THE URBAN IMPACT OF INTERNAL MIGRATION

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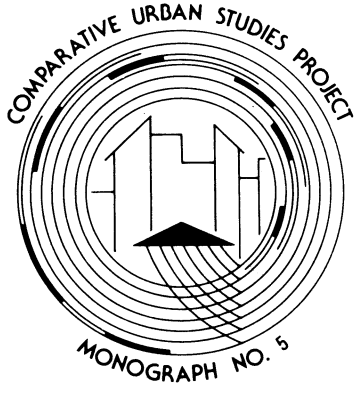

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MIGRATION AND DEMOGRAPHIC PHENOMENA IN FRANCE

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Although migration is more often studied as a result than as a causal factor, this paper investigates how migration as a causal factor may influence the future enactment of demographic phenomena--for instance, new migration, a marriage, or a birth of a child. Migration is distinguished according to whether the areas of departure or destination are rural or urban. The methodology used for this analysis is a generalization of the classical demographic approach. First I examine the age effect and, when it is possible, the duration effect (that is, the duration of time that separates the original migration and the demographic event studied). This general methodology is applied to data on migration in France and should shed new light on the process of urbanization and its demographic consequences in France.

INTERACTIONS BETWEEN MIGRATION AND OTHER DEMOGRAPHIC PHENOMENA

There are three ways in which interactions between demographic phenomena may occur. These interactions include those that 1) prevent the enactment of a phenomenon under consideration; 2) create new behavior; or 3) neither impede nor give rise to the phenomenon being studied.

One example of the first case, a disturbance that may preclude the enactment of the phenomenon under consideration, is mortality. However, as with marriage, one can still make the hypothesis of "non-dependence," namely, that an individual who died single would have had the same behavior if he had lived as those who did not die at the same age (Henry, 1972). This hypothesis differs from that of stochastic independence between phenomena; indeed, the latter requires that the first phenomenon does not in any way influence the distribution of possible values for the second. But the obvious fact of early death modifies the individual's probability of marrying; this probability then becomes zero.

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Although the hypothesis of non-dependence is not directly verifiable, one can compare the marriage at a given age of two sub-populations: the first surviving to a later given age and the second having died before reaching this age. If the marriage rates of the two populations are identical to the time of the mortality of the second, the hypothesis will have a strong chance of being verified, and one is then able to compare such phenomena as the patterns of marriage between two populations with different mortality.

The second type of interaction comprises phenomena that create a new behavior which was not possible before the occurrence of the initial phenomenon. For instance, marriage allows for the possibility of legitimate reproduction. Similarly, serial phenomena would fall into this category--having one child, for example, makes it possible to have the second. In this case, the dependence between the two phenomena is total.

The third case is intermediate between the first two--the disturbing phenomenon neither impedes nor gives rise to the phenomenon being studied. In this case alone, stochastic independence between the two phenomena can exist. If the disturbing phenomenon produces no effect, the hypothesis of non-dependence can still be verified; individuals who experience the disturbance would have had, if they had not experienced it, the same behavior as those who did not experience it. Finally, analysis of the dependence, if it exists, must deal primarily with the effect of age and the effect of the duration of marriage.

In analyzing the interaction between migration and those demographic phenomena which occur after it, the possibility of the three types of outcomes is realized. In general, the term "interaction" is used rather than the term "causal," since most often the effect does not take place in one direction only; that is, the fact of having migrated may influence the probability of marrying. Conversely, the act of marrying may modify the migratory behavior of the individual. Since only one effect is, in fact, considered here, it will be necessary to keep the possible reciprocal effects in mind.

STUDY DESIGN

Patterns of French migration are first examined through census data from 1962 and 1968* to show interactions between

*The census data from 1975 were not yet available when this paper was accepted for publication, but some results were subsequently added.

demographic phenomena. Second, migration is investigated by analyzing data from two retrospective surveys.* Since 1962, when a question on place of residence on January 1 of the previous census year (1954 for the 1962 census, 1962 for the 1968 census) was included in the census, a closer examination of migrants in France has been possible than when there were only questions on birthplace. The 1962 census was collected on a complete basis and in 1968 on a sample basis (one-fourth). In addition, the data from the two retrospective studies conducted in France in the years 1967 and 1972 include about 2,500 persons drawn by a stratified probability sample.** Survey questions concern, in particular, all changes of residence (dates, places, regions) since the age of 15 years and, for the second survey, the makeup of the family (year of marriage and birthdate of each child). Although the small number of respondents does not permit definitive conclusions, it does provide material for some interesting analyses of migration in France. For the purposes of this study, it is assumed that the deceased population would have behaved, if they had lived, in the same way as those surveyed and likewise that sampling error and under-reported events did not unduly bias the results.

CENSUS DATA

French censuses provide the number of migrants during three intercensal periods: 1954-1962, 1962-1968, and 1968-1975. This crude measure does not take into account the number of moves made by the migrants nor the returns to a previous area of residence. It is based on the number of administrative areas between which the moves are made: *communes* (near 38,000 units) and *regions* (22 units).*** Table 1 presents the number of migrants and the annual rate of internal migration.

*These retrospective surveys were conducted by the Department of Psycho-Sociology of the National Institute for Demographic Studies, Paris. The first survey was in November and December 1967 and included 2,692 persons (D. Courgeau, 1973), the second was in December 1972 and January 1973 and included 2,554 persons (H. Bastide and A. Girard, 1974). In the tables of this paper these surveys are indicated by the years 1967 and 1972.

**In the 1972 survey, the sample studied in rural areas had been intentionally reduced. It is thus necessary to weight the sample in order to have results representative for all of France.

***"European" France (1968) is divided into 37,708 communes ("parishes"), the local unit of government administered by an elected municipal council. Although 197 communes have populations greater than 30,000, the majority (approximately 88%) have fewer than 1,500 inhabitants each. The communes are, in turn, grouped into cantons (3,209 in 1968); the average canton includes 12 communes.

The nation is divided into 95 départements (roughly equivalent to the American "state"). Since 1960, the départements have been grouped into 22 "programme (continued)

TABLE 1: MIGRANTS BETWEEN COMMUNES AND REGIONS

Period	Sample Population (in 1,000s)	Migrants between Communes: Number (in 1,000s)	Migrants between Communes: Annual Rate (percentage)
1954-1962 (8.22 years)	44,650	12,039	3.28
1962-1968 (6.21 years)	47,367	11,453	3.90
1968-1975 (7.14 years)	50,922	15,454	4.25

Period	Sample Population (in 1,000s)	Migrants between Regions: Number (in 1,000s)	Migrants between Regions: Annual Rate (percentage)
1954-1962 (8.22 years)	44,650	3,286	0.89
1962-1968 (6.21 years)	47,367	3,221	1.10
1968-1975 (7.14 years)	50,922	4,562	1.25

SOURCE: *Migrations 1954-1962*, p. 56-57; *Annuaire Statistique de la France 1970-71*. p. 52-53; Courgeau, 1978:527.

regions," mainly for purposes of planning and budgetary considerations and should thus not be considered as "political" subdivisions. This paper deals with the administrative units of communes, regions, and départements. (For greater detail on the above, see "France," The Statesman's Year-Book, Statistical and Historical Annual of the State of the World for the Year 1978-1979 (John Paxton, ed., 115th edition. New York: St. Martin's Press, 1978, pp. 457-487).

The annual rate, calculated by dividing the period rate by the duration of the period, shows an increase in migration. Although the increase may be related to the duration of the period and is lowered when taking this duration into account, it remains around 10% from 1954-1962 to 1962-1968 (Courgeau, 1973). Because residential mobility is not given by these census data* and migration intervals are changing so that no international comparisons of mobility are possible, the retrospective surveys were used to supplement the present analysis.

Migration selectivity with respect to age plays an important role: The inter-regional migration rate between 1962 and 1968 is near 5% for the age group 15-19 years in 1968, grows to 15% for the age group 25-29 years, and falls to 3% for the later ages. If such selectivity is applicable for net migration rates of towns, this pattern of migration will have an impact on the future growth of these towns. Table 2 shows the net migration rates for two French départements: Bouches-du-Rhône (metropolitan area of Marseille) and Rhône (metropolitan area of Lyon) (see following page).

The net migration figures in Table 2 show increases in the number of youth in these cities and decreases for the number of elderly people (from fifty years of age and older). This structural change will induce a change in the city's population growth. Although the fertility for urban areas is lower than for rural areas,** the annual birthrate for rural areas is lower than for urban areas (for the 1962-1968 period this annual rate is 16.3 per thousand for rural areas and 18.8 per thousand for urban ones). Conversely, the annual death rate for rural areas is 13.1 per thousand and for urban areas, 10.5 per thousand.

Even if net migration to towns decreases, as shown by the last censuses (1962, 1968, 1975), the effect on birthrates of past migration will be more lasting. Table 3 shows the distribution of migrants between rural areas and growing cities.***

*The census data from 1975 give residential mobility for the 1968-1975 period.

**For the married cohorts 1950-1951, the average numbers of children before 10 years of marriage are 2.52 for rural areas, 2.36 for towns of less than 20,000 inhabitants, 2.19 for the towns between 20,000 and 2,000,000 inhabitants, and 1.91 for the metropolitan area of Paris.

***Small cities (less than 20,000 inhabitants), medium-sized cities (from 20,000 to 100,000 inhabitants), large cities (more than 100,000 inhabitants), and the metropolitan area of Paris.

TABLE 2: NET MIGRATION RATE BY AGE FOR THE DÉPARTEMENTS OF BOUCHES DU RHÔNE AND RHÔNE, FOR THE PERIOD 1962-1968.

Age in 1968		0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39
Net Migration Rate (Percentage)	Bouches du Rhône	1.88	1.97	1.40	1.81	4.86	1.61	0.75	1.44
	Rhône	5.16	1.44	2.14	5.36	16.66	9.42	2.46	.99

Age in 1968		40-44	45-49	50-54	55-59	60-64	65-69	70-74	+75
Net Migration Rate (Percentage)	Bouches du Rhône	1.34	0.66	-.64	-1.43	-1.35	-1.09	.05	.40
	Rhône	1.39	1.12	-.16	- .93	-2.47	-2.93	-1.96	-.44

SOURCE: *Fascicules departementaux du recensement de 1968.* INSEE, 1971, p. 32.

TABLE 3: NUMBER OF MIGRANTS BETWEEN RURAL AREAS AND TOWNS FOR THE PERIOD 1962-1968, IN THOUSANDS.

Area of origin in 1962 \ Area of Destination in 1968	Rural	Small Cities	Medium-sized Cities	Large Cities	Metropolitan area of Paris
Rural		698	524	525	232
Small Cities	407		259	338	137
Medium-sized Cities	270	203		299	136
Large Cities	358	253	242		185
Metropolitan Area of Paris	239	176	157	134	

SOURCE: G. Desplanques, 1975, p. 50.

There is a hierarchical distribution of migrants from rural areas to small cities, medium-sized cities, and large cities. A city of a given size gains more people from cities of smaller size or rural areas than it sends to them. Conversely, it sends more migrants to still larger cities than it receives. These results are not true for the metropolitan area of Paris, which sends more migrants to rural areas and small towns than it receives from them.

This brief overview of census data indicates the importance of the present study of the demographic impact of internal migration in France. However, since the official data are obtained from questions concerning residence on a specified past date, they do not give information about *successive moves* made by one individual during his life. Such information is necessary to determine to what extent a person (*mover*) who has moved in the recent past would be more oriented toward future mobility than a past *stayer*. Other data were needed to study whether stepwise migration, which implies a migration by steps from a rural environment via smaller cities to larger cities, is a general pattern. The official census results do not show if such patterns are in effect, but only that larger cities draw their population from medium-sized cities and that these places are, in turn, receiving migrants from small cities. The retrospective survey data allow examination of return migration. Similarly, census data cannot give us information about the effects of a previous migration on marriage: Does a previous mover have the same choice of marrying as a stayer? For example, departures from rural areas are greater for women than for men in urban areas (during the period 1962-1968, 1,029,580 women departed from rural areas, as compared to 941,840 men). Similarly, the census data give us some information on the changes of birthrates induced by young migrants in urban areas, but they do not give us information on the changes of fertility that can be detected between rural stayers and movers from rural areas toward urban areas.

THE RETROSPECTIVE SURVEY DATA

In order to set the background for further analysis, I begin with a retrospective look at migration in France between 1963 and 1972. The data in Table 4 show that the annual probability of moving is near 10% in France. This number may be compared with data from the United States, where nearly 20% of persons 15 years old and over move in a year's time and with data from Great Britain where this rate is 11%. From 1963 to 1970 there is a regular increase in the probability of moving from

TABLE 4: ANNUAL PROBABILITY OF MOVING FROM ONE HOUSE TO ANOTHER

Years	1972	1971	1970	1969	1968
Movers (percentage)	7.8	8.8	10.8	10.7	10.3
Years	1967	1966	1965	1964	1963
Movers (percentage)	9.5	8.1	9.1	7.5	7.0

SOURCE: Survey, 1972.

one house to another in France, compared to a nearly unchanged rate in the United States since 1948.

THE ANALYSIS

MULTIPLE MOVES

A major effect of one move is to allow for a new move, since this may be a repeated phenomenon. Recall the second type of causality discussed earlier (p. 1), where the dependence between phenomena is total and new demographic phenomena are created. *A priori*, at least two variables can intervene: the age at which the prior move took place and the duration of time which separates these moves. Since the survey sample is small, the individuals are grouped into larger age-categories for the prior move. It is useful to look at the exact duration that separates one move from the next move in this analysis.*

Let ${}_aS_x^{n-1}$ be the number of individuals of age category "a" at the (n-1) move, who x years after this move have not made an n^{th} move. Between the duration x and x + 1, ${}_aM_x^n$ of these individuals made an n^{th} move. Thus, one is able to state the traditional rate for the n^{th} move:

*Since only the year of migration was asked for, one cannot establish the exact duration separating migrations; the results, however, do not disturb the theoretical analysis.

$$ {}_am_x^n = \frac{{}_aM_x^n}{{}_aS_x^{n-1}} $$

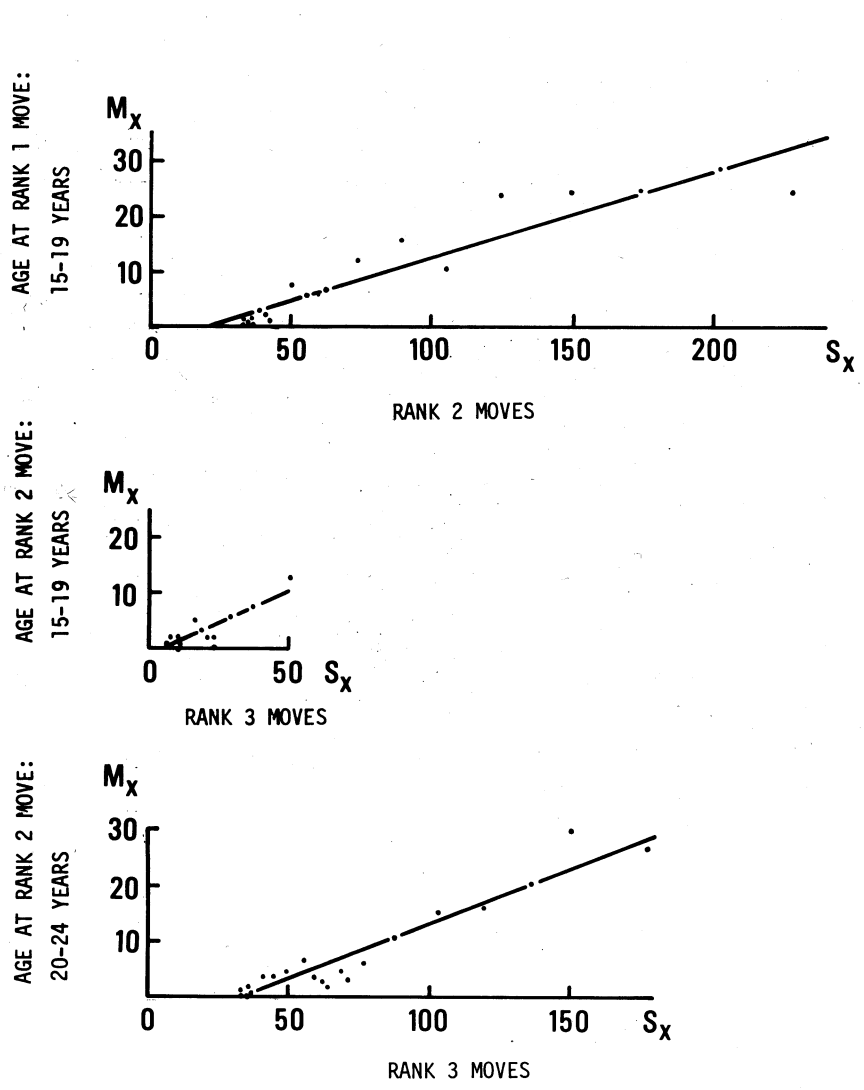
It is appropriate to note that the number ${}_aS_x^{n-1}$ diminishes when we reach x + 1, not only because of new moves, but also because certain individuals are not reached by the survey.* The assumption also is made that if one had observed individuals left out of the survey, their behavior would have been the same as those included.

One can summarize these rates over durations until a given duration x, by an index of ${}_aK_x^n$ of order n (order refers to the number of the move that is made). For x = 20, for example, it is the percentage of individuals who have made at least an n^{th} move 20 years after having made the (n-1) one. Since there is no maximum duration after which no move is possible, the problem of a limit towards which this index approaches as the duration x increases cannot be resolved easily.

Figure 1 presents an example showing the number of movers for the probability of Rank 2 (second move) and Rank 3 (third move) for the cohort born before 1923, having first moved between 15 and 19 years of age. Note that the variation of ${}_aM_x^n$ as a function of ${}_aS_x^{n-1}$ (when x is variable and a and n remain the same) can be considered as roughly linear. As one draws a line through the points observed, a very satisfactory summary of the phenomenon can be obtained by the use of two indices; the first gives the limiting value ${}_a\hat{K}^n = \lim_x {}_aK^n{}_x$ under the hypothesis of a linear model. This is .91 for the example given. The second index ${}_a\mu_x^n$ gives the annual probability of movement for the true risk population which is independent of duration and is represented by the slope of the regression line (see Appendix 1). In

*The deletions might affect the denominator of the rate if they took place during the course of a year, but owing to the fact that the surveys had been made at the end of the year, they are not involved here. Of course, if one is working with age-categories of one year, these deletions would not be relevant in any case.

FIGURE 1. NUMBER OF MOVERS OF RANK N AS A FUNCTION OF THE POPULATION HAVING MADE A MOVE OF (N-1) ONLY



our example, the value is .16. The results of the frequency of movements of different ranks by age for a 20-year period is given in Table 5. (Future analyses should determine if these results are distorted when the length of observation time changes.) Since these analyses are based on all the residence changes of an individual, international comparisons of these indices are possible. This estimation of multiple moves also can be applied to cases in which a move is defined as a residential shift between specific, geographically delimited areas. In the latter case, international comparison is no longer possible because the results will be a function of the definition of the spatial area used.

To extend the analysis further, I consider movement between two geographic areas. One geographic classification is particularly interesting: between generalized urban and rural areas or between cities of different size. This strategy enables us to eliminate the effect of the distance separating areas since these geographic units, except for very large cities, are fairly uniformly distributed over France. However, a traditional demographic rate is no longer satisfactory because movers between two areas are related not only to the population of the zone of origin, but also of destination. Next, I will show how to eliminate this factor.

Let P_i^t and p_j^t be the populations at Time t for types of communities i and j, and between them a flow of movers M_{ij} for period t to t'. The probability m_{ij} that a first individual drawn from the population p_i^t and another individual drawn from the population $p_j^{t'}$ will be the same is

$$m_{ij} = \frac{M_{ij}}{P_i^t P_j^{t'}}$$

This index eliminates the effects on the number of movers of the size of the population at origin and destination. Under certain conditions the index can also be generalized in the case of a longitudinal study (see Courgeau, 1975). Note that this index is independent of the geographic classification of the remaining areas outside the territory; it allows the grouping of different movements into a single index, which is a weighted mean of the indices of each flow; and it can be applied to movements of diverse ranks, with the conditions that the previous movement is defined. In particular, this analysis enables us to compare the

TABLE 5. FREQUENCY OF MOVEMENTS OF DIFFERENT RANKS FROM A GIVEN AGE, FOR A PERIOD OF TWENTY YEARS

Change of	Cohorts Born	Mean Age of Reference: (a)	K_{20}^1	N*	K_{20}^2	N	K_{20}^3	N
Residence	before 1923	17.5	.92	654	.86	227	.81	50
		22.5	.74	388	.77	260	.82	177
		27.5	.53	200	.60	147	.73	125
		35.0	.42	123	.58	56	.46	127
	in 1923-1942	17.5	.85	949	.92	311	.98	79
		22.5	.74	499	.78	460	.81	253
		27.5	.54	249	.69	158	.71	237
		35.0	.28	143	.55	72	.67	180
Département	before 1923	17.5	.38	675	.74	87	--	15
		22.5	.25	556	.55	123	.49	53
		27.5	.12	470	.47	65	.58	53
		35.0	.10	428	--	36	--	--
	in 1923-1942	17.5	.33	967	.69	120	--	20
		22.5	.23	821	.62	138	.66	72
		27.5	.16	733	.47	64	.47	62
		35.0	.09	560	.49	63	.61	52

Change of	Cohorts Born	Mean Age of Reference: (a)	K_{20}^4	N	K_{20}^5	N
Residence	before 1923	17.5	--	11	--	1
		22.5	.81	72	--	22
		27.5	.75	92	.88	30
		35.0	.60	120	.65	84
	in 1923-1942	17.5	--	20	--	5
		22.5	.92	110	--	44
		27.5	.70	159	.88	83
		35.0	.59	179	.61	115
Départment	before 1923	17.5	--	4	--	1
		22.5	--	18	--	5
		27.5	--	19	--	11
		35.0	--	26	--	12
	in 1923-1942	17.5	--	3	--	1
		22.5	--	18	--	8
		27.5	--	28	--	13
		35.0	--	40	--	15

*N = number of observations.
SOURCE: Survey, 1972.

return moves with other types of movements and to determine if further movements upward in the rural-urban hierarchy take place by stages.

Findings

First, on the basis of the 1972 survey, I determine whether the fact of having made a previous migration modifies the probability of making another. To do this, I examine the various populations having experienced their last move at given ages during a period of twenty years.* Table 5 gives the results for two large cohorts, those born before 1923 and those born between 1923 and 1942, for both changes in residence and movement between départements; this table enables us to see a great difference between the first move and subsequent moves, especially for changes of départements. The probability of making an initial change of département is generally low. In contrast, when one has made at least one change, the probability of making a further one is at least twice as great. In addition, the more the reference-age increases, the smaller is the likelihood of making either a first or subsequent move. However, this decline is much more evident for the first move.** For moves of a rank higher than one, made at a given age, there is a very slight increase in their frequency with rank.

The estimates of the coefficients K and μ for moves of ranks higher than one can be calculated by the method of least squares (see Appendix I for a full explanation of this procedure). Table 6 lists the estimates of the indices over a 20-year period.

Comparisons of the estimates of $\hat{K}$ to those K's calculated in 20-year periods reveal that two frequencies are very close: One is able to show with little difficulty that after 20 years practically no new migration occurs (only 5% of the initial population carries out a new move after twenty years).

The variations of $\hat{\mu}$ show that, for a given move, this probability decreases slightly with age: the younger the subjects are at the last move, the greater a chance of a new move. A slight effect of rank appears: For moves made when young, for a given age, the probability of making a new move increases with rank; for moves made when the subjects are older, the probability decreases slightly with rank. In contrast, the moves made

*See Courgeau (1973 and 1974) for details on the 1967 survey; the results are similar to those of the 1972 survey except for the first migration, K^1.

**The few deviant findings are those in which the numbers surveyed are less than 100. This note holds true for all of the following analyses.

TABLE 6: ESTIMATES OF THE INDICES $\hat{K}$ AND $\hat{\mu}$

Change of	Cohorts Born	Age at Prior Move	$\hat{K}^2$	$\hat{\mu}^2$	N^*	$\hat{K}^3$	$\hat{\mu}^3$	N
Residence	before 1923	15-19	.91	.16	227	.88	.24	50
		20-24	.77	.16	260	.80	.20	177
		25-29	.60	.14	147	.74	.16	125
		30-39	.56	.19	56	.50	.12	127
	in 1923-1942	15-19	.95	.18	311	.98	.25	79
		20-24	.78	.17	460	.77	.22	253
		25-29	.67	.20	158	.69	.18	237
		30-39	.59	.19	72	.61	.12	180
Département	before 1923	15-19	.76	.19	87	-	-	16
		20-24	.57	.14	123	.46	.23	53
		25-29	.48	.17	65	.58	.16	53
		30-39	-	-	36	-	-	43
	in 1923-1942	15-19	.68	.21	120	-	-	20
		20-24	.62	.19	138	.57	.26	72
		25-29	.53	.18	64	.57	.11	62
		30-39	.45	.25	63	.49	.14	52

Change of	Cohorts Born	Age at Prior Move	$\hat{K}^4$	$\hat{\mu}^4$	N	$\hat{K}^5$	$\hat{\mu}^5$	N
Residence	before 1923	15-19	-	-	11	-	-	1
		20-24	.78	.24	72	-	-	22
		25-29	.79	.12	92	.86	.20	50
		30-39	.65	.11	120	.67	.13	84
	in 1923-1942	15-19	-	-	20	-	-	5
		20-24	.86	.25	110	-	-	44
		25-29	.66	.23	159	.83	.24	83
		30-39	.68	.10	179	.78	.17	115
Département	before 1923	15-19	-	-	4	-	-	1
		20-24	-	-	18	-	-	5
		25-29	-	-	19	-	-	11
		30-39	-	-	26	-	-	12
	in 1923-1942	15-19	-	-	3	-	-	1
		20-24	-	-	18	-	-	8
		25-29	-	-	28	-	-	13
		30-39	-	-	40	-	-	15

*N = number of observations.

SOURCE: Survey, 1972.

between départements give the same value of $\hat{\mu}$; this probability seems independent, therefore, of geographic classification. Figure 2 gives a summary view of the effects of rank and age on these two indices.

This analysis confirms in more refined form, the results obtained from my 1967 investigation (Courgeau, 1973). The probability that an individual will carry out a new move depends somewhat on duration, rank probability of move, and on the geographic classification used to define a move. It decreases with the age at the time of the last move.

Table 7 presents a geographic classification of rural and differentiated urban areas. For this analysis, data from the 1967 study are used. For multiple moves, the general notations are $M_{ijk\cdots}$, that is, the number of individuals that make a move from Category i of a commune to Category j, followed by a new move to Category k, and so on, during an observation period of 35 years (cohorts born before 1923 and observed between ages 15 and 50).

The importance of return moves compared with other types of moves is shown by comparing the returning movers ($M_{i.i}$, for example, that make a move out of Category i, followed by a return to this category, the point indicating that the intermediate category of residence may be elsewhere out of Category i) to the other movers ($M_{i.j}$, when j is the whole country excluding i). The corresponding indices m ($m_{i.i}$ and $m_{i.j}$ in the example) are calculated in Table 7 (see Courgeau 1975 for details of this calculation).

When the departure from an urban area is directly followed by a return, there is a frequency nearly 5 times greater than that of other movements, independent of the rank of departure. On the other hand, for the rural departures, the returns at the second rank of migration are only slightly higher than other migrations and are nearly the same at Rank 3 ($m_{.i.i}$). Table 8 gives the data for return movement following an intermediate stage move made before the return.

Although the cases observed are few, one sees that the influence of the first residence no longer affects the movement from the Rank 3 move. Other results, although obtained with an even smaller number of cases (Courgeau, 1975), generally confirm this finding. Therefore, if the influence of the n^{th} residence strongly affects the choice of the (n+2), residences of ranks inferior to n no longer influence the choice of the (n+2).

FIGURE 2. SCHEMATIC FIGURE SHOWING THE CHANGES IN THE INTENSITY OF MIGRATIONS ($\hat{K}$) AND IN THE ANNUAL PROBABILITY OF A NEW MOVE, FOR FUTURE MOVERS ONLY ($\hat{\mu}$), BY AGE AND NUMBER OF PREVIOUS MOVE

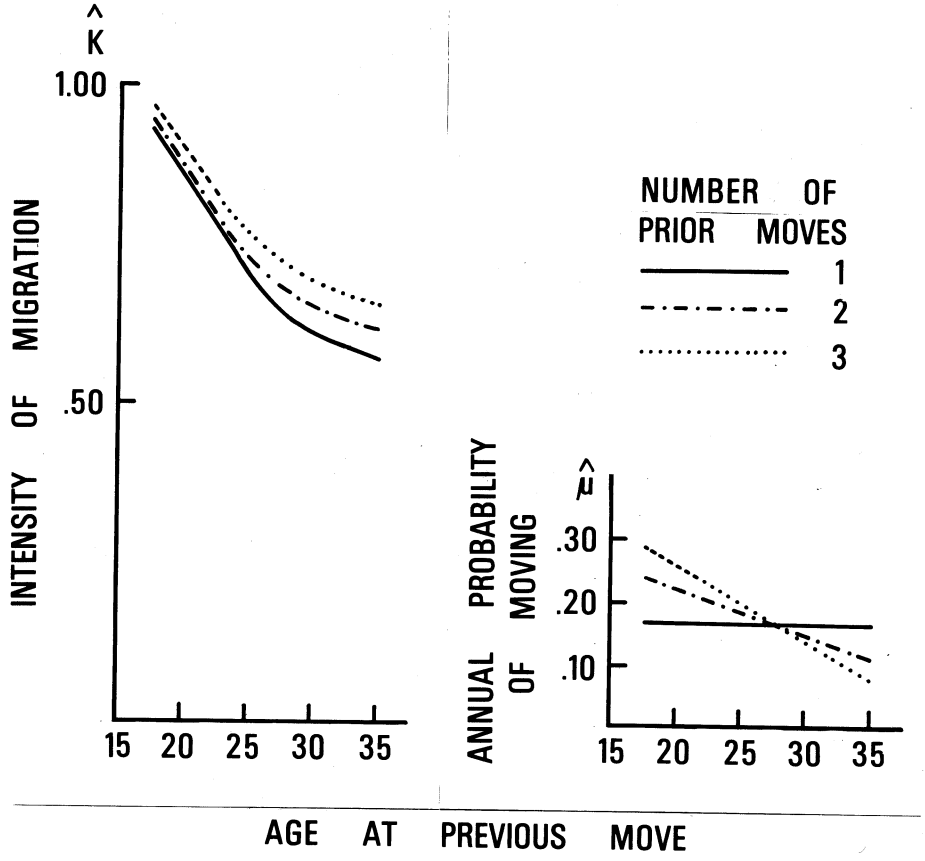


TABLE 7: DIRECT RETURN MOVEMENT

Category of Commune	$M_{i.i}$	$m_{i.i}$ (per 10,000)	$M_{i.j}$	$m_{i.j}$ (per 10,000)
Rural	62	9.2	39	5.7
Small Cities	19	22.0	15	3.4
Medium-sized Cities	20	21.7	20	5.5
Large Cities	20	32.5	14	4.5
Paris Agglomeration	13	24.2	9	4.6
Total	134	13.9	97	4.9

Category of Commune	$M_{.i.i}$	$m_{.i.i}$ (per 10,000)	$M_{.i.j}$	$m_{.i.j}$ (per 10,000)
Rural	12	4.5	7	4.2
Small Cities	12	18.7	15	4.5
Medium-sized Cities	8	17.7	7	3.9
Large Cities	14	22.2	18	5.8
Paris Agglomeration	5	9.7	7	3.8
Total	51	10.4	54	4.6

SOURCE: D. Courgeau, 1975, pp. 88, 89.

TABLE 8: RETURN MIGRATION WITH AN INTERMEDIATE MOVE

Category of Commune	$M_{i..i}$	$m_{i..i}$ (per 10,000)	$M_{i..j}$	$m_{i..j}$ (per 10,000)
Rural	12	3.1	34	7.4
Small Cities	3	8.7	14	6.0
Medium-sized Cities	4	7.1	14	5.3
Large Cities	3	7.5	10	4.3
Paris Agglomeration	1	3.2	10	6.7
Total	23	4.2	82	6.1

SOURCE: D. Courgeau, 1975, p. 90.

By eliminating the return movements we can see if, among the other movements, certain types are more frequent. In particular, movements progressing by stages through the urban hierarchy, symbol M_{++} (for example, movements from rural type to smaller cities, then to medium-sized cities), are no more frequent than other movement, symbol $\bar{M}_{++}$, as set forth in Table 9.

TABLE 9: STAGE MOVEMENTS THROUGH URBAN HIERARCHY

M_{++}	m_{++} (per 10,000)	$\bar{M}_{++}$	$\bar{m}_{++}$ (per 10,000)
27	5.2	70	4.6

SOURCE: D. Courgeau, 1975, p. 92.

MIGRATION AND MARRIAGE

This paper considers whether staying or moving (excepting moves made for the purpose of marrying) modifies an individual's probability of marriage. In order to determine whether a move influences marriage, two populations are compared: the stayers, who have not moved before marriage; and the movers, who have moved before marriage.

The marriage rate of the stayers is calculated (the first move is considered a disturbing phenomenon) by:

$$\bar{n}^{e}_{a} = \frac{\bar{N}^{e}_{a}}{\bar{S}^{e}_{a} - 1/2E_{a}}$$

where $\bar{N}^{e}_{a}$ is the number of marriages for stayers which occur between the ages a and a+1; $\bar{S}^{e}_{a}$ is the stayers who are single at the age a; and E_{a} is the number of single persons who move between the ages a and a+1. One can hypothesize, then, that if these single people had not moved, they would marry at the same rate as the stayers. It is noted that the number of unmarried stayers declines with age a+1 not only because of the marriage

and movement of single persons, but also because some are not reached by the survey.

For the second population, the movers, the population at risk is increased by the first move of single persons. One then has the following rate:

$$n^{e}_{a} = \frac{N^{e}_{a}}{S^{e}_{a} + 1/2E_{a}}$$

where N^{e}_{a} is the number of marriages of movers that occur between the ages a and a + 1; and S^{e}_{a}, the movers and single population at the age a. One then hypothesizes that the single persons who have moved in the course of the year have married at the same rate as the unmarried who have moved in the past.

The population at risk, which is initially zero, increases by the entry of new movers; it is thus possible that the first rates of marriage may not be very meaningful if the numbers are very small. If one calculates the frequencies of single persons at an age a, it is necessary to verify that the first rates are calculated on an adequate base population.

If the two series of rates are identical, a previous move, excluding moves for the purpose of marrying, does not influence marriage. If the rates are not identical, it is possible to compare the two sub-populations. The small numbers in this study do not permit extension of the study as a function of age at previous move. On the other hand, we can investigate whether the mover's place of origin influences his/her behavior. Two sub-populations are considered: one living in rural areas and the other living in urban areas at 15 years of age.

Findings

These data are from the 1972 survey in which married persons were asked questions about moves made by the individual, moves made by the spouse prior to the marriage, and the date of marriage. In addition, questions asked about the reasons for movement reveal, when several moves were made during the same year of the marriage, which one relates directly to marriage. Table 10 gives the frequency of single persons at different ages for the stayers and movers, by sex. The differences in marriage between male stayers and movers are less clear than for women;

TABLE 10: FREQUENCIES OF SINGLE PERSONS AT AGE a, FOR THE STAYERS AND MOVERS POPULATIONS, BY SEX, BIRTH COHORT

Males

Age	Born before 1923		Born between 1923 and 1942	
	Stayers	Movers	Stayers	Movers
20 years	.96	.96	.92	.96
25 years	.54	.57	.42	.44
30 years	.21	.28	.17	.20
35 years	.12	.19	--*	--
40 years	.10	.13	--	--
50 years	.08	.11	--	--
Total	328		511	

Females

Age	Born before 1923		Born between 1923 and 1942	
	Stayers	Movers	Stayers	Movers
20 years	.81	.85	.75	.75
25 years	.37	.40	.23	.35
30 years	.17	.24	.12	.23
35 years	.16	.22	--	--
40 years	.16	.21	--	--
50 years	.16	.21	--	--
Total	210		437	

SOURCE: D. Courgeau, 1976, p. 905.

*The small numbers of persons in these cohorts observed at 35 years and older explain why the frequencies are not calculated for these ages.

this is true for both cohorts. At all ages, the stayers are married more than the movers. For men and women, the comparison of annual marriage rates shows that at any age before 30 years, the stayers have a higher probability of marriage than movers.*

*The table is not presented here, but the increase of single movers to stayers over time verifies this result.

Does this result still hold when a distinction is made between two sub-populations--one rural, the other urban? In order to answer this question individuals with rural or urban residence at 15 years of age are compared. Note that the numbers in certain sub-populations are small and we must consider the results with caution (see Table 11).

Males from rural areas have different behavior than other sub-populations, particularly for the cohort born between 1923 and 1942.* The rural stayers have a lower probability of getting married than the rural movers, and this probability is even lower than that of the urban stayers. In all cases, in particular for females from rural areas, the preceding results for the total populations still hold--the stayers have a higher probability of marrying than the movers. The results for those who make multiple moves after eliminating the moves for the purpose of marrying are given in Table 12. The comparison of these figures to those in Table 2 shows that the elimination of moves made for the purpose of marriage does not modify the direction of the results for K. In contrast, for the majority of cases, the μ falls slightly when one eliminates moves made for marrying.

For migrations of Rank 1, the residual variance--which was very high when all moves were considered--decreases strikingly when moves for marriage are eliminated (see Appendix 1). One can then estimate for these moves (changes of residence) the values K^1 and μ^1, which are .88 and .10 for the cohort born before 1923, and .90 and .07 for the cohort born between 1923 and 1942. For changes between départements, the following values are found: .38 and .10 for the cohort born before 1923, and .47 and .06 for the cohort born between 1923 and 1942. The difference between stayers and those who have made at least one move is always the same.

MOVEMENT AND FERTILITY

I consider here only legitimate fertility and deal with one specific, important problem: the difference in fertility rates between stayers and movers, with specific consideration of urban-rural migration influences.

The differences in fertility between rural and urban areas have already been studied in France (Tugault, 1975). Although rural-fertility in the nineteenth century was lower than that of the cities, the situation was reversed by the end of the century.

*The small numbers observed for the cohort born before 1922 may explain the opposite results beginning at 28 years of age.

TABLE 11: FREQUENCIES OF SINGLE PERSONS AT AGE a, FOR THE STAYERS AND MOVERS POPULATIONS, BY SEX, BIRTH COHORT AND PLACE OF RESIDENCE AT 15 YEARS OF AGE

	Cohort Born Before 1923							
	Male				Female			
	Rural		Urban		Rural		Urban	
Age	Stayers	Movers	Stayers	Movers	Stayers	Movers	Stayers	Movers
20 years	.96	.96	.96	.96	.80	.89	.81	.82
25 years	.62	.54	.48	.53	.35	.45	.38	.36
30 years	.22	.31	.21	.27	.16	.30	.18	.19
35 years	.14	.23	.10	.17	.16	.27	.16	.18
40 years	.13	.16	.03	.12	.16	.27	.16	.18
50 years	.11	.13	.06	.10	.16	.24	.16	.18
n	142		186		97		113	
	Cohort Born Between 1923 and 1942*							
	Male				Female			
	Rural		Urban		Rural		Urban	
Age	Stayers	Movers	Stayers	Movers	Stayers	Movers	Stayers	Movers
20 years	.96	.97	.88	.96	.73	.72	.77	.77
25 years	.53	.33	.33	.52	.23	.29	.23	.38
30 years	.23	.12	.10	.25	.07	.20	.16	.24
n	230		281		196		241	

SOURCE: D. Courgeau, 1976, p. 905 and Survey 1972.

*The frequencies were not calculated for age cohorts above 35 years because of the small numbers in those age samples.

TABLE 12. ESTIMATION OF THE RATE OF NEW MOVEMENTS AND THE ANNUAL PROBABILITY OF MIGRATION, ELIMINATING MIGRATION BY MARRIAGE

Change of	Cohorts Born	Age at Prior Move	$\hat{K}^2$	$\hat{\mu}^2$	N*	$\hat{K}^3$	$\hat{\mu}^3$	N	$\hat{K}^4$	$\hat{\mu}^4$	N
Residence	before 1923	15-19	.76	.17	160	-	-	32	-	-	8
		20-24	.78	.16	114	.84	.17	87	-	-	34
		25-29	.66	.12	73	.75	.12	65	-	-	43
		30-39	.44	.16	76	.71	.08	84	.85	.11	69
	in 1923-1942	15-19	.80	.20	240	.91	.21	64	-	-	14
		20-24	.85	.16	218	.75	.20	124	.84	.29	63
		25-29	.72	.13	154	.65	.22	141	.62	.21	82
		30-39	.69	.09	133	.62	.10	155	.60	.14	107
Département	before 1923	15-19	.65	.20	64	-	-	9	-	-	2
		20-24	.63	.14	64	-	-	32	-	-	14
	in 1923-1942	15-19	.39	.24	101	-	-	17	-	-	2
		20-24	.62	.15	80	-	-	40	-	-	12
		25-29	.47	.15	55	-	-	44	-	-	15
		30-39	.32	.24	62	-	-	40	-	-	27

*N = number of observations.

But when one examines fertility within urban areas, it is impossible from most existing data to separate the fertility of those born and living in the cities and those born in the countryside who have migrated to the city at the beginning of adulthood. The 1972 survey, however, permits this distinction, and I present the first results here.

Findings

The small numbers observed do not permit us to define each of the sub-populations with the precision that would be useful to examine the phenomenon clearly. The first population--urban stayers--includes all individuals born in urban areas and who have always resided there. The second population--rural stayers --includes all individuals born in rural areas and always residing there. The third population of movers includes individuals born in rural areas, who resided there until 15 years of age, moved to an urban area, and resided there at the time of the survey.

To measure the fertility of these sub-populations, we now examine the marriage cohorts. Since the numbers of these cohorts are small, we can only analyze the average number of children born during the ten- or twenty-year period. While the definition of the stayers, for rural as well as for urban areas, is relatively satisfactory, that for movers from rural areas to urban areas is less so. In effect, it has not been possible to distinguish between individuals having made their migrations before marriage and those who migrated afterwards. In similar fashion, we have had to define respondents as movers (the husband or the wife, as is the case) without distinguishing whether the husband comes from a rural area and has married a woman from an urban area or whether the converse occurs. In turn, it cannot be determined whether the husband and the wife are both originally from rural areas. It would be better to work with populations defined by age at marriage: in particular, to isolate women who married between 20 and 24 years of age. Finally, it can be misleading to calculate the mean number of children ever born for persons who have been married less than 10 years, since the effects of length of marriage may play an important part in these findings. With these limitations in mind, I proceed to the results shown in Table 13. This table shows a difference between the three cohorts. For cohorts married before 1943, movers from rural areas to urban areas have an average number of children lower than not only the urban stayers, but also the rural stayers. On the other hand, for cohorts married since 1943 movers from rural areas to urban areas have a mean

number of children that is very close to that of the rural stayers and markedly higher than that of the urban stayers. This preliminary analysis should provide the basis for further research on this subject from larger sample surveys.

TABLE 13. MEAN NUMBERS OF CHILDREN FOR STAYERS AND MOVERS FROM RURAL TO URBAN AREAS

Cohorts Married	Population	Mean Number of Children: Before 10 Years	Before 20 Years	Number of Observations
before 1943	Urban Stayers	1.82	2.31	137
	Rural Stayers	2.18	2.82	57
	Movers from Rural to Urban Areas	1.63	1.92	60
between 1943-1952	Urban Stayers	2.09	2.34	161
	Rural Stayers	2.42	2.86	69
	Movers from Rural to Urban Areas	2.49	2.98	57
between 1953-1962	Urban Stayers	2.08	--	157
	Rural Stayers	2.30	--	81
	Movers from Rural to Urban Areas	2.23	--	43

CONCLUSION

The data from the surveys analyzed here allow us to delineate the broad research lines for studying the effect of movement on demographic phenomena. The results obtained here are from surveys based on rather limited numbers of respondents and are preliminary results and, therefore, may not be confirmed by later studies. Nevertheless, they indicate that migration is far from being a totally random phenomenon or independent of other demographic phenomena. About 35% of the individuals made at least one change of département in the period of 20 years.

Isolation of individuals having made a change of département between 15 and 19 years of age shows that more than 70% will make a second change of département in the next 20 years. The behavior of this very mobile population can be summarized by two indices. The first index, K, increases with the rank number of the migration and declines as the age at last move increases. The second index, μ, is independent of the length of time that separates one move from the other. In contrast, it increases slightly with rank migration for those moves made before 30 years of age and decreases with the age at which the last move was made. The differences by age and rank are rather weak and may, for simplicity, be omitted. These results are roughly comparable to those reported for studies in the United States (Morrison, 1971).

When considering multiple moves made between different geographic areas, the indices that eliminate the effects of the areas of origin and destination indicate that the return moves to the original areas are more frequent than other moves, except for persons originating from rural areas. Moves progressing by stages are not more extensive than other types of moves.

The comparison of stayers and movers with respect to marriage shows that individuals, especially females, who have moved are less likely to marry at early ages than stayers. Only individuals originating from rural areas behave differently. At least for recent cohorts, male movers originating from these areas have higher chances of marrying than those who remain. In all other cases, in particular for the females originating from rural areas, the opposite is true.

Finally, if one compares the mean number of children for populations having migrated from rural areas to the city, we can see an important change of behavior over the course of time. For cohorts married before 1943, the average number of children for movers is smaller than for the stayers, both rural and urban By contrast, for the cohorts married after that time, the fertility of rural stayers and movers is similar, but higher than for the urban stayers.

The analyses here should be further pursued in several directions. First of all, it should be extended to include other demographic phenomena in order to bring the interactions with migration to light. From there it will be possible to build more general models in order to account for the diversity of those effects, but always striving for the fewest number of parameters. Further, analyses of the sociological and psychological facets of these phenomena must be attempted to illuminate

basic causes of the mutual interaction. In particular, it would be interesting to see why the fact of having made numerous moves increases the probability of making another one.

APPENDIX I

MODEL FOR ESTIMATING MULTIPLE MOVES

The model can be written:

$$M_x = \mu\left[S_x - (1-k)S_o^x\right] + \sqrt{\gamma}\, Z_x$$

where M_x is the number of migrants between the periods x and x + 1 after the move of a lower rank.*

S_x is the population at risk for a new move.

S_o^x is the total number of migrants of a lower rank that are always reached by the survey.

μ, K, and γ are the coefficients independent of the period x, that must be estimated;

Z_x is a normal distributed variable with a mean of zero and a variance of one.

One then hypothesizes that $M_1, M_2, \ldots M_x \ldots M_n$ are independent where n is the number of years of observations taken in order to estimate the coefficients.

Under these conditions, the least squares method gives the same estimations as the maximum likelihood method, of these parameters:

*To simplify notations, I have omitted the indication of age at which the previous move had been made and the rank of that move.

$$\hat{\mu} = \frac{\left[\sum_x (S_o^x)^2\right]\left[\sum_x M_x S_x\right] - \left[\sum_x S_x S_o^x\right]\left[\sum_x M_x S_o^x\right]}{\left[\sum_x (S_x)^2\right]\left[\sum_x (S_o^x)^2\right] - \left[\sum_x S_x S_o^x\right]^2}$$

$$\hat{K} = 1 - \frac{\left[\sum_x (S_x)^2\right]\left[\sum_x M_x S_o^x\right] - \left[\sum_x S_x S_o^x\right]\left[\sum_x M_x S_o^x\right]}{\left[\sum_x (S_o^x)^2\right]\left[\sum_x M_x S_x\right] - \left[\sum_x S_x S_o^x\right]\left[\sum_x M_x S_o^x\right]}$$

$$\hat{\gamma} = \frac{\sum_x (M_x - \hat{M}_x)^2}{n-2} \quad \text{where} \quad \hat{M}_x = \hat{\mu}\left[S_x - (1-\hat{k})S_o^x\right]$$

Table 14 gives the values of $\hat{\gamma}$ calculated for a period of 20 years. For comparison, the values of $\hat{\gamma}^1$ for residence changes estimated for the sample period for the cohort born before 1923 is $\gamma^1 = 106.81$, and for those born between 1923 and 1942, $\hat{\gamma}^1 = 467.82$. These values demonstrate that the model is satisfactory for migration of rank superior to 1, but much less so for the first migration.

When we eliminate migrations by marriage, the differences between ranks is less clear, but does not disappear: for the cohort born before 1923 the value is $\hat{\gamma}^1 = 24.33$, and for those born between 1923 and 1942, $\hat{\gamma}^1 = 14.20$. Table 15 gives the values of $\hat{\gamma}$ when migration by marriage is eliminated.

TABLE 14. THE VALUES OF $\hat{\gamma}$ FOR A 20-YEAR PERIOD

Changes of	Cohort Born	Age at Prior Movement	$\hat{\gamma}^2$	Number of Observations	$\hat{\gamma}^3$	Number of Observations
Residence	before 1923	15-19	11.84	227	2.51	50
		20-24	14.36	260	7.18	177
		25-29	5.22	147	2.80	125
		30-39	1.31	56	2.04	127
	in 1923-1942	15-19	13.34	311	4.64	79
		20-24	10.71	460	7.52	253
		25-29	3.93	158	4.78	237
		30-39	.80	72	2.99	180
Département	before 1923	15-19	2.71	87	--	16
		20-24	3.18	123	1.47	53
		25-29	1.74	65	0.54	53
		30-39				
	in 1923-1942	15-19	3.47	120	--	20
		20-24	3.08	138	0.88	72
		25-29	1.53	64	1.46	62
		30-39	1.03	63	0.52	52

Changes of	Cohort Born	Age at Prior Movement	$\hat{\gamma}^4$	Number of Observations	$\hat{\gamma}^5$	Number of Observations
Residence	before 1923	15-19	--	11	--	1
		20-24	1.33	72	--	22
		25-29	3.47	92	0.60	50
		30-39	2.72	120	1.31	84
	in 1923-1942	15-19	--	20	--	5
		20-24	2.69	110	--	44
		25-29	2.77	159	1.97	83
		30-39	2.29	179	3.51	115
Département	before 1923	15-19	--	18	--	1
		20-24	--	19	--	5
		25-29	--	26	--	11
		30-39				
	in 1923-1942	15-19	--	3	--	1
		20-24	--	18	--	8
		25-29	--	28	--	13
		30-39	--	40	--	15

TABLE 15. THE VALUES OF $\hat{\gamma}$ WITH MIGRATION BY MARRIAGE ELIMINATED

Changes of	Cohort Born	Age at Prior Move	$\hat{\gamma}^2$	Number of Observations	$\hat{\gamma}^3$	Number of Observations
Residence	Before 1923	15-19	2.47	160	-	32
		20-24	6.80	114	3.76	87
		25-29	2.17	73	2.04	65
		30-39	0.89	76	1.32	84
	Between 1923 and 1942	15-19	12.81	240	2.87	65
		20-24	2.26	219	3.81	124
		25-29	3.94	154	3.88	141
		30-39	1.50	133	2.04	155
Département	Before 1923	15-19	0.84	64	-	9
		20-24	1.91	64	-	32
		25-29				
		30-39				
	Between 1923 and 1942	15-19	2.02	101	-	17
		20-24	1.86	80	-	40
		25-29	1.98	55	-	43
		30-39	0.58	62	-	40

Changes of	Cohort Born	Age at Prior Move	$\hat{\gamma}^4$	Number of Observations
Residence	Before 1923	15-19	-	8
		20-24	-	34
		25-29	-	44
		30-39	1.78	69
	Between 1923 and 1942	15-19	-	15
		20-24	1.00	63
		25-29	1.27	82
		30-39	2.35	107
Département	Before 1923	15-19	-	2
		20-24	-	14
		25-29		
		30-39		
	Between 1923 and 1942	15-19	-	1
		20-24	-	3
		25-29	-	6
		30-39	-	10

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II

THE IMPACT OF INTERNAL MIGRATION ON THE TOKYO METROPOLITAN POPULATION

*Toshio Kuroda**

Human migration has a dual function--it equalizes both aggregate socioeconomic disparities between regions and regional inequalities in living standards among members of society. However, while it brings equalization of regional economic differences, migration also increases social differences. Population movement in postwar Japan has rapidly increased, with economic motives as the principal causal factor. This has paradoxically brought along with it two dilemmas: overpopulation and underpopulation. In terms not only of economic causes, but of social and environmental causes as well, a new era in migration has begun. Balance between the various living conditions which comprise one's overall quality of life has become a causal factor in residential selection. This paper examines the change in the population of metropolitan Tokyo, focusing particularly on migration.

POPULATION GROWTH AND STRUCTURAL CHANGE IN THREE METROPOLITAN AREAS

The fundamental characteristic of population movement and distribution in Japan since the Second World War has been the formation of three metropolitan areas through concentrated migration to the cities of Tokyo, Osaka, and Nagoya--the centers of the established industrial zone along Japan's Pacific coast--and the consequent extraordinary growth of population in these regions. In the 25 years between 1950 and 1975, the population of Japan grew from 84,115,000 to 111,937,000 people; in the same 25 years, the three metropolitan areas' population grew from 28,450,000 to 52,150,000. In contrast to a national population of 27,822,000, the metropolitan areas' population grew by 23,700,000. In other words, the greater part (85.2%) of the

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