Review of Income and Wealth
Series 44, Number 4, December

EARNINGS MOBILITY: AN INTERNATIONAL COMPARISON OF ITALY AND FRANCE

BY A. BIGARD
Université du Maine

Y. GUILLOTIN
Université du Maine

AND

C. LUCIFORA
Università Cattolica di Milano

In this study we consider two panels of wage-earners, from 1974 to 1988, for Italy and France respectively. The international perspective and the availability of micro-data are particularly interesting for they allow us to address individual characteristics as well as national specificities. In the empirical analysis a partitioning of the earnings distribution by deciles is used and the overall hierarchical mobility of individuals is investigated. Transition matrices are computed in order to compare wage formation and mobility processes across countries, in the period under investigation. A rich battery of mobility indices is presented and the relations between them are studied.

The paper addresses several different issues and compares the results across countries. First, the evolution of earnings and the relative wage profiles are compared across countries. Second, the heterogeneity issue is addressed and some structural characteristics of the sample are studied, namely: cohort and gender differences in earnings.

1. INTRODUCTION

In recent years, there has been a renewal of interest in the analysis of earnings mobility using panel data on individuals. The wider availability of longitudinal data on earnings and the increasing concern for growing income inequality in several developed countries may explain this interest. A wide range of studies in different countries and at different dates have investigated the evolution of earnings thus shedding light on several aspects of wage formation.[1] However, one major difficulty in comparing results across countries is their substantial heterogeneity; most available studies often differ in terms of the population covered, time period considered as well as the methodology used. This study offers an international comparison based on the analysis of two very similar sets of

Note: Previous versions of this paper have been presented at the VII EALE Conference (Lyon, 7–10 September 1995), and in seminars at the Université de Bruxelles, Università Cattolica di Milano, Centre for Economic Performance–London School of Economics and University of Aberdeen. The authors are grateful to A. Atkinson, P. Bingley, R. Blundell, G. Brunello, D. Checchi, P. Gregg, N. Westergard-Nielsen and two anonymous referees for their useful comments. The data used in the present study have been kindly supplied by INSEE (France) and INPS (Italy). C. Lucifora is grateful to CNR for financial support and to F. Rappelli for the excellent research assistance. Usual disclaimers applies.

[1]See Atkinson *et al.* (1992) for an excellent survey of recent studies. Cross-national comparisons are also offered in Freeman and Katz (1995); Gottschalk and Smeeding (1997); Blau and Khan (1996).

(longitudinal) data on earnings and uses a common methodology. There are at least two features that make this study innovative with respect to the existing literature: the first is the length of the panel used—i.e. it spans 15 years from 1974–88—substantially longer period than that used elsewhere (OECD, 1996; Burkhauser *et al.*, 1997a, b); the second is the methodological aspects used to analyze the structure and dynamics of mobility patterns, such as the analysis of immobility poles and the mapping of transition matrices over time (i.e. "Statis" representation). The paper is organized as follows. Section 2 describes some stylized facts about earnings mobility and inequality. Section 3 outlines the methodology, discusses the implications of the mobility measures used in the empirical analysis and presents the data sets. In Sections 4 and 5, the main results are discussed and some structural features of mobility, such as gender and cohort, are addressed. The concluding remarks are presented in the last section.

2. Evolution of Earnings and Mobility Pattern

In a number of countries, from the 1980s to more recent years, a marked change in the distribution of earnings was experienced in the U.S. and the U.K.—as shown in a number of studies—wage inequality increased at an extraordinary rate (Hills, 1996; Levy and Murname, 1992). Conversely, in countries such as Italy, France and Germany, among others, only modest increases in inequality were detected (OECD, 1996). Although much attention has been devoted in the literature to the analysis of the possible causes of this phenomenon, there has been less interest in the analysis of the underlying patterns of earnings mobility. Yet mobility issues may have important implications both for the evaluation of the economic relevance of inequality (for equity and efficiency reasons, for example), as well as for policy issues. In particular, as is often stressed in the literature, a significant change in "cross-sectional" inequality may be consistent with substantially different patterns of mobility. Thus an increase in inequality may be attributable either to a persistent fall in low earnings, as opposed to median or high earnings, or to an increase in earnings turbulence for highly mobile workers. While the former is highly undesirable, the latter may be better tolerated. In order to correctly evaluate the relationship between the two, it is very important to rely on lifetime measures of earnings and mobility, rather than on cross-section evidence, and so the choice of the length of the period of analysis is crucial.

If we compare the evolution of earnings inequality in France and Italy, between 1974 and 1988, we find a similar structure and moderate changes over time. Table 1 presents different indicators of cross-sectional earnings inequality computed on two panels, both at the start and at the end of the sample period.[2]

[2]Inequality indices computed extra-sample are similar to those obtained using each country panels and reported in Table 1. In particular, the indices computed on the totality of the French INSEE archive gave the following results: *log dev*: 0.18/0.22; *Theil*: 0.19/0.21; *Gini*: 0.32/0.34 (where the two figures refer to 74/88, respectively). As far as Italy is concerned, Brandolini and Sestito (1996) using a different survey (SHIW–Bank of Italy) report the following figures for individual incomes (earnings are not available): *log dev*: 0.22/0.19; *Theil*: 0.26/0.18; *Gini*: 0.35/0.33 (where the two figures refer to 77/87, respectively).

TABLE 1

EARNINGS INEQUALITY (1974–88)

Inequality Index	France		Italy	
	1974	*1988*	*1974*	*1988*
log deviation	0.16	0.20	0.14	0.11
Theil	0.19	0.24	0.14	0.14
Gini	0.30	0.33	0.26	0.24

Source: INSEE (France), INPS (Italy).

Both countries show comparable dispersion at the beginning of the period, with only slightly diverging trends over time: inequality was moderately increasing over the period in France and decreasing in Italy. A number of features concerning the wage determination process can explain some of the similarities observed in the distribution of earnings. First, both countries are characterized by centralized industry-wide collective bargaining and despite the apparent difference in union density rates—being much higher in Italy than in France—union coverage is extremely high in both. Second, the minimum wage legislation, in France, (i.e. the so called SMIC) and the negotiated contractual minima, in Italy, provide a lower bound to the distribution of earnings; this can also explain the reduced dispersion detected.[3] Finally, job security provisions (particularly for public sector employees) and the prevalence of long-term employment relationship have contributed, in both countries, to the expansion of internal labor market practices reducing *de facto* external mobility and labor market turbulence (OECD, 1994).

3. THE MEASUREMENT OF EARNINGS MOBILITY

The evidence shown in the previous section suggests that, at any point in time, differences in earnings levels are likely to be observed. The dynamics of earnings is also characterized by a significant heterogeneity since not only earnings may differ across individuals with different characteristics (age, schooling, working experience, etc.), but also the rate of growth of earnings as well as the change of that rate, over the life-cycle, can exhibit significant variations. Hence, for any given distribution of earnings, the existence of hierarchical mobility—of the type discussed above—allows any possible modification of that (initial) distribution to occur. The purpose of this paper is limited to the analysis of the hierarchical mobility of earnings and does not investigate the issue of inequality. In particular, the kind of mobility which is under examination here concerns the different earnings levels associated with an individual, along his or her life-cycle, relatively to a given hierarchical structure. First, we shall investigate whether, in the time interval considered, individuals move upwards or downwards in the earnings hierarchy and then compare the experience of France and Italy. Second, for a given population, we shall analyze whether the observed mobility paths exhibit any systematic regularity or, conversely, are totally random.

[3]In Italy an indexation mechanism linking labor earnings—particularly those at the bottom of the pay scales—to the dynamics of CPI (i.e. the so called *Scala mobile*) was in force during the period of analysis.

The choice of the earnings hierarchy is one of the main determining factors for the measurement of mobility. One possibility is to define, *a priori*, a number of earnings intervals which are then used to rank individuals. In this case, there is the problem of defining the appropriate evolution (over time) for the threshold of each interval. An alternative approach consists of breaking-down the sample population to a given number of quantiles of the earnings distribution. Hence, at any point in time, an individual will be ranked accordingly in the earnings hierarchy and mobility will be measured by comparing his or her relative position at different points in time. In the present study, earnings mobility is described by transition matrices which indicate the proportion of individuals (n_{ij}), in the i-th decile of the earnings distribution at time $t(D_i)$, who are observed at time $t+k$ in the j-th decile (A_j).[4]

In the empirical analysis, we compute and discuss various summary indicators of (relative) earnings mobility. First, an analysis of the degree of dependence between the rank of departure (D_i) and the rank of arrival (A_j) is presented. Second, several indicators for the measurement of the hierarchical earnings mobility are computed and compared across countries. Among those mobility measures we can distinguish the immobility ratio, which records the frequency of the movements; the average absolute jump, which measures the amplitude of the movements—i.e. the number of deciles the typical individual jumps over between time t and $t+k$; and the more traditional correlation coefficient.[5] Finally, an analysis of the "poles" of immobility and an optimal partitioning of the matrices (according to the mobility patterns observed) is presented for each country.

3.1. *The Data*

The data used in this study are drawn from a similar source in each country, that is the earnings declarations of employers to the National Social Security.[6] Both samples accurately record annual data on individual earnings and on several other characteristics for the time period 1974–88. In particular, the complete French data set is a random draw of approximately 80,000 individuals born in October of each even year; similarly, the complete Italian sample contains roughly 15,000 individuals randomly drawn after selecting those born on the 15th day of January of each odd year from the INPS (Istituto Nazionale di Previdenza Sociale) archives. In the samples effectively used in the empirical analysis only those individuals continuously present for the entire period of observation were

[4]Considering the shape of the earnings distribution (which in general is not uniform), it must be stressed that the distance in absolute terms between earnings ranks is not the same. In particular, a movement from position 3 to position 5 of the earnings hierarchy, in relative terms, is similar to a movement from position 8 to position 10; in absolute terms, however, the earnings difference is not the same. Also, due to the fact that there might be individuals earning an identical salary, the number of observations in each decile can be slightly different.

[5]All the measures, in fact, are types of correlation coefficients, which are simply defined as some transformation of the original earnings data. A detailed description of all the indicators used in the analysis is offered in the Appendix.

[6]Individual data are covered by privacy rights and may not be diffused. Transition matrices, however, can be obtained upon request.

retained, that is 24,645 for France and 3,050 for Italy.[7] Both samples are representative of salaried workers employed in the private non-agricultural sector and distributed over the whole national territory. The earnings variable is defined as gross yearly wages (i.e. corrected for the number of weeks effectively worked in the year) and it is inclusive of premia and other periodic payments; it excludes overtime payments and social charges. Both full- and part-time workers are covered, and when the latter are considered, full-time earnings equivalent is computed.[8] The data are unique in their reliability since their basis in administrative records allows us to record earnings levels and job changes with a degree of certainty which is absent in standard self-reported longitudinal samples. In the files, each employee and each employer can be identified by a unique code. For individuals, information on year of birth, gender and nationality are reported, also the industry classification of the firm and broad occupational groups are available. The main drawback of the data is the lack of the individual's schooling achievements.

In order to get an overview of the main features of the data, in Table 2 we report average (selected) characteristics by deciles of the earnings distribution, both at the beginning and at the end of the period for each country (i.e. average age and proportion of males). As one might expect, in both 1974 and 1988 and in France and Italy, the top of the earnings hierarchy is characterized by older individuals, predominantly males.

Comparing the two samples we find that the proportion of males is slightly larger in Italy, while individuals located in the upper half of the earnings distribution are on average older in France. Finally when looking at the evolution between the initial and final year—given that the same individuals are observed through the years—the average age increases. Hence, for the purpose of the following analysis, it appears interesting to highlight the existence of a number of structural differences that characterize the deciles distribution in each of the two countries.

Data requisites, as dictated by the forthcoming analysis, introduce certain limitations and *caveats* which need some discussion.[9] Firstly, since mobility—as shown in several previous studies—appears to be an increasing function of the length of the period over which it is measured and a decreasing function of the initial age structure of the population under investigation, in order to allow

[7]The Italian sample has been obtained selecting those workers among all individuals present in 1974 with both positive earnings and at least a week of work, who also had worked at least one week in each of the 15 years considered. A careful check of the structural and dynamic features of this "balanced" sample produced results which are in line with both, more aggregate, official data (Lucifora and Rappelli, 1995), as well as with other samples, drawn from the same source (INPS), available only for a limited number of years (OECD, 1996).

[8]In Italy, the legislation on part-time work did not exist before 1984. Even after, part-time work remained well below 1 percent of total private employment. As far as pay is considered (excluding social charges) it was designed so that it was totally irrelevant to the worker whether to work part- or full-time, the former being exactly half of the latter. In France, there were 7.6 percent of part-time workers in 1974 and 6.3 percent in 1988. All the computations have also been made (but not reported) for full-timers and are available on request. Thus, when part-time workers are excluded mobility indices are slightly lower in magnitude, with no significant changes in the general pattern of differences across countries.

[9]Namely, a "constant" representative sample of a large number of individuals over a long time period.

TABLE 2

MEANS OF SELECTED CHARACTERISTICS BY DECILES
(Italy and France, 1974–88)

	France				Italy			
	Proport. of Males (%)		Average age		Proport. of Males (%)		Average Age	
Decile	74	88	74	88	74	88	74	88
1	30	49	35	51	59	76	35	50
2	49	59	34	49	57	70	34	49
3	66	67	34	49	62	67	33	48
4	73	69	34	48	76	64	33	48
5	75	70	34	48	79	68	33	47
6	78	74	34	48	81	79	33	47
7	79	74	35	48	87	81	34	47
8	83	78	35	48	87	89	33	47
9	87	82	36	49	93	87	35	49
10	91	90	39	51	94	91	38	50

comparisons across countries to be meaningful both the time period and the age structure have been harmonized between the samples.[10] Secondly, a further limitation of both data sources is represented by the phenomenon of "attrition". The requirement of a "constant" sample of individuals who have to be followed-up over time and the difficulties in tracing those with less regular histories, necessarily implies that a significant portion of the initial population is lost year after year. Since "attrition" is likely to be larger the longer the time period considered, there is a clear trade-off between long periods and sample representativeness. Another limitation, strictly linked to the one discussed above, concerns the issue of "selectivity bias." Indeed, it can be argued that the source of "attrition" is non-random, that is some people with given characteristics experience a higher probability of being excluded from the sample. In the particular case under examination (Social Security records) the most obvious sources of bias are represented by women temporarily leaving employment and re-entering afterwards; by salaried workers becoming self-employed and; finally, by individuals becoming long-term unemployed.[11] To the extent that these groups of individuals account for a significant portion of the employed population, after a number of years selectivity effects might be relevant. As far as the present study is concerned, due to lack of data and to the constraints imposed by the methodology used, no correction for "selectivity" effects is considered.[12] The extent and the direction of the bias is, however, uncertain. On the one hand, the exclusion of the long-term unemployed might overstate earnings mobility since unemployment spells are likely to

[10]See Atkinson *et al.* (1988) for a survey of earnings mobility studies.

[11]In the Italian sample, if the individual becomes unemployed for less than a year he will appear in the data with a shorter number of weeks worked. Conversely, when the length of the unemployment spell is over 12 months there will be no individual record, for that given year, in the data.

[12]In a recent paper, using a different methodology, Bingley *et al.* (1995) try to correct for different sources of selectivity. Their main finding is that unemployment represents the most important source of selectivity. Alternatively, Guillotin and Sevestre (1994) have shown that when the pattern of selection is unclear, controlling for selectivity might be particularly difficult and often counter-productive.

represent a major obstacle for upward mobility; on the other hand, since in "-constant" samples the most stable individuals in a given population are likely to be over-represented, an under-estimation of mobility patterns may result. These *caveats* should be borne in mind when interpreting the results and when comparing the experience of France and Italy.

4. A Descriptive Analysis of Earnings Mobility

In this section, a descriptive analysis of earnings mobility in France and Italy is presented. As previously discussed, we are interested in describing relative earnings mobility of individuals—across deciles of the distribution—using transition matrices. We compute the mobility rates, first, by ranking individuals according to their labor earnings and, next, by assigning each to a decile of the distribution. Hence we use the longitudinal structure of our data to measure movements of individuals within the distribution (i.e. transitions); hence providing an insight into the nature of the dynamic processes which characterize cross-sectional inequality. In order to be more clear about potential mobility patterns, we shall often refer to two extreme situations. First, the case of "no-mobility" where individuals are characterized by substantial inertia in relative positions, such that the probability of remaining in the same decile is (close to) one and all transitions lie along the main diagonal; second, the case of "perfect mobility" where individuals stand the same chances to move from one decile to any other of the distribution, the probability of moving is the same everywhere and transitions are evenly distributed across deciles. Our data, allows us to compute indices of mobility for short time intervals (two years) up to a substantial portion of an individual working life (15 years). In practice, we expect the observed mobility patterns to lie between the two extreme cases discussed above. In Figures 1(a) and 1(b), we plot the frequency distribution corresponding to the extreme years of the time period analyzed i.e. 1974 and 1988—for France and Italy respectively.

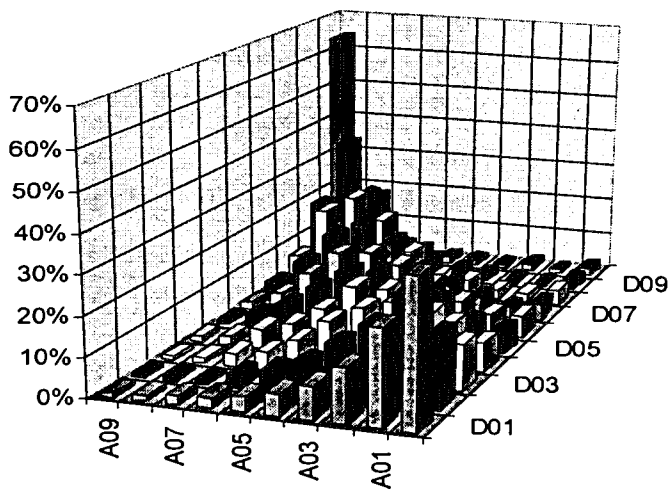

Figure 1. (a) Frequency Distribution of Transition Matrices (France 1974–88)

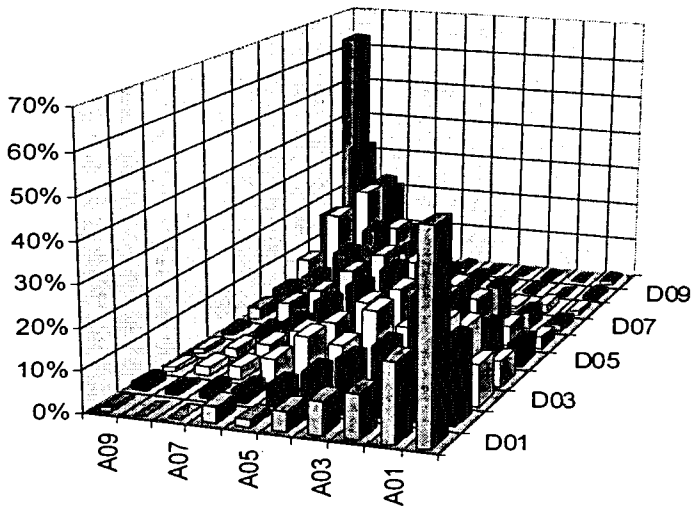

Figure 1. (b) Frequency Distribution of Transition Matrices (Italy 1974–88)

The decile marked D01 represents the lower end of the earnings distribution in the initial year of observation (i.e. Departure), while decile A10 represents the upper end of the earnings distribution in the final year of observation (i.e. Arrival). That is, in France only 1.1 percent of the individuals who started from the lowest decile of the distribution (D01) in 1974 reached, in relative terms, the upper end of the distribution (A10) in 1988; the corresponding figure for Italy is equal to 0.6 percent. As shown in the figures in both countries there is a substantial concentration along the main diagonal, suggesting a certain degree of earnings immobility over the 15 years interval considered. At a descriptive level, a simple inspection of transition probabilities shows a higher concentration along the main diagonal in Italy, which is even more pronounced for the lowest decile of the earnings distribution, thus suggesting a higher earnings persistence over time and a lower probability for individuals to escape from low earnings deciles. France, conversely, appears to be characterized by higher transition probabilities off the main diagonal, thus indicating the presence of a higher mobility both up and down the hierarchy.[13]

4.1. *Dependence Analysis*

We begin the analysis of earnings mobility investigating the relationship between the rank of departure and the rank of arrival over the whole period. Different indicators of dependence, between starting and arriving positions, are presented in Table 3.[14] This approach is based on a normalization of a χ^2 test, which should be compared with the null hypothesis of independence (i.e. zero

[13]The issue of whether the differences observed across countries are statistically significant is returned to in a later section.

[14]Note that, in order to interpret and compare the various indicators, ranges for extreme values (i.e. no-mobility and perfect mobility) are also given in the tables.

means independence), and on a decomposition of the test itself.[15] The case of statistical independence corresponds to perfect earnings mobility, that is whichever is the decile of departure the individual will have the same probability to reach any decile of arrival. The figures obtained for France and Italy are 0.97 and 1.03 respectively, showing the existence of a substantial dependence (see Table 3).

TABLE 3

MOBILITY INDICES

Mobility Indices	Range			
Dependance	*perf mob*	*no mob*	France	Italy
Phi of Dependance	0	3	0.97	1.03
Correlation ratio	0	1	0.69	0.75
Phi of Symmetry	0	0	0.08	0.12
Frequency and Jump				
Immobility ratio (%)	10	100	28.8	30.5
Moving up (%)	0	45	36.7	33.7
Moving down (%)	0	45	34.6	35.7
Absolute jump	0	3.3	1.54	1.41
Ascending jump	0	1.65	0.77	0.71
Descending jump	0	1.65	0.77	0.71

Other measures of dependence, such as conventional bivariate correlations between the position of departure and that of arrival, have been computed. Results indicate the existence of a strong correlation in both countries. In the case of Italy we obtain a coefficient of 0.75, while in France it is equal to 0.69 (both statistically significant at the 1 percent level). If anything, the above results confirm stronger dependence and higher relative immobility in the Italian case.[16] The existence of asymmetry in upward and downward movements can also be investigated, by inspecting the off-diagonal elements, using a normalized χ^2 test.[17] The latter shows a figure of 0.08 percent for France and 0.12 percent for Italy, suggesting a moderate asymmetry in transition probabilities (see Table 3). The composition of the asymmetry is further analyzed in Tables 4(a) and 4(b), in particular. Reported figures (symmetrically) indicate the main contribution to the asymmetry (i.e. the first 10 contributions account for 65.4 percent in France and 62.5 percent in Italy).

In France, the analysis of the asymmetry shows the presence of a downward mobility from D6–D10 to A1 not compensated in the opposite direction. In Italy,

[15]The first 10 contributions cumulate up to 60.8 percent for France and 60.9 for Italy. Detailed results are not reported for lack of space, but can be obtained upon request. Also, to be able to compare the tests across matrices with a different number of observations, the results have been specified as: $\varphi^2 = (\chi^2/n)$ where n is the number of observations.

[16]If Pearson correlations are computed instead the resulting coefficients are 0.73 (France) and 0.76 (Italy). The above figure can be compared with those given in the OECD (1996) study 0.76 [0.75] (France) and 0.78 [0.72] (Italy), where the first is the Pearson coefficient and that in square brackets is the Spearman rank coefficient (statistical significance levels are not reported). Note that in the OECD study quintiles were used and the period covered was 1986–91 (6 years).

[17]The index of asymmetry is calculated with reference to a symmetric matrix and relatively to the main diagonal (the n_{ij} elements are replaced by $(n_{ij}+n_{ji})/2$). To allow comparisons to be made a normalization is introduced and the φ^2 indicator is used (see the Appendix for further details on the computations).

TABLE 4

COMPOSITION OF THE χ^2 TEST OF ASYMMETRY

4(a): France

France	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
D01		10.4								
D02										
D03										
D04					5.20					
D05								6.82		
D06	5.17									
D07	7.40									
D08	6.91	4.38								
D09	6.98									
D10	5.97		6.15							

4(b): Italy

Italy	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
D01							3.27			
D02										11.1
D03								5.0		6.6
D04										
D05			4.11							4.4
D06										
D07			4.46							10.6
D08										
D09							6.17			
D10									6.44	

there are more movers from D2–D7 to A10 than in the opposite direction. This is an interesting result as it reveals different mobility patterns, over the period, between France and Italy.

In sum, both countries appear to be characterized by a significant dependence between individuals' relative position at departure and that at arrival. However, at a descriptive level, when a direct comparison of the various indicators across countries is attempted, Italy shows more earnings inertia, stronger dependence and a different pattern for upward and downward mobility.

4.2. *Mobility Analysis: Frequency and Jumps*

To further pursue the analysis of mobility patterns, we concentrate on the frequency and the magnitude of the movements within the earnings hierarchy. First, the frequency of movements is characterized with reference to the immobility rate, which is given by the percentage of individuals who are in the same relative earnings position after 15 years and are located on the main diagonal of the transition matrix. Since, the direction of the movements also has important economic implications, we shall differentiate between ascendant and descendant mobility rates. In the following discussion, all indicators will be directly compared with the result that would be obtained in the case of "perfect mobility" or "no-mobility" (results are reported in the bottom half of Table 3). The immobility rate gives a figure of 28.8 percent in France and 30.5 percent in Italy, to be

compared with 10 percent as in perfect mobility. In other words, nearly one-third of individuals in each sample did not experience any change in their relative position over the period, while two-thirds did.[18] Considering the percentage of individuals that experience an upward jump in the earnings hierarchy over the whole period, we find that 36.7 percent in France and 33.7 percent in Italy are—independently from the magnitude of the jump—better off at the end of the period. Conversely, when the downward jumps are considered, 35.0 percent of the individuals in France and 35.7 percent in Italy are worse off in terms of their relative earnings position. Both the latter have to be compared with a figure, for both upward and downward mobility rates, equal to 45 percent under perfect mobility and 0 under no mobility. Besides the frequency and the direction of movements in the earnings distribution, it might prove interesting to investigate the amplitude of the jumps. Generally, the indicator used in this kind of analysis is the average absolute jump (i.e. the average signed jump is zero by construction). Over the period of analysis, the average magnitude of a jump for an individual is 1.54 and 1.42 deciles respectively for France and Italy, which can be contrasted with the 3.3 deciles under the perfect mobility case. In both countries the jump corresponds, on average, to a move of 15 percent in the earnings hierarchy.[19] As was done before, we decomposed upward and downward movements and computed average ascending and descending jumps separately: upward (downward) jumps are equal to 0.77 deciles in France and 0.70 in Italy (see Table 3). In all cases considered, the magnitude of the jumps in France is larger and statistically different from Italy at the 1 percent level of significance.[20]

These findings suggest that it might be useful to investigate the average jump experienced by individuals located at different points of the distribution, that is we condition the movement within the distribution on the decile of departure at the beginning of the period.[21]

By simply inspecting Figure 2, a striking similarity between France and Italy can be noted. Both countries are characterized by smaller jumps, as compared with perfect mobility (i.e. normalized to 1), in the extreme deciles of the distribution and by larger jumps in central deciles. Whilst low mobility in the upper end of the distribution can be easily rationalized with reference to individuals who have reached the top of their earnings profile, more concern arises when low mobility within the distribution is observed in lower deciles (particularly in Italy),

[18]These results can be compared with those reported in the OECD study: 56.8 (France) and 50.6 (Italy). It is interesting to note that the different length of the period of observation may explain the lower immobility detected in the present study (OECD, 1996). A discussion of the relationship between length of observation and mobility is returned to in a later section.

[19]With respect to perfect mobility, the magnitude of the jumps (in percentage) compares to 44.5 percent in France and 43 percent in Italy.

[20]The statistical significance of the above results has been assessed by bootstrap methods (Efron and Tibshirani, 1993). In particular, we performed 400 iterations on the French data and obtained, at the 99 percent confidence limits, 1.52 and 1.57. For Italy, we obtain 1.35 and 1.49. It appears that confidence intervals are disjointed. This led us to reject the null hypothesis of equal coefficients for the absolute jump.

[21]Since average absolute jumps are different depending on the decile of departure, for comparison purposes it is necessary to use a normalization. To see how the average absolute jumps might differ across the different deciles (in perfect mobility) consider the following example: the average absolute jump for D01 and D10 is equal to 4.5, however it is only 2.5 for D05 and D06. Hence, we divided the observed average absolute jump by its value in perfect mobility.

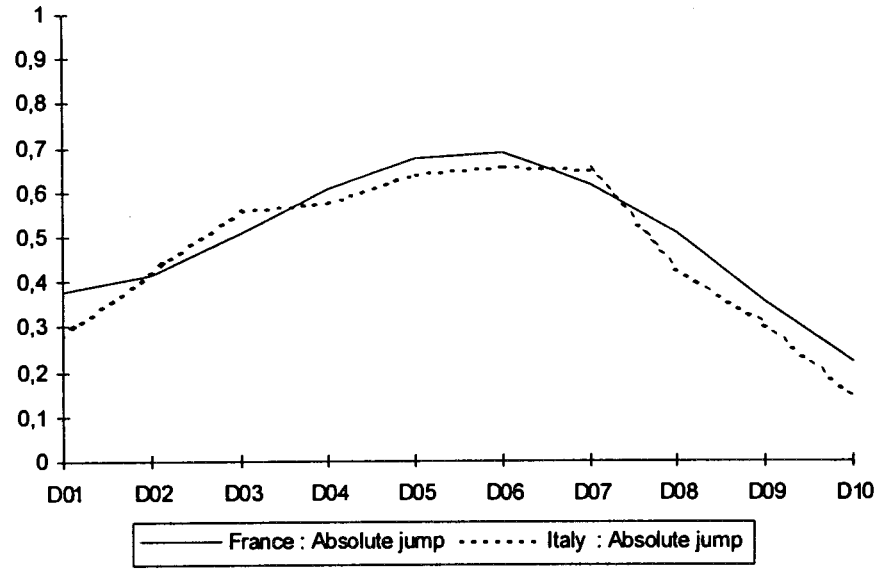

Figure 2. Absolute Jump by Decile.

as individuals appear to be stuck in a low earnings trap for a substantial portion of their working life. This finding is confirmed when considering separately the conditional average ascending and descending jumps (i.e. normalized as above).[22] In Figure 3 the plots suggest, for both France and Italy, that the upper half of the earnings distribution is characterized by average ascending jumps which are larger than what would have prevailed under perfect mobility; conversely, average descending jumps in the upper quarter of the distribution appear to be lower than under perfect mobility.

Closer inspection of Figure 3 suggests the existence of a sort of dichotomy, with respect to the perfect mobility standard (i.e. normalized to 1). In particular, it appears that those individuals who are located in the upper part of the earnings distribution experience larger upward moves and smaller downward moves. Conversely, for those individuals characterized by a relatively weak position in the earnings hierarchy the event of remaining there or falling below is quite likely, while upward jumps are more difficult. This is an interesting result as it provides some evidence for the hypothesis that "high wage" worker–job matches are also characterized by a faster wage growth, while "low wage" matches are likely to remain as such for long periods of time. The analysis of the "high wage–low wage" features of earnings mobility patterns will be pursued further in one of the following sections.[23]

[22]Since the conditioning can be done with respect to the position of departure and the position of arrival in the earnings hierarchy, both types of conditional jumps were computed. However, in the light of the similarity between the results only one set is reported.

[23]To assess the robustness of the mobility indicators within the period of observation, we computed several mobility indices for different sub-periods (i.e. 1974–76, 1980–82, 1986–88). The main results, though not reported for lack of space, are in line with the results reported here.

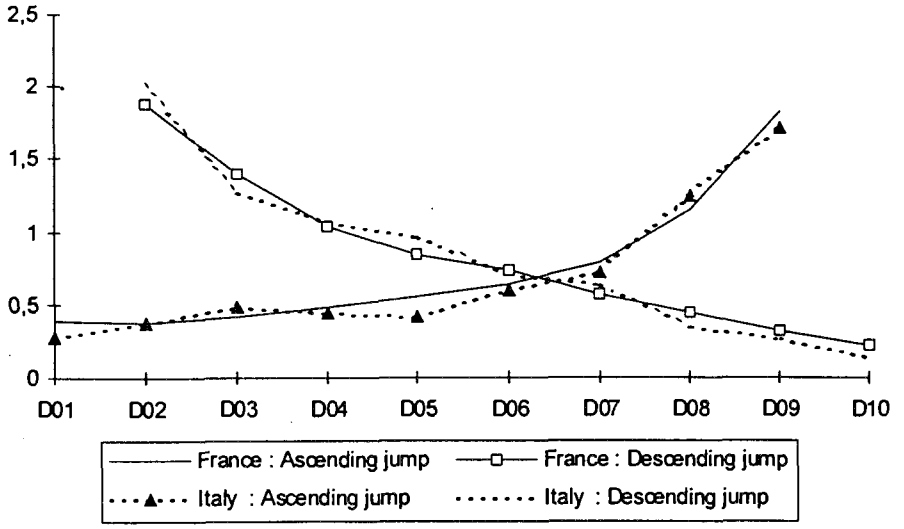

Figure 3. Ascending and Descending Jumps by Decile

4.3. *The Identification of the Poles of Immobility*

The evidence presented in the previous sections suggest the existence of lower mobility in some segments of the earnings hierarchy. In particular, earnings mobility appears to be very low both at the bottom and at the very top of the distribution. In the following analysis, the partitioning of the sample in a fixed number of quantiles is released and a more flexible approach is used. The basic idea is that of pooling deciles according to individuals' mobility patterns: the earnings distribution is then partitioned such as to minimize the transitions of individuals across different earnings intervals.[24] The results of optimally partitioning the entire earnings distribution in three intervals—both for males and females—are shown in Table 5.

The columns reporting the index α, in Table 5, can be interpreted as the divergence—in terms of mobility within each of the earnings intervals identified—from perfect mobility (i.e. set equal to 1): the higher the value of α the lower is mobility. Conversely, the columns showing values for the τ ratio indicate the proportion of individuals who started in a given earnings interval at the beginning of the period and are still found there at the end of it. Table 5 shows that relative mobility, in general, is lower as compared with perfect mobility. The α index shows significant deviations from 1 (i.e. more than six times within top deciles), while the τ ratio indicates a relative lower mobility for bottom deciles (i.e. less transitions to and from other earnings intervals). In particular, to the first interval are optimally assigned all those individuals who—in the time period under consideration—experienced some earnings mobility within deciles 1 to 5 in France, and 1 to 6 in Italy, but had very little exchanges with the upper earnings deciles of the earnings distribution. In a similar way, individuals placed in the top decile

[24]More details on the methodology used are given in the Appendix, see also (Bigard, 1991).

TABLE 5

OPTIMAL PARTITIONING OF THE EARNINGS DISTRIBUTION BY MOBILITY PATTERNS

Earnings Classes ($k = 3$)	France	
	α	τ (%)
1 to 5	1.56	77.9
6 to 9	1.67	66.7
10 to 10	6.41	64.1
All	*2.09*	*72.0*

Earnings Classes	Italy	
	α	τ
1 to 6	1.42	85.0
7 to 9	2.04	61.3
10 to 10	6.31	63.0
All	*2.09*	*75.8*

of the distribution seem to have experienced very little variations in their relative positions. These findings reinforce the hypothesis that movements within the distribution occur in well-defined segments with little exchanges between them.

4.4. *The STATIS Mapping of Transition Matrices*

As previously discussed, the length of the labor market experience considered in the measurement of mobility patterns and the extent of the earnings mobility actually detected may be closely related. In particular, it appears that the longer the employment spell over which mobility is measured, the higher is likely to be the overall earnings mobility.[25] In this section we intend to investigate the nature of this relationship using a specific approach, that is the STATIS methodology (Lavit, 1988). This method has been applied in our case to the end-of-period matrices (1974 and 1988) as well as to the intermediate-period matrices (74–76, 74–78, 74–80, 74–82, 74–84, 74–86).[26] In practice, transition matrices recording earnings mobility at increasing length are plotted in a reference mobility space and their evolution over time tracked down. Note that the more matrices are similar, the closer the points appear on the plot. As a term of reference we have also reported in the mobility space 4 different matrices corresponding to the following extreme cases: *no mobility* (**I**); *perfect mobility* (**M**—located at the origins of the axis); *perfect mobility* in both top and bottom of the hierarchy as well as no mobility in the middle (**E**) and finally *no mobility* in bottom and top of the hierarchy and perfect mobility in the middle (**C**). The mapping is reported in Figure 5. The first result we obtain is that mobility increases with the duration of

[25]See also, OECD (1996) and Burkhauser *et al.* (1995b) for additional evidence on this point.

[26]Consider the matrices $X_1, X_2, \ldots, X_r$, of similar dimensions and increasing length of observation (i.e. 1, 2, up to r). Next, diagonalize the matrix obtained by the traces of the products $X_i' X_j$. Consider the two eigenvectors corresponding to the highest eigenvalues and plot the results in the plane determined by them. A more detailed description of the approach can be found in (Lavit, 1988).

the period of observation. That is, as the period lengthens matrices approach the *perfect mobility* reference matrix **M** and depart from the *no mobility* matrix **I**. Secondly, the observation that matrices appear to be located closer to matrix **C** than to matrix **E** seem to suggest that mobility patterns, both in France and Italy, are characterized by a higher mobility around the center and no mobility at the bottom and at the top of the earnings hierarchy, rather than the opposite.

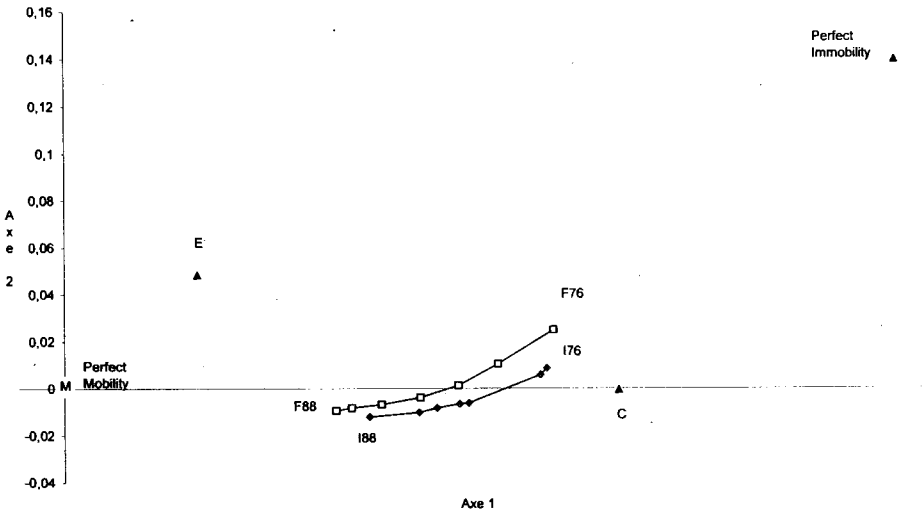

Figure 4. Mobility and duration of observation. Statis Map for Matrices (1974, *N*)

The evidence reported in Figure 4 underlines the importance of the length of the period on the evaluation of mobility patterns. In particular, if the observation period is restricted to a limited portion of the average working life of individuals, the resulting overall mobility can be significantly biased downwards. While the bias might be less severe in countries characterized by a rather flexible labor market (i.e. both in terms of jobs held and earnings volatility); in countries where career and earnings profiles follow rather rigid rules—such as in Italy and France, for example—the phenomenon can play a significant role (OECD, 1996; Burkhauser *et al.*, 1997b).[27]

5. Heterogeneity and Mobility: Disaggregating Mobility by Gender and Age

In this section we address the issue of heterogeneity and investigate some structural characteristics of the individuals which might be related to different mobility patterns. Since, as discussed in one of the previous sections, mobility

[27]The possibility that earnings mobility may vary with the business cycle was also investigated. In particular, we considered the relationship between earnings mobility indices (i.e. absolute jump, Statis mapping) and business cycle variables (i.e. unemployment, GDP). Although the relationship between mobility and the business cycle is not *a priori* unambiguous, it can be argued that both job and earnings opportunities might decrease with the level of economic activity. Simple descriptive statistics provided some support to the view that earnings mobility is higher when the economy is growing and *vice versa*.

decisions are likely to differ along the life cycle of the individual (i.e. young vs. aged workers) and also according to the sex (e.g. marital status, childbearing, and other factors), we shall focus our attention on both the role played by gender and by cohort. The analysis of the above features should allow a better understanding of mobility patterns in each country.

5.1. *The Role of Gender*

In Table 6, several mobility indicators have been computed separately for men and women. In order to allow direct comparisons to be made, the original partitioning of the sample by deciles has been preserved. In both countries, there is more asymmetry for women: starting from a lower point, they are more likely to move up. Jumps are corrected to account for this fact.[28] Controlling this asymmetry, the comparison between genders, as far as the French case is concerned, suggests little differences in mobility patterns. Most indicators exhibit values which are very similar between men and women and close in magnitude to those previously obtained for the entire population. The comparison in the Italian case, however, appears more interesting. The mobility indicators suggest that Italian women, as compared with men, are characterized by lower dependence, higher asymmetry, more numerous and greater ascending jumps.

TABLE 6

MOBILITY INDICES BY GENDER

Mobility Indices	Range		France		Italy	
Dependance	*Perf. Mob*	*No Mob*	*Male*	*Female*	*Male*	*Female*
Phi of Dependance	0	3	0.99	0.96	1.09	0.99
Correlation ratio	0	1	0.67	0.68	0.76	0.66
Phi of Symmetry	0	0	0.13	0.30	0.18	0.40
Frequency and Jump						
Immobility ratio (%)	10	100	28.7	28.9	31.4	27.6
Moving up (%)	0	45	32.4	47.1	29.3	49.3
Moving down (%)	0	45	38.8	24.0	39.3	23.1
Absolute jump	0	3.3	1.61	1.53	1.39	1.36
Ascending jump	0	1.65	0.82	0.78	0.65	0.75
Descending jump	0	1.65	0.79	0.75	0.73	0.61

Also, when we consider the optimal partitioning of transition matrices in different earnings intervals according to mobility patterns, some interesting differences across genders can be observed. Results, separately for males and females, are reported in Table 7.

First, the results of the partitioning exercise differ both across countries and gender. While, in France, the three classes partitioned for men reflects the pattern of mobility previously observed, the classes partitioned for women exhibit a rather more contained pattern of mobility in the lower deciles of the distribution. Few exchanges in relative earnings positions seem to have taken place between deciles 1 to 3 and the remainder of the earnings hierarchy. In terms of estimates of the

[28]This is why the global means for jumps is not a weighted mean of jumps by gender.

TABLE 7

OPTIMAL PARTITIONING OF THE EARNINGS DISTRIBUTION BY MOBILITY PATTERNS
(*by Gender*)

France					
Male			Female		
Earnings Classes ($k = 3$)	α	τ (%)	Earnings Classes ($k = 3$)	α	τ (%)
1 to 5	1.70	75.1	1 to 5	1.27	81.9
6 to 9	1.51	65.5	6 to 8	2.28	59.1
10 to 10	5.18	65.7	9 to 10	6.53	62.1
All	*2.06*	*69.5*	*All*	*2.03*	*75.7*
Italy					
Male			Female		
Earnings Classes ($k = 3$)	α	τ (%)	Earnings Classes ($k = 3$)	α	τ (%)
1 to 2	3.71	70.1	1 to 4	1.34	72.5
3 to 9	1.2	83.1	5 to 8	1.77	64.6
10 to 10	5.42	63.9	9 to 10	8.09	74.3
All	*2.17*	*78.8*	*All*	*2.12*	*70.3*

divergence from perfect mobility (i.e. the index α) and the proportion of transitions across intervals (i.e. the τ ratio), France shows a relatively higher persistence in the earnings positions of women with respect to those of men. In Italy, differences in mobility patterns across genders appear even more striking. While mobility patterns for women do not differ much from what we observe for France, both earnings intervals and mobility indices (i.e. α and τ) highlight a pole of immobility for Italian men which is located at the bottom end of the earnings hierarchy (i.e. deciles 1 and 2). More than 70 percent of men who start their working career from relatively low earnings positions in the hierarchy are still placed there at the end of the period. This result is particularly interesting as it shows the existence of a "low-earnings" trap which affects particularly male workers.

5.2. *The Role of the Life Cycle*

A further element which has a significant influence over the mobility patterns of individuals in the earnings hierarchy concerns the position in the life cycle. As discussed in one of the earlier sections, we expect earnings mobility to be higher for young people and progressively decrease over the life cycle. In order to investigate to which extent these features are to be found in the period examined for France and Italy, we computed different indices of mobility according to the cohort of the individuals. To highlight the differences in mobility patterns two extreme cohorts—the "young" and the "old"—have been followed over the period.[29] The main set of results are reported in Table 8.

[29]The "young" cohorts—born between 1950 and 1948—have an average age of 25 in 1974, while the "old" cohorts—born between 1928 and 1930—have an average age of 59 in 1988.

TABLE 8

MOBILITY INDICES BY COHORT

Mobility Indices	Range		France		Italy	
Dependance	*Perf. Mob*	*No Mob*	*Young*	*Old*	*Young*	*Old*
Phi of Dependance	0	3	0.74	1.09	0.92	1.23
Correlation ratio	0	1	0.59	0.72	0.69	0.80
Phi of Symmetry	0	0	0.47	0.26	0.39	0.40
Frequency and Jump						
Immobility ratio (%)	10	100	19.4	30.1	25.5	32.8
Moving up (%)	0	45	59.8	27.1	50.5	26.0
Moving down (%)	0	45	20.8	42.7	24.0	41.2
Absolute jump	0	3.3	1.88	1.72	1.45	1.58
Ascending jump	0	1.65	1.16	0.60	0.94	0.65
Descending jump	0	1.65	0.72	1.12	0.51	0.93

A direct comparison across cohorts confirms the existence of marked differences in mobility patterns between "young" and "old" workers. Namely, most indicators in both countries suggest that younger individuals are characterized by lower dependence, more asymmetry and higher earnings mobility both in terms of proportion of movers as well as in the magnitude of (ascending) jumps. In general, young workers show a probability of moving up which is more than double that of moving down coupled with larger ascending jumps in the earnings distribution. Conversely, older workers are more likely to experience downward moves of larger magnitude. Of the two countries, Italy is the one for which the differences across the two cohorts are less pronounced, thus providing a further dimension to the hypothesis of a relatively higher earnings immobility as compared with France.[30]

6. CONCLUDING REMARKS

In this paper we offered a cross-national comparison of earnings mobility using two sets of longitudinal data on earnings for France and Italy. Several summary indicators of (relative) earnings mobility have been considered in the empirical analysis. The main findings suggest that earnings mobility is lower than what would be observed in a "perfect mobility" world, nevertheless it is found that, in general, mobility is higher in France as compared to Italy. For both countries, the empirical evidence shows that the initial ranking in the earnings hierarchy has an influence on the earnings (mobility) performance of the individual during his working life. In particular, lower earnings at the start imply little upward mobility and significant persistence. Different segments of the distribution, characterized by similar mobility patterns showed few exchanges among them. The existence of heterogeneity in mobility patterns has been investigated in order to detect the different role played by gender and cohort effects. The analysis has shown, for the Italian case, the presence of an immobility pole in the bottom

[30]A more detailed analysis considered the performance of the absolute jump (not reported here) for 12 different cohorts in each country. Results were in line with the above finding.

end of the male hierarchy and the existence of a potential "low-earnings" trap in which individuals appear to remain for a significant portion of their working career. The role of the cohort on earnings mobility largely confirmed the conventional life-cycle view of the wage career: higher mobility at the beginning of the working career and a progressive decline towards the middle of the life-cycle.

APPENDICES

1. *Formulas Used in Computation*

Let n_{ij} be the number of employees starting from decile i and arriving at decile j.

$$n_i = \Sigma_j n_{ij}, \qquad n_j = \Sigma_i n_{ij}, \qquad n = \Sigma_{ij} n_{ij}.$$

Variations in percentages

Immobility ratio (%):	$100\,(\Sigma_{i=j}\, n_{ij}/n)$.
Moving up (%):	$100\,(\Sigma_{i<j}\, n_{ij}/n)$.
Moving down (%):	$100\,(\Sigma_{i>j}\, n_{ij}/n)$.

Jump and Mobility Indices

Phi of dependence:	$\text{sqrt}\,((\Sigma_{i,j}\,(n_{ij} - n_i/10)^2/(n_i/10))/n)$.
Phi of symmetry:	$\text{sqrt}\,((\Sigma_{i,j}\,(n_{ij} - (n_{ij}+n_{ji})/2)^2/((n_{ij}+n_{ji})/2))/n)$.
Absolute jump:	$\Sigma_i\, 1/10\, \Sigma_j\, (n_{ij}/n_i)\lvert j-i\rvert$.
Ascending jump:	$\Sigma_i\, 1/10\, \Sigma_j\, (n_{ij}/n_i)\, \max\,(0, j-i)$.
Descending jump:	$\Sigma_i\, 1/10\, \Sigma_j\, (n_{ij}/n_i)\, \max\,(0, i-j)$.

2. *The Optimal Partitioning of Matrices*

Let N be the total of individuals and n_{ij} the number of individuals coming from decile D_i and arriving at decile A_j. Let $(J_\lambda)_\lambda$ be a partition of the interval [1, 10] into k intervals (for $k = 3$, there are 36 such partitions). Let us define $p_\lambda =$ Card $(J_\lambda)/10$, and n_λ the sum of n_{ij} for all i and j in J_λ. The number of individuals starting from J_λ is $p_\lambda N$. Their immobility ratio is therefore:

$$\tau_\lambda = n_\lambda / p_\lambda N.$$

Among partitions into k classes, we are looking for those which maximize the criterion:

$$C = \Sigma_\lambda \tau_\lambda.$$

This means that every class "keeps" as many elements as possible. In that sense, we speak of "poles of immobility." This criterion has a second interpretation: if the mobility had been perfect, we should have observed in the "square" $J_\lambda \times J_\lambda$ the size $n_\lambda^* = p_\lambda^2 N$. The ratio $\alpha_\lambda = n_\lambda / n_\lambda^* = t_\lambda / p_\lambda$ measures therefore the divergence

with respect to perfect mobility. The criterion is a weighted mean of these ratios (see Bigard, 1991):

$$C = \Sigma_\lambda p_\lambda \alpha_\lambda .$$

References

Atkinson, A., F. Bourguignon, and C. Morisson, *Empirical Studies in Earnings Mobility*, Harwood, London, 1992.

———, Earnings Mobility, *European Economic Review*, 88, 1992.

Bigard, A., Partitioning Mobility Matrices, *Proceedings of the Fifth International Symposium on Applied Stochastic Models and Data Analysis*, World Scientific, Singapore, 1991.

———, Y. Guillotin, C. Lucifora, and F. Rappelli, An International Comparison of Earnings Mobility: the Case of Italy and France, *Quaderni dell'Istituto di Economia del Lavoro*, Università Cattolica, No. 12, 1995.

Bingley, P., N. Henning Bjorn, and N. Westergard-Nielsen, Wage Mobility in Denmark, 1980-1990, Centre for Labour Market and Social Research, Aarhus, Denmark, 1995.

Blau, F. and L. M. Khan, International Differences in Male Wage Inequality: Institutions vs. Market Forces, *Journal of Political Economy*, 104, 1996.

Brandolini, A. and P. Sestito, Income dispersion in Italy, 1977–95, *Bank of Italy Research Department*, mimeo, 1996.

Burkhauser, R., D. Holtz-Eakin, and S. Rhody, Labor Earnings Mobility and Inequality in the U.S. and Germany During the 1980s, *International Economic Review*, 38(4), p. 775–94, 1997a.

———, Mobility and Inequality in the 1980s: A Cross-National Comparison of the U.S. and Germany, in Jenkins, S., Kapteyn, A., and Van Praag, B., (eds.), *The Distribution of Welfare and Household Production: International Perspectives*, pp. 111–75, Cambridge University Press, Cambridge, 1997b.

Efron, B. and R. J. Tibshirani, and *An Introduction to the Bootstrap*, Chapman and Hall, 1993.

Freeman, R. and L. Katz, *Differences and Changes in Wage Structures*, University of Chicago Press, Chicago, 1995.

Gottschalk, P. and T. M. Smeeding, Cross-National Comparisons of Level and Trends in Inequality, *Journal of Economic Literature*, XXXV, 1997.

Guillotin, Y. and A. Bigard, La mobilité hiérarchique des salaires en France de 1967 à 1982, *Economie et Prévision*, No. 102–103, 1992.

——— and P. Sevestre, Estimation de fonctions de gains sur données de panel: engogénéité du capital humain et effet de la sélection, *Economie et Prévision*, No. 116, 1994.

Hills, J., *New Inequalities: The Changing Distribution of Income and Wealth in the U.K.* Cambridge University Press, Cambridge, 1996.

Hope, K., *The Analysis of Social Mobility: Méthods and Approach*, Clarendon Press, Oxford, 1972.

Lavit, C., *Analyse conjointe des tableaux quantitatifs*, Masson, 1988.

Levy, F. and R. Murname, U.S. Earnings Levels and Earnings Inequality: A Review of Recent Trends and Explanations, *Journal of Economic Literature*, XXX, 1992.

Lucifora C. and F. Rappelli, Evoluzione delle retribuzioni nel ciclo di vita: un'analisi su dati longitudinali, *Lavoro e Relazioni Industriali*, 2, 1995.

Monjardet, B., Concordance et consensus d'ordres totaux, *Revue de Statistiques appliquées*, 33(2), 1985.

OECD, *The OECD Job Study: Facts, Analysis, Strategies*, OECD, Paris, 1994.

———, *Income Distribution in OECD Countries*, Social Policy Studies, OECD, Paris, 1995.

———, Earnings Inequality, Low-Paid Employment and Earnings Mobility, in *Employment Outlook*, OECD, Paris, 1996.