure 4.10. Standard deviation of the ages of mothers at motherhood in 1982



The exceptions are all to be found in regions where fertility has been higher than average for a long period of time. Only two regions in the western part of France, Brittany and Pays de la Loire, retain the old pattern with a higher fertility in rural areas and a lower fertility level in larger settlements. This pattern is totally the reverse of what is observed in Picardie, Nord-Pas-de-Calais, and Alsace, where the gross reproduction rate has its minimum value in rural areas and its maximum value in the largest urban agglomerations (Sautory, 1987).

However, it must be stressed that the differences in fertility according to the settlement size are very small when compared to the regional differences.

Sautory (1986) computed the variance of gross reproduction rates by region and type of settlement (rural, small towns, and large urban areas). The inter-regional differences explain 95% of the total variance in 1968, 85% in 1975, and 90% in 1982. Thus the regional factor is very important, whereas the effect of the size of settlement is negligible.

4.3.2. Evolution of fertility in the largest urban areas
At each census since 1954, data on fertility have been computed for the largest urban agglomerations (INSEE, 1954, 1962, 1968, 1975, and 1982). A continuous series is available for the 34 urban agglomerations which had more than 100,000 inhabitants in 1954. The sample is too small for many statistical computations, but indicative results are given in table 4.6, with unweighted means and standard deviations. There is an increase in the mean gross reproduction rates for those 34 cities between 1954 and 1962, followed by a continuous decrease since that date. The variance is rather low and continuously decreases between 1954 and 1982. A convergence in the reproductive behaviour of the population of those cities, as it was observed for regions and départements may thus be observed. As was demonstrated for regions (Blanchet, 1981), almost all cities follow the same conjunctural trend in gross reproduction rate as well. This may explain the rather large stability in the inter-urban pattern of variation, as measured by the correlation coefficients of the fertility index values at successive dates, which are all close to 0.9 and statistically significant (table 4.6).

Table 4.6. Evolution of fertility in the largest urban areas

Gross reproduction rate for 34 agglomerations with 100,000 inhabitants or more	1954	1962	1968	1975	1982
Mean	1.19	1.32	1.28	0.91	.89
Standard deviation	0.18	0.16	0.14	0.10	0.10
Correlation coefficient with preceding series		0.91	0.91	0.92	0.85

Source: INSEE, Données de démographie régionale.

In most cases, the gross reproduction rate of the agglomerations was less than that of the surrounding département. This difference was between 10-20% for two-thirds of the cities in 1954, but has substantially dropped since that date. In about ten cases, the difference remains larger than 6% (for Angers, Caen, Dijon, Grenoble, Montpellier, Nancy, Nantes, Rennes, Rouen). The trend towards geographical homogeneity in fertility levels thus seems very general. Deviations from this trend may, however, be observed at a lower geographical scale within large agglomerations. The fertility level of the central cities remains much lower than in the suburbs (from 3 to 11%). This difference is totally explained by the high proportion of non-married women in central cities (Sautory, 1986). From observed recent trends in migration differentials between central and peripheral urban areas according to the marital status of women (Bonvalet and Lelièvre, 1989), it may be predicted that this difference in fertility levels has a high probability of persisting or even increasing in the near future.

4.3.3. Inter-urban variations of net migration
In France, as in many other countries, migration from rural areas was mainly responsible for the rapid urbanization process and for the high urban population growth rates during the thirty-year period following the second world war. As the rural population surplus decreased, urbanization entered its stage of saturation. The urbanization rate (share of urban population in total population) reached 73% in 1982, and was even as high as 90% if computed in the extended framework of the 'Zones de Peuplement Industriel et Urbain'. Currently, migration is no longer the main source of urban growth. The share of net migration dropped dramatically during the last four census intervals: 58% in 1954-62, 54% in 1962-68, 32% in 1968-75, and has even become negative since 1975: the loss of population due to net migration takes an amount of population out of the urban areas equivalent to half of their natural growth.
Despite its decreasing importance in absolute terms, net migration is still a component to consider when trying to predict the future evolution of urban populations. Its variations in space and time are much larger than the inter-urban differences of gross reproduction rates (tables 4.6 and 4.7). The statistical dispersion of migration rates, with coefficients of variation of 60 to 150%, were always higher than the relative dispersion of natural growth rates (40 to 55%) or the gross reproduction rates (10 to 15%).
Inter-urban differences in net migration rates are also less stable over time than fertility differentials. Whereas, as shown in table 4.6, the correlation coefficients of the GRR in one period compared to the next one were always close to 0.9, the correlation coefficients between successive net migration rates in urban areas were slowly increasing from 0.3 in 1954-62 to 0.6 in 1975-82. This corresponds to changes in the relative attractiveness of urban areas for migrants, which may be related to their socioeconomic characteristics.

Table 4.7. Evolution of net migration in urban areas

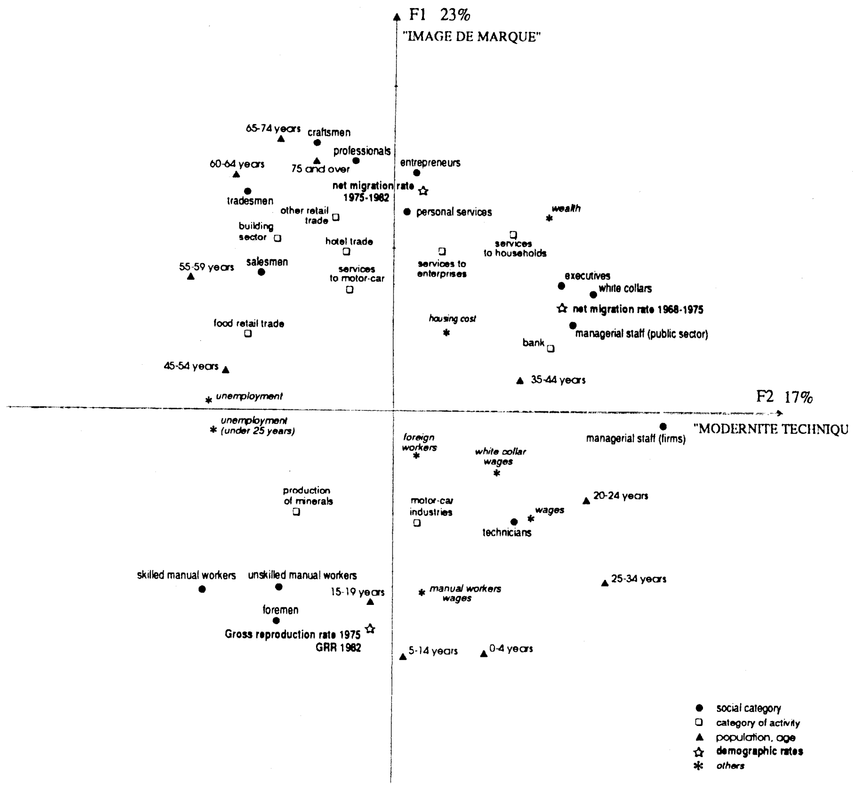
Period	Mean annual rate (in %) of net migration in urban areas				Correlation coefficient with gross reproduction rate
	all > 50,000 inhabitants		the 34 largest in 1954		
	average	standard deviation	average	standard deviation	
1954-62	1.51	0.94			
1962-68	1.34	1.22	1.64	0.84	-0.51
1968-75	0.60	0.97	0.81	0.81	-0.39
1975-82	-0.48	0.73	-0.48	0.62	-0.55

4.3.4. Gross reproduction rate, net migration and socioeconomic structure of the urban system

To obtain a more general idea of the socioeconomic structure of urban areas, the following analysis is based on a larger sample of cities, taking into account 107 urban areas with more than 50,000 inhabitants in 1982. We selected 63 variables for describing the demographic, social, and economic composition of their population.

Figure 4.11 shows the main results of a principal component analysis of those data, with the two first factors together explaining about 40% of the total variance. Those factors were identified as the two main 'latent dimensions' of the French urban system (Pumain and Saint-Julien, 1978). The first one, called 'image de marque', is an inheritance from the first Industrial Revolution, and ranks the cities from the most industrialized of the northern and eastern part of France to the less industrialized of the southern part. The term 'image de marque' has been chosen because the ordering of cities along this axis corresponds to the contemporary social representation of the general quality and attractiveness of cities. The second one was called 'modernity' because it summarizes differences between cities which evolved during the 1960s and 1970s, and which were linked to the economic expansion of that period: new types of services and industries and growing social groups like managers and technicians mainly became concentrated in the rapidly-growing cities of the Rhône-Alpes region or in the capitals of other regions, whereas other cities, especially those belonging to the central and western part of the territory, remained less developed. The income level is correlated to the first dimension, whereas the level of wages is correlated to the second. The position of the unemployment variable reinforces the significance of the second factor. The age structure follows the two main differentiations: children are at the opposite of the older people along the first factor, according to the north-south differential, and young adults, between 20 and 45 years, are more frequent in dynamic cities, the less developed ones having an older age structure in their labour force.

Figure 4.11. Correlations between urban variables and the first two axes of a principal component analysis



Source: Pumain and Saint-Julien, 1989.
All variables are measured for the 107 urban agglomerations with 50,000 inhabitants or more in 1982.

This socioeconomic structure of the urban system has remained rather stable since about 1968 (Pumain and Saint-Julien, 1989). Therefore, the net migration rates and the gross reproduction rates of the last two periods for the largest cities have been projected on this structure, according to their correlations with the factors. It can be seen from figure 4.11 that the gross reproduction rate keeps the same position; its correlation with the first factor is -0.7 and 0 with the second one. This indicates a high stability of the inter-urban differentials in reproductive behaviour: fertility is still higher in the large cities of the old industrial regions of northern France than in the large cities of the south. On the other hand, there has been a shift in urban attractiveness upon migration. For the period 1968-75, the net migration rate has a correlation coefficient of 0.5 with the modernity factor (and 0.26 with the first factor), whereas for 1975-82, the correlation has become 0 with modernity, but is 0.7 with 'image de marque'. Urban growth in this last period mainly took place in cities whose functional specificities are recreation, tourism, and trade, and whose social structure depends more on free enterprise than on salaried labour. In contrast, previous urban development was more intense in cities combining major public services and services to large enterprises, with many managers and high wages.

One generally assumes that urban attractiveness reflects both the adaptation of the urban system to the innovations of time and the preferences of people. Its distribution among cities has recently become the opposite of the differentials in gross reproduction rates, a pattern remaining very similar to the regional one.

As net migration varies much more than natural growth, it must also be used for predictions of future growth rates of urban populations. However, net migration rates fluctuate over time and change their links with socioeconomic characteristics, thus predictions will remain difficult. The only chance for improving their quality is in a better understanding of the growth diffusion process and of the competition for growth in the system of cities.

4.4 | Conclusion

The analysis of the impact of declining fertility on the spatial distribution of population in France is deceiving. Regional and rural-urban differences in fertility remained very stable in their geographical distribution, and saw their amplitude reduced in the last decades. If the future evolution of spatial population distribution is to be forecasted, more attention should be paid to the pattern of migration flows and to attractiveness differentials, including the observation of socioeconomic variables, for regions as well as for urban and rural areas. However, a new pattern in some aspects of fertility behaviour has been detected. An increase in the inequalities of ages at motherhood among départements is observed. New behaviour patterns are diffusing from the most urbanized and developed areas towards the more remote parts of the country. In those urbanized areas, the age at motherhood has increased for some women, while others retained the previous pattern. This induces an increasing variety of behaviours within these areas. However, such a qualitative change has little impact on the evolution of the spatial configuration of populations.

References

Blanchet, D. (1981), Evolution de la fécondité des régions françaises depuis 1960. *Population*, 4-5, pp. 817-844.

Bras, H. Le (1971), Géographie de la fécondité française depuis 1921. *Population*, 26, 6, pp. 1093-1124.

Bonvalet, C. and E. Lelièvre (1989), Mobilité en France et à Paris depuis 1945: bilan résidentiel d'une génération, *Population*, 3, pp. 531-560.

Calot, G. and J.C. Deville (1971), Nuptialité et fécondité selon le milieu socioculturel. *Economie et Statistique*, 27, pp. 3-42.

Garden, M. and H. Le Bras (1988), La dynamique régionale. In: J. Dupâquier (ed.), Histoire de la population française, Paris, PUF, 3: De 1789 à 1914, pp. 138-166.

INSEE, volumes Données de démographie régionale, parus dans les Collections de l'INSEE: 1954: *Etudes démographiques*, 8, 1964; 1962: D5, 1970; 1968: D23, 1973; 1975, D82, 1981; 1982: D115, 1986.

Noin, D., P.J. Thumerelle and B. Kostrubiec (1986), Analyse géographique des causes de décès en France (1981-1982). *Espace, Populations, Sociétés*, 2, pp. 69-84.

Poussou, J.P., D. Courgeau and J. Dupâquier (1988), Les migrations intérieures. In: J. Dupâquier (ed.), Histoire de la population française, Paris, PUF, 3, de 1789 à 1914, pp. 177-197.

Pumain, D. and T. Saint-Julien (1978), Les dimensions du changement urbain. Paris, CNRS, 202 p.

Pumain, D. and T. Saint-Julien (1989), Recent changes in the French urban system. In: L.S. Bourne, R. Sinclair, M. Ferrer and A. d'Entremont (eds.), The Changing Geography of Urban Systems. Pamplona, Universidad de Navarra, pp. 239-250.

Sautory, O. (1986), Evolution des disparités géographiques de fécondité de 1954 à 1982. *Espace, Populations, Sociétés*, 2, pp. 37-46.

Sautory, O. (1987), Fécondité à la ville et à la campagne. In: INSEE, *Données sociales*, pp. 276-281.

Tugault, Y. (1975), Fécondité et urbanisation. Paris, PUF, Travaux et Documents de l'INED, 74.

ANNEX

Table I. Populations in 1982, mean annual rate of natural increase and of net migration (1975-1982) in %, standardized mortality rates, gross reproduction rate, and population density in French départements

Regions départements	Population in 1982	Mean annual rate of natural increase in % 1975 -1982	Mean annual rate of net migration in % 1975 -1982	Standard-ized mortality rate per 1000	Gross repro-duction rate	Popu-lation density per km²
France métropolitaine	54,334,871	0.40	0.06	10.1	0.91	100
11 Ile de France	10,073,059	0.68	-0.39	9.3	0.88	839
75 Ville de Paris	2,176,243	0.29	-1.09	9.0	0.78	20,647
77 Seine-et-Marne	887,112	0.63	1.70	10.2	0.94	150
78 Yvelines	1,196,111	0.98	0.47	9.1	0.96	524
91 Essonne	988,000	0.91	0.10	9.0	0.90	548
92 Hauts-de-Seine	1,387,039	0.62	-1.13	9.1	0.87	7,898
93 Seine-st-Denis	1,324,301	0.87	-0.84	10.0	0.99	5,607
94 Val-de-Marne	1,193,655	0.69	-0.93	9.5	0.87	4,871
95 Val-d'Oise	920,598	0.87	0.45	9.9	0.95	739
21 Champagne-Ardennes	1,345,935	0.52	-0.42	10.3	0.96	53
08 Ardennes	302,338	0.47	-0.80	11.1	0.99	58
10 Aube	289,300	0.31	-0.09	9.8	0.90	48
51 Marne	543,627	0.68	-0.31	10.2	0.94	67
52 Haute-Marne	210,670	0.45	-0.57	10.6	1.02	34
22 Picardie	1,740,321	0.51	0.03	11.1	0.97	90
02 Aisne	533,790	0.43	-0.41	11.4	1.00	72
60 Oise	661,781	0.67	0.63	10.6	0.97	113
80 Somme	544,570	0.42	-0.24	11.4	0.94	88
23 Haute-Normandie	1,655,362	0.61	-0.08	10.8	0.99	134
27 Eure	462,323	0.54	0.76	10.5	0.98	77
76 Seine-Maritime	1,193,039	0.64	-0.39	10.8	1.00	190
24 Centre	2,264,164	0.27	0.47	9.3	0.90	58
18 Cher	320,174	-0.07	0.26	10.0	0.86	44
28 Eure-et-Loire	362,813	0.52	0.63	9.5	0.99	62
36 Indre	243,191	-0.19	-0.09	9.9	0.83	36
37 Indre-et-Loire	506,097	0.39	0.40	8.8	0.86	83
41 Loir-et-Cher	296,220	0.16	0.47	9.0	0.89	47
45 Loiret	535,669	0.47	0.84	9.3	0.95	79
25 Basse-Normandie	1,350,979	0.53	-0.03	10.5	0.97	77
14 Calvados	589,559	0.69	0.05	10.5	0.93	106
50 Manche	465,948	0.41	0.04	10.6	1.02	78
61 Orne	295,472	0.41	-0.31	10.3	0.99	48

Table I. (Continued)

Regions départements	Population in 1982	Mean annual rate of natural increase in % 1975 -1982	Mean annual rate of net migration in % 1975 -1982	Standard-ized mortality rate per 1000	Gross repro-duction rate	Popu-lation density per km²
26 Bourgogne	1,596,054	0.16	0.08	9.9	0.90	51
21 Côte-d'Or	473,548	0.52	0.04	9.4	0.86	54
58 Nièvre	239,635	-0.28	-0.04	10.3	0.88	35
71 Saône-et-Loire	571,852	0.15	-0.10	9.9	0.92	67
89 Yonne	311,019	-0.02	0.57	10.1	0.98	42
31 Nord-Pas-de-Calais	3,932,939	0.60	-0.53	12.4	1.07	317
59 Nord	2,520,526	0.65	-0.59	12.4	1.07	439
62 Pas-de-Calais	1,412,413	0.51	-0.42	12.5	1.07	212
41 Lorraine	2,319,905	0.51	-0.57	11.5	0.93	99
54 Meurthe-et Moselle	716,846	0.56	-0.67	11.2	0.91	137
55 Meuse	200,101	0.26	-0.52	11.2	1.01	32
57 Moselle	1,007,189	0.59	-0.58	12.1	0.91	162
88 Vosges	395,769	0.36	-0.42	11.2	1.00	67
42 Alsace	1,566,048	0.38	0.09	11.7	0.87	189
67 Bas-Rhin	915,676	0.37	0.16	11.7	0.84	193
68 Haut-Rhin	650,372	0.39	-0.02	11.8	0.91	184
43 Franche-Comté	1,084,049	0.58	-0.25	10.3	0.98	67
25 Doubs	477,163	0.89	-0.70	10.0	0.99	91
39 Jura	242,925	0.23	0.03	10.1	0.97	49
70 Haute-Saône	231,962	0.30	0.35	10.7	0.98	43
90 Territoire-de Belfort	131,999	0.57	-0.13	11.0	0.99	217
52 Pays de la Loire	2,930,398	0.63	0.20	10.0	0.99	91
44 Loire-Atlant.	995,498	0.65	0.28	10.8	0.97	146
49 Maine-et-Loire	675,321	0.80	0.21	9.5	1.05	94
53 Mayenne	271,784	0.57	-0.04	10.2	1.02	53
72 Sarthe	504,768	0.50	-0.09	9.2	0.92	81
85 Vendée	483,027	0.52	0.48	9.9	1.02	72
53 Bretagne	2,707,886	0.28	0.33	11.7	0.95	100
22 Côtes-du-Nord	538,869	0.06	0.32	11.5	0.95	78
29 Finistère	828,364	0.15	0.27	11.6	0.95	123
35 Ille-et-Vilaine	749,764	0.58	0.35	11.4	0.93	111
56 Morbihan	590,889	0.29	0.39	12.3	1.00	87

Table I. (Continued)

Regions départements	Population in 1982	Mean annual rate of natural increase in % 1975-1982	Mean annual rate of net migration in % 1975-1982	Standardized mortality rate per 1000	Gross reproduction rate	Population density per km²
54 Poitou-Charentes	1,568,230	0.21	0.16	9.2	0.87	61
16 Charente	340,770	0.13	0.03	9.5	0.86	57
17 Charente-Maritime	513,220	0.13	0.31	9.4	0.89	75
79 Deux-Sèvres	342,812	0.33	-0.04	0.1	0.94	57
86 Vienne	371,428	0.28	0.28	8.7	0.82	53
72 Aquitaine	2,656,544	0.05	0.55	9.7	0.82	64
24 Dordogne	377,356	-0.33	0.49	9.9	0.81	42
33 Gironde	1,127,546	0.25	0.63	9.7	0.81	113
40 Landes	297,424	-0.13	0.59	9.6	0.82	32
47 Lot-et-Garonne	298,522	-0.04	0.34	9.4	0.86	56
64 Pyrénées-Atl.	555,696	0.06	0.50	9.6	0.83	73
73 Midi-Pyrénées	2,325,319	-0.01	0.36	9.3	0.78	51
09 Ariège	135,725	-0.47	0.22	9.3	0.79	28
12 Aveyron	278,654	-0.14	0.15	9.2	0.84	32
31 Haute-Garonne	824,501	0.29	0.54	9.2	0.74	131
32 Gers	174,154	-0.33	0.23	9.3	0.75	28
46 Lot	154,533	-0.33	0.70	9.5	0.81	30
65 Hautes-Pyr.	227,922	-0.15	0.20	9.8	0.77	51
81 Tarn	339,345	-0.01	0.04	9.1	0.84	59
82 Tarn-et-Garonne	190,485	-0.08	0.63	9.3	0.82	51
74 Limousin	737,153	-0.36	0.35	9.7	0.75	44
19 Corrèze	241,448	-0.34	0.42	10.1	0.79	41
23 Creuse	139,968	-0.82	0.21	10.1	0.75	25
87 Haute-Vienne	355,737	-0.18	0.35	9.2	0.72	64
82 Rhône-Alpes	5,015,947	0.50	0.20	9.9	0.93	115
01 Ain	418,516	0.42	1.15	9.7	0.96	73
07 Ardèche	267,970	-0.06	0.66	9.9	0.89	48
26 Drôme	389,781	0.34	0.74	9.6	0.96	60
38 Isère	936,771	0.60	0.63	9.9	0.91	126
42 Loire	739,521	0.34	-0.40	10.5	0.95	155
69 Rhône	1,445,208	0.67	-0.51	9.8	0.95	445
73 Savoie	323,675	0.38	0.49	10.1	0.88	54
74 Haute-Savoie	494,505	0.64	0.80	10.0	0.91	113

Table I. (End)

Regions départements	Population in 1982	Mean annual rate of natural increase in % 1975-1982	Mean annual rate of net migration in % 1975-1982	Standardized mortality rate per 1000	Gross reproduction rate	Population density per km²
83 Auvergne	1,332,678	-0.01	0.04	10.4	0.83	51
03 Allier	369,580	-0.25	-0.08	10.3	0.82	50
15 Cantal	162,838	-0.10	-0.22	10.4	0.87	28
43 Haute-Loire	205,895	-0.16	0.20	10.1	0.90	41
63 Puy-de-Dôme	594,365	0.22	0.14	10.6	0.81	75
91 Languedoc-Roussillon	1,926,514	-0.02	1.07	9.4	0.84	70
11 Aude	280,686	-0.31	0.68	9.0	0.83	46
30 Gard	530,478	0.07	0.96	9.6	0.88	91
34 Hérault	706,499	0.13	1.09	9.3	0.81	116
48 Lozère	74,294	-0.13	0.04	10.2	0.92	14
66 Pyrénées-Orient	334,557	-0.19	1.79	9.6	0.86	81
93 Provence-Alpes-Côte d'Azur	3,965,209	0.13	0.96	9.5	0.86	126
04 Alpes-de-Haute Provence	119,068	-0.12	0.96	9.5	0.81	17
05 Hautes-Alpes	105,070	0.17	0.94	9.4	0.89	19
06 Alpes-Maritimes	881,198	-0.22	1.31	8.7	0.82	205
13 Bouches-du-Rhône	1,724,199	0.32	0.47	10.0	0.86	339
83 Var	708,331	0.06	1.74	9.7	0.90	119
84 Vaucluse	427,343	0.27	1.04	9.9	0.91	120
94 Corse	240,178	-0.01	-2.66	9.6	0.90	28
2a Corse-du-Sud	108,604	-0.02	-2.37	10.4	0.94	27
2b Haute-Corse	131,574	0.00	-2.89	9.1	0.87	28