Estimation of French Internal Migration in the Period 1990-1999 and Comparison with Earlier Periods

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Beginning in 1962, each French census has included a question that asks for a person's place of residence on 1 January of the year of the last census[1]. However, if we want to measure temporal trends in internal migration in France, the information provided by this question cannot be used directly and in fact raises two problems that are hard to overcome.

First, even if the period over which migrant numbers are measured is constant (for example an interval of five years, as in Australia, Canada, Great Britain, Japan and the United States, around the 1970s (Long and Boertlein, 1976)), an estimate has to be given of the annual average migration rate. Yet many studies have shown that because of repeat and return migration by the same individual, the number of *migrants* such a question measures is not even approximately equal to five times the annual number (Courgeau, 1973; Long, 1988; Rees, 1977). Without additional information, therefore, this migrant count measured over a period of five years cannot be used to estimate the corresponding annual number. The simple solution to this problem is to ask the same question for a period of one year, as has been done in Australia, Great Britain, Japan and the United States, in the same censuses (Long and Boertlein, 1976). It then becomes clear that the rate over five years is not five times higher than the annual rate. In the United States, for instance, for an annual rate of 19.2% the corresponding five-year rate is 47.0% as compared with an expected rate of 96.0%. Repeat and return migration is responsible for this two-fold difference.

Second, unlike other countries where this question is asked over a period of five years prior to the census, allowing measurement over a constant period between successive censuses, estimation of annual rates of migration is made even harder in France by the large variation in the periodicity of the census (ranging between six and nine years).

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[1] One of the reasons given for this practice is that by comparing these data with the population measured in a previous census it is possible to infer an estimate of the number of emigrants going abroad during the inter-censal period. However, this measurement is subject to so large an error that it has hardly ever been possible to use it for this purpose (Baccaïni, 1999).

These two problems must be addressed by analysing the successive moves made by individuals, based on finely detailed survey data, and by modelling this distribution over time using a small number of parameters.

1. Short presentation of the model and the evaluation of its parameters

We demonstrated (Courgeau, 1973) that this was possible and that the model applied to migration in such diverse contexts as the United States (Morrison, 1970), Sweden (Wendel, 1953) and France (for which the estimation was made using an INED Demographic Situation survey, presented in Girard and Zucker, 1968). It should be noted, however, that although the model for these three countries is the same, the parameter estimates differ greatly. For any one country, these parameters will also vary over time. In what follows we present a new estimation of their value based on the Labour Force Surveys from 1991 to 1999 and the Young People and Careers survey of 1997 (L'Hospital, 2001) and we apply these new parameters to data from the 1999 census.

Longitudinal and period analysis of data for France and for the United States and Sweden lead to the following conclusions:

1) The probability for a person who has migrated once of migrating again in the future, K, is largely independent of the previous migration's rank order but is affected by the geographical subdivision on which moves are measured.

2) For the population that will migrate again in the future, the annual hazard rate for this migration is independent of the duration of residence between each migration, the rank order of this migration and the geographical subdivision used. The instantaneous hazard rate of a new migration, k, has of course the same properties.

3) Return migration to an area of origin is proportional, in the ratio l, to moves of a rank higher than one, made throughout the period under study. It follows that the probability for a person who has migrated of making a return migration is Kl.

If we assume also that the instantaneous hazard rate for migration of any rank, p, is virtually constant over the inter-censal period under consideration and that the total population, P, varies little (these conditions simplify the formulation of the solution but can be removed without difficulty), then we show that the number of migrants during a given time period t can be written:

$$M(t) = Pp\left[(1 - K(1 + l))t + \frac{K(1 + l)}{k}(1 - e^{-kt}) \right] \qquad [1]$$

We have merely to estimate using existing data a probability of migration corrected for return migration[2] $K(1 + l)$ and the instantaneous hazard rate for a new migration k, in order to get from a number of

[2] For changes of address, the parameter corresponds closely to pure moving, since moves back to a previous address are negligible.

migrants $M(t)$ to a number of *migrations Ppi* made in the same period, and hence to an instantaneous hazard rate of migration.

To allow for possible variations over time, different surveys have been used:

—for the period 1954-1975, evaluation of the parameters is based on use of a retrospective survey conducted by INED in 1968 on a total of 2,464 persons (Courgeau, 1973);

—for the period 1975-1990, the values are estimated from annual Labour Force Surveys for the period 1976-1988. The numbers involved this time are large but the level of non-response is high in some regions (Courgeau, 1986; INED, 1989; Baccaïni et al., 1993);

—last, a new estimation of their value, based on Labour Force Surveys between 1991 and 1999 in which non-response rates are greatly improved, and on INSEE's 1997 Young People and Careers survey (L'Hospital, 2001), has been applied to the 1999 census data.

L'Hospital demonstrates that the assumptions of this model are always well verified, but that the parameter values have varied in France between the 1970s and the 1990s. Let us look first at the situation for moving corrected for returns (Table 1).

TABLE 1.– ESTIMATES OF THE PROBABILITY OF MOVING CORRECTED FOR RETURN MIGRATION, FRANCE OVER THE LAST FORTY YEARS

Changes of:	Parameter $K(1+l)$		
	1954-75	1975-90	1990-99
Region	0.77	0.59	0.61
Department	0.80	0.70	0.68
Commune	0.76	0.79	0.78
Residence	0.78	n.d.	0.91

Sources: Courgeau (1973) for 1954-1975, Courgeau (1995) for 1975-1990 and L'Hospital (2001) for the 1990s detailed in the text. The Labour Force Survey data on changes of place of residence were not available for the 1980s.

Table 1 makes clear that in the period 1954-1975 this parameter was largely independent of the spatial subdivision used for the analysis[3]. For the two subsequent periods, it increases quite sharply from the largest geographical subdivision, the region, to the lowest level of subdivision, the individual place of residence, though for any given subdivision it remains constant between consecutive periods. The small numbers observed for 1954-1975 (2,464 persons reported their moves) may explain part of these changes. This pattern of increase tells us that the longer the migration distance, the **lower** the probability of making a new migration: in other words, if you have already moved a long way you will move **less**.

The instantaneous hazard rate for a new migration, k, was estimated at 0.18 for the periods before the 1990s. It takes a much higher value, estimated at 0.26, for the 1990s. A more linear variation in this parameter over

[3] The estimates for the 1970s are not significantly different, the variations are random and caused by the small numbers used for the estimation.

time appears likely, but would involve a more complex model, which we will not develop here.

2. *Estimation and comparison of total and age-specific rates of mobility*

Using these parameter values and formula [1], it is possible to get from the numbers of migrants measured over different inter-censal periods, to instantaneous migration hazard rates that are assumed to be constant over each inter-censal period but variable from one period to the next.

Table 2 gives the results for the various inter-censal periods since 1954 (Courgeau, 1978, 1990; Baccaïni et al., 1993).

TABLE 2.– ESTIMATES OF THE INSTANTANEOUS HAZARD RATES OF MIGRATION (PER 1,000) FOR THE VARIOUS INTER-CENSAL PERIODS

Period	Changes of:			
	Region	Department	Commune	Residence
1954-1962	13.3	20.0*	48.7	**
1962-1968	15.1	25.1	53.4	**
1968-1975	17.9	29.0	60.5	97.7
1975-1982	16.5	26.5	58.8	94.7
1982-1990	16.2	25.8	55.6	85.6
1990-1999	16.8	28.7	67.8	122.0

* In 1954-1962 the division of France into departments differed from that in the subsequent periods.
** The 1962 and 1968 censuses did not include a change of place of residence question.
Source: INSEE, census data.

This table shows us that the decline in mobility observed between 1975-1982 and 1982-1990 stopped and even went strongly into reverse in the last inter-censal period. This increase, quite small for inter-regional moves, was largest for changes of residence. This change is confirmed by other measurements of residential mobility. Courgeau et al. (1999) used data from the French electricity utility company (EDF) to show that this measurement of residential mobility registered a strong recovery from the end of 1986, a trend that continued throughout the 1990s. The data from the Labour Force Survey also show a recovery in mobility from the end of 1985 (INED, 1989; Courgeau, 1995; L'Hospital, 2001).

This result contradicts those obtained using the parameter estimates for the period 1975-1990 with no updating, which showed a continuous decline in mobility (Baccaïni, 2001). This estimation gave values for the rates (per 1,000) of 15.9 for changing region (vs. 16.8), 25.2 for changing department (vs. 28.7), 53.2 for changing commune (vs. 67.8), and 80.7 for changing dwelling (vs. 122). As already noted, however, the estimated parameter k of the model varied strongly at the end of the 1980s.

Thus it is important to update the estimation of the model's parameters for each period in order to ensure the validity of the migration rates, since these can vary widely from one period to the next, as occurred for parameter k between the 1980s and the 1990s.

With this method we can also calculate migration rates by age and by sex similar to those provided by Baccaïni (2001), under the assumption that the parameters change little with age. Although this assumption is questionable, it provides us here with an approximate estimate of these rates, presented in Figure 1. It should be noted that the ages shown in this diagram are those reached in 1999 but that the migration takes place on average 4 to 5 years earlier. The discussion that follows considers ages at migration.

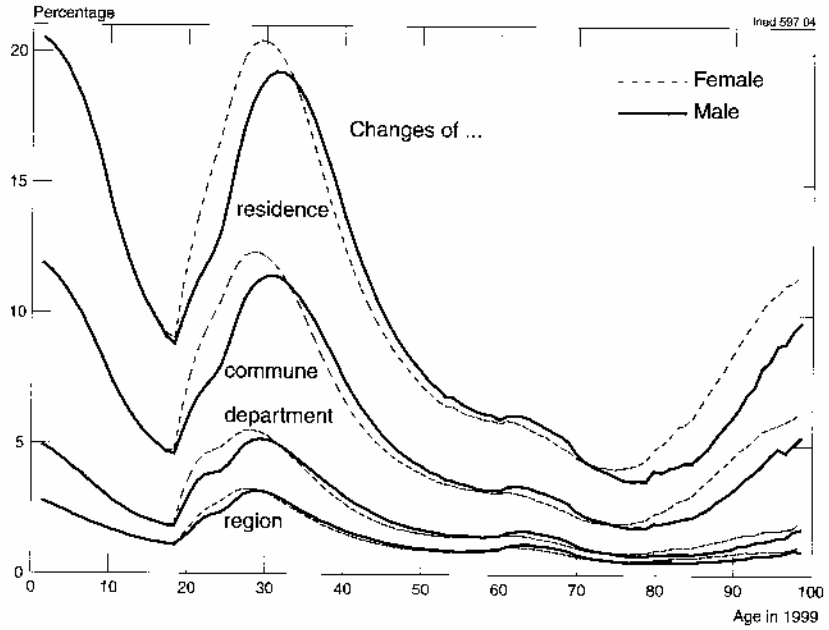

Figure 1.–Estimated annual rates of migration by age and sex, for changes of residence, commune, department and region (period 1990-1999)

Source: INSEE, census data.

The shape of these curves changes little compared with the earlier periods[4]: up to age 14, the migration rates are falling and parallel those for adults aged 25-40, corresponding to childhood moves induced by those of their parents; between ages 15 and 25, they rise sharply as a result of the mobility associated with labour market entry and with union formation, which occurs earlier for women; between ages 25 and 56, stabilization in the labour market and the education of children are responsible for a sharp decrease in mobility; between 56 and 65, it recovers slightly due to retirement, followed by a decrease up to around 76; lastly, renewed mobility that increases with age appears after age 77 and corresponds to moving into ins-

[4] For the comparison with the period 1975-1982, see Courgeau (1990).

titutional accommodation or to returning to live with children for elderly parents. As this diagram shows, the variations by age are large, and are linked to the main stages of the individual life course. This simplified schema is of course much more complex in reality and can only be analysed using data on event histories (Courgeau and Lelièvre, 1992).

3. Discussion and conclusions

Under certain conditions, the modelling approach proposed here allows data on *migrants* to be used to obtain results for *migrations*, which are comparable across successive inter-censal periods of possibly varying length, and to observe mobility trends in France over a period of forty-five years. It can also be used to derive estimates for regional in-migration and out-migration flows in France (Courgeau, 1986, 1988, 2001). However, these results are still only approximate and the estimate obtained is not as precise as would be obtained if the census included a question on address one year ago. For as well as the precision of the model used, we also need to consider the precision of the estimators of the model's parameters, which depends on the sources employed. This precision has certainly improved markedly over time, first through use of the Labour Force Surveys that cover some 60,000 households and whose non-response rate has fallen considerably in recent years (Courgeau, 1995; L'Hospital, 2001), particularly for the Ile-de-France region. Next, the Young People and Careers survey conducted by INSEE in 1997 on over 20,000 individuals aged 19-45, provides longitudinal information on the migration history of a very large population. The INED surveys used initially for estimating the parameters covered at most 3,000 individuals.

This issue will take a different form in future because of the introduction of the redesigned continuous French census, in which a sample of the population is interviewed each year and asked an "address five years ago" question. Here the period of observation is the same from one year to the next and will thus allow simple comparisons, by calculation of the five-year rates. On the other hand, however, the first problem, which arose over estimating annual rates, is not solved by this new mode of data collection: measurement of a five-year rate still does not allow us to estimate an annual rate. The "migrants-migrations" model will thus still have to be used for this estimation.

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