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Measuring wealth mobility

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MEASURING WEALTH MOBILITY

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Abstract

In the economic literature on mobility, measurement issues are generally disregarded. The aim of the paper is to assess their impact on the analysis of Italian households' mobility across the wealth distribution in 1989-2004. The paper shows that response (or measurement) errors and transitory shocks may account up to 30-50 per cent of the observed mobility (depending on the index used). Moreover, the dynamics of mobility are also likely to be biased by the dynamics of response (or measurement) errors. In the case of Italy, the declining level of observed mobility is downward biased by the increasing difficulty of measuring household wealth (which results in an increase in response errors). Measurement issues appear to be more important than socio-demographic characteristics in explaining mobility.

JEL Classification: C33, D3, P46.
Keywords: wealth mobility, attrition, response error, latent class analysis.

Contents

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1 Introduction

The distribution of personal and household economic well-being within a society is a key aspect of the economy. Economists have greatly emphasized the need to pay attention not just to the static characteristics of the distribution but also to changes within it over time. Indeed, inequality and mobility are strictly related (Davies and Shorrocks, 2000).

First, the normative significance of any cross-sectional measure of inequality depends on the degree of mobility within the distribution. A society may experience a high level of inequality, but provided it goes hand in hand with a high mobility, this disparity could decrease in the long run.

Moreover, a higher mobility implies a greater chance for people in the lower tail of the distribution to improve their well-being, providing they have the necessary skills and ability. Therefore, a high degree of inequality would seem to be far less questionable if the society offers equal opportunities to all individuals than if there were an entrenched hierarchy (or underclass).

The literature proposes several definitions and classifications of mobility.

While no one measure of economic mobility is all encompassing, income and wealth are the most commonly used (Jianakoplos and Menchik, 1997; Keister, 2000). Other studies define mobility in terms of occupations and education levels (Rustichini et al., 1997). Generally, wealth mobility is less studied, probably because of the limited availability of survey data. This is particularly true of Italy. A paper by Jappelli and Pistaferri (2000) deals with the issue of wealth dynamics in Italy, but wealth mobility is only marginally considered: only the mobility in a two-year period (1993-1995) is studied. A more recent paper by Faiella and Neri (2004) compares Italian and American households' wealth mobility in a ten-year period. However, the analysis is only descriptive, and therefore measurement issues are not dealt with.

Nonetheless, household wealth is an important indicator of household economic well-being. Since it consists of all the assets that can be converted into cash, it can be viewed as a good proxy of lifetime consumption or poverty.

Whatever the measure, mobility may be studied by analysing how the same group of households changes as the households age – intracohort mobility (Hurst et al., 1998; Steckel and Krishnan, 1992; Kennickell and Starr-McCluer, 1997). Alternatively, it can be addressed looking at intercohort mobility, which is the mobility exhibited by different groups of households belonging to different generations (Davies and Shorrocks, 2000; Charles and Hurst, 2002; Piketty, 2000; Rustichini et al., 1997).

In the economic literature there are two approaches to the analysis of mobility. One approach is based on stochastic process, usually a first-order Markov chain, which determines how the distribution changes over time. The other posits a deterministic model, typically a life-cycle model for explaining the determinants of wealth accumulation (Modigliani, Brumberg, 1954). The main drivers explaining differences in accumulation patterns are earnings, rates of return on accumulated assets, initial endowments, rate of saving and bequests.

In both approaches non-sampling errors are generally disregarded (the only exception being attrition). Since mobility may be heavily affected by measurement issues, it is crucial to get rid of those issues before entering into economic reasoning. The objective of the paper is to present a model to separate true from spurious change and therefore to assess the impact of measurement issues in the analysis of mobility. The data used in the analysis are from the Italian Survey of Household Income and Wealth. The study refers to the Italian households' wealth mobility in the period 1989-2004. I look at mobility among members of the same generation. Mobility is measured in relative terms: a household may experiment a change even if its wealth does not change, as long as there is a change in other households' situation. In other words, the aim is to estimate the probability for a random household to improve its relative position within the wealth distribution in a given time span.

The outline is as follows. The next paragraph presents a brief description of the data. Section 3 deals with issues in the measurement of wealth mobility, focusing on the problems of attrition and measurement error. Section 4 introduces the class of models used in the analysis to separate real from spurious change. Section 5 describes the observed patterns of mobility, while Section 6 presents the estimated level of wealth mobility in Italy and its dynamic between 1989 and 2004.

2 Data

Data used in the analysis are from the Bank of Italy Survey on Household Income and Wealth (SHIW). The dependent variable is the household's relative position in the wealth distribution. This variable is constructed as the ratio of household total net wealth, defined as the sum of real assets (real estate, companies and durables) and financial assets (deposits, government securities, equity, etc.), net of financial liabilities (mortgages and other debts), to its overall mean. This variable is then categorized in four classes using the same relative thresholds for each point of observation. This solution allows me to eliminate from the analysis the mobility (or immobility) due to changes in the absolute values of thresholds which, in turn, are due to changes in wealth distribution over time.

The paper studies the changes in households' rankings in the period 1989-2004. Since the number of households that stayed in the sample for the whole period is too small, most of the analyses are carried out using two distinct samples, splitting the whole span into two nine-year periods: 1989-1998 and 1995-2004. Mobility over different periods is also considered for description or robustness checks.

The choice of two nine-year periods answers two contrasting needs. First, since wealth presents a high level of persistence over time, the analysis of mobility requires a sufficiently long period of observation.[1] Unfortunately, the longer

[1] The longer the spell the higher the probability that transitions are also due to saving patterns. Conversely, in short periods wealth transitions are more likely to be affected only by variations in asset prices or exceptional events.

the span, the smaller the size of the sample and the lower the precision of the results. I thus prefer to conduct the analysis on two distinct samples. Although the periods are partially overlapping they still make it possible to study the dynamic of wealth mobility over time.

For the 1989-1998 period, the sample consists of 544 units. The three years considered in the analysis are 1989, 1993 and 1998.[2] Since I use relative wealth the figures are comparable across time. At each point in time households are classified in four wealth classes based on the quartiles estimated for 1989. I use 1998 weights, adjusted for non-response following the method of D'Alessio and Faiella (2002), and post-stratified to reproduce some known 1998 distributions of population by age, geographical area and size of municipality.

For the 1995-2004 period, the sample consists of 1010 households. The analysis uses the measurements of wealth at three different points in time: 1995, 2000 and 2004. At each point in time the relative net wealth is then classified according to the quartiles estimated for 1995.[3] The weights used in the analysis refer to 2004, adjusted as described above.[4]

3 Issues in the measurement of wealth mobility

Since household's wealth is a stock one would expect it to be quite persistent across time. As a consequence wealth mobility should only be affected slightly by spurious data (at least compared with income mobility). Unfortunately, the measurement of household wealth through survey data is subject to many sources of error. In the case of the data at hand, the three major measurement problems stem from non-response in the first wave, attrition and response (or measurement) errors.[5] Item non-response is not an important issue because

[2] Because of the relatively small sample size it is not possible to use all the available measurements. Indeed, the inclusion of 1991 and 1995 would result in a high number of possible patterns of transition, most of which would probably not be observable. The presence of a high number of trajectories with a zero frequency leads to inconveniences in the estimation of log-linear models. For a detailed view of the effects caused by of cell with zero frequency (sampling zeroes) see Agresti 2002 and Christensen, 1997.

[3] In order to assess the robustness of the models, different cut-off points were also used to classify the household's wealth (including quartiles computed for each year).

[4] The analysis has been replicated using the 1995 weights and the results do not change significantly.

[5] Previous studies have addressed those issues in the case of the SHIW. The problem of non-response has been studied by D'Alessio and Faiella (2002), while the problem of measurement errors has been investigated by Cannari et al. (1990), Cannari, D'Alessio (1993), D'Aurizio et al. (2006), and Biancotti et al. (2008). Other studies have addressed the problem by comparing macro estimates with survey data. Bonci et al. (2005) show that from 1995 to 2002 the sample estimate of total financial assets of Italian households is about one third of the corresponding estimate from the Financial Accounts. For financial liabilities the corresponding percentage is around 44 per cent. By contrast, the sample estimate of housing wealth is reasonably coherent with the aggregate value, ranging around 84 per cent (Cannari and Faiella, 2005). A possible explanation is that the distribution of financial wealth is highly concentrated among the wealthier households, who have a higher propensity to refuse the interview and to underreport their effective holdings.

of the way the survey is designed. As a matter of fact non response on items relating to income or wealth is not allowed.

Since the focus of the analysis is response error, I first need to take into account the problems of unit non-response and attrition.

3.1 Unit non-response and attrition

To the extent that initial non-response and panel attrition are not random, they affect the sample composition and may therefore bias the estimate of mobility based on the remaining sample. In order to tackle the problem of initial non-response, I adjust the weights using the method of D'Alessio and Faiella (2002).

As to attrition, following the typology introduced by Fitzgerald et al. (1998), I test for the presence of selection on observables and of selection on unobservables.

The first case arises whenever the attrition process depends on observable characteristics such as age, education level, profession, economic well-being, and so on. Tables A1-A3 in the appendix present some tests for the case of selection on observables. Three different models are estimated for households interviewed in 1995. In the first, the dependent variable is the probability of drop-out in 2000; in the second, the probability of drop-out in 2004. in the third the dependent variable is the wave of drop-out (categorized in five classes: drop-out in 1998, in 2000, in 2002, in 2004, still in the sample). For each probit, two models are fitted: the first includes the year in which the household was interviewed for the first time, the second does not.

The general result of the analysis is that the hypothesis of attrition on observables cannot be rejected by the data at hand. Nonetheless, there is no clear and strong association between the attrition probability and the household's socio-demographic characteristics. The year of first interview is the most important determinant for the drop-out process, accounting for about 11-17 per cent of total variability. By contrast, demographic aspects such as age, level of education and profession do not always play an important role: in two models they are not significantly different from zero, and overall they only account for about 2-4 per cent of total variability. Similarly, no clear pattern of association with household wealth emerges.

Anyway, in order to correct for the attrition in the analysis the weights (adjusted for initial non-response) are post-stratified to reflect the main socio-demographic characteristics of the population at the end of the time span considered.

The case of selection on unobservables arises whenever there are unobserved variables that jointly determine both the attrition process and household wealth. It may be, for example, that households experiencing large swings in their economic position are less likely to remain in the survey than those with a steady economic position. If so, any measure of mobility exhibits less mobility than would result from the entire sample.

In order to test for selection on unobservables I use two samples. The first consists of 1,209 households participating the 1995 wave and the second of 4,842 households interviewed in 2000. In both cases, the households are eligible for a new interview in 2004. The interviewers' years of experience and level of education are used as instruments. These variables affect the attrition propensity: generally, interviewers with greater experience or a higher level of education tend to obtain higher response rates. Moreover, these variables are uncorrelated with household wealth for at least two reasons. First, they are not under the respondent's control. Second, they can be assumed to vary across respondents independently of household's wealth. The assignment of interviewers is not based on the respondent's characteristics, but mainly linked to logistic aspects.

Results are shown in Tables A4 and A5. The non-significance of the inverse Mills ratios in both models indicates that the correlation between the errors can be attributed to the characteristics of the interviewer and not to other unobserved variables such as the unobserved wealth variations. The presence of attrition on unobservables is therefore not supported by the data at hand.

3.2 Response errors

The measures of mobility are also likely to be affected by response errors in the data. These errors may cause units to move up and down even if their true rank in the distribution is unchanged.

Wealth reporting in surveys is a two-stage process involving first the reporting of assets and liabilities owned by the household and then the reporting of the amount held. Response errors may occur at either stage. An entire wealth component could be mis-reported leading to either the respondent's failure to report true holdings or his or her reporting of an asset not actually held. Alternatively, ownership may be correctly reported but the amount can be misreported. A theorical framework for the cognitive factors in reporting is suggested by Tourangeau and others (1984) who distinguish the following stages in the cognitive work necessary to answer a survey question: understanding, retrieval and response production.

Deliberate under-reporting is probably the major cause of response error. Nonetheless, in either of the stages mentioned there are areas of potential sources of error without invoking under-reporting. A first reason is the understanding of terms. For the survey respondents questions should be stated in clear, simple and easily understood language.

A second reason is retrieval problems. Even if the respondent has fully understood the question he or she may fail to retrieve the correct information. Lack of knowledge is the first cause. For instance, in the SHIW the respondent is asked to report the assets and liabilities owned by all the members of the household. Even if the respondent is selected as the most knowledgeable person in the household, he or she may not know all the assets held by other components (for instance, in the case of a working child still living at home). Another source of lack of knowledge may be the non salience of some assets. The household may fail to report assets such as bank certificates or postal deposits of low amount. Also time contributes to faulty recall. Since the reference period is the end of the previous year, households that are interviewed at the end of the data collection period are more likely to have greater difficulty of recall than those interviewed at the beginning of the fieldwork. When the required information is not directly retrivable from memory, respondents adopt a reconstruction strategy which is not likely to be completely successful. For instance, it can lead to a sort of rounding.

In the final stage, after recalling the requested information, the respondent decides his or her response strategy. Besides deliberate prevarication, there are further possible sources of error at this stage. Questions on household wealth may be considered impolite or very personal, leading to reticence on the part of the respondent. Another source of error may come from the interaction between the interviewer and the respondent. For instance, if the respondent belongs to a very rich household he or she may decide to under-report household wealth because of a need for "social conformability" with the interviewer.

All the issues mentioned are likely to generate both bias and random error referring to the distribution of errors around their average value. If the bias and its variance were constant across time they would not cause spurious mobility. For instance, if a respondent under-reports in each wave his or her household's wealth by the same amount this would not affect mobility (the transition probabilities would be affected only because of the differential propensity to under-report of various segments of the population: some households might be classified in the wrong initial wealth class). Unfortunately, the assumption of constant response patterns is not very realistic even if the respondent is the same in all the waves. A first reason is that people do not generally rember exactly how much they have under-reported in the previous survey. Moreover, the respondent for the same household may change in different surveys and he or she may behave differently from the previous one. Moreover, the interviewer may change as well, and the respondent may not like the new person, so that he or she may be less willing to cooperate than in the previous surveys. Finally, households' portolios in recent years has become more complex and this makes the retrieval process more difficult.

The most recent papers about the presence of measurement errors in the SHIW are D'Aurizio et al. (2006) and Biancotti et al. (2008). The paper by Biancotti et al. investigates the presence of mis-measurement using the Heise index (Heise, 1969). To gauge the influence of this issue, I compute the index for the major components of household wealth over different periods (see Table A6 in the appendix). Although the level of reliability is fairly acceptable, ranging from 0.6 to 0.8, it fluctuates across different waves, especially in the case of financial assets and liabilities.[6]

[6] The Heise framework cannot be applied to the analysis of measurement error of categorical variables since the classical assumption of no covariance between true variable and measurement error does not hold in this context. The reason is that for any category of true variable, the error term can only assume bounded values.

4 The econometric model for wealth mobility

The latent class analysis provides a useful framework to test and correct for spurious change when categorical variables are concerned.

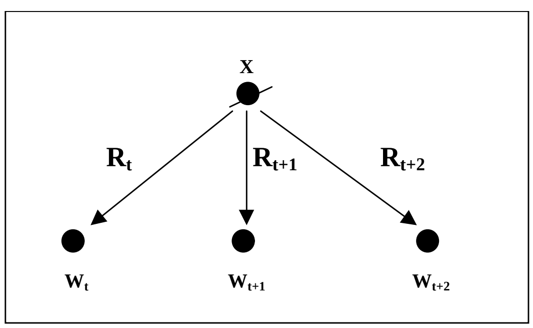
Such models are based on the assumption that the true variable of interest (the household's wealth, for instance) cannot be measured directly. It is only possible to measure some imperfect indicators (manifest variables) of such a latent variable. The covariation actually observed among manifest variables is due to each manifest variable's relationship to the latent variable.

Let W_t be a categorical variable (with D levels) representing household wealth measured at T occasions $1 \leq t \leq T$, and let w_t be a particular level of W_t. Because of the measurement error, such a variable has to be considered only an imperfect proxy. Let X_t denote an occasion-specific true latent variable with C latent levels and x_t a particular level at time t. The latent variable is related to the manifest indicators through the matrices $\mathbf{R}_t$.

For each point in time, the square matrix $\mathbf{R}_t$ contains the conditional probabilities of the observed variable given the latent one: the element $\rho_{d||c}$ is the probability that a given household belongs to category d of the manifest variable, given membership in class c of the latent variable. If $C = D$ then $\rho_{d||c}$ can be interpreted as the probability of correct response, or the reliability (of each class). The matrix $\mathbf{R}_t$ therefore provides a useful criterion to assess the measurement properties of the observed household's wealth: the closer the response probability matrix is to an identity matrix, the smaller is the non-sampling error of the variable.

The simplest model is the (LCA) latent class model (Haberman, 1979; McCutcheon, 1987; Hagenaars, 1990; and Vermunt, 1997) shown in Figure 1.

Figure 1. The Latent class model

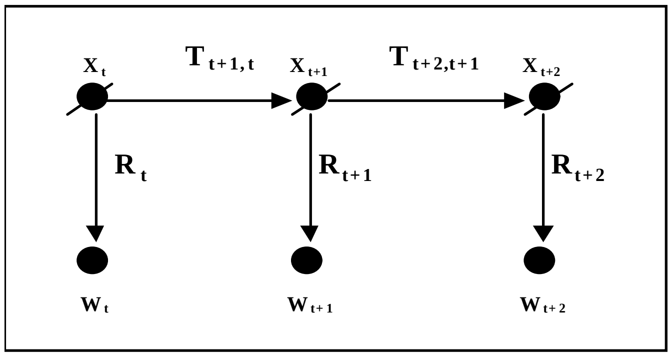


The basic assumption behind the LCA model is that the latent variable X does not change over time: all the observed changes are due to measurement errors.

The latent Markov model (LMM) provides a useful extension of the LCA model for investigating true change, controlling for the influence of noisy data. It was introduced in 1955 by Wiggins and also referred to as the latent transition or hidden Markov model (see Wiggins, 1973; Langeheine and Van de Pol, 1994; and Vermunt, 1997).

Figure 2 exemplifies the model when three measurements are available. Since the objective is to estimate the latent turnover table, the latent variables should have as many latent classes, or true states, as the observed indicator variables have categories ($D = C$).

Figure 2. The Latent Markov model



The LMM model consists of two parts. The first is the “true” underlying model of systematic change, represented by the transition matrix **T**, which contains the estimated true transition probabilities. The generic element is the probability that a certain household belongs to class b at time $t+1$ given that it belongs to class a at time t. The transition structure for the latent variables has the form of a first-order Markov chain. The wealth class at time t only depends on the wealth class at time $t-1$ ($X_{t+1} \perp X_{t-1} | X_t$). Moreover, each occasion-specific observed variable depends only on the corresponding latent variable, that is measurement errors at time $t-1$ do not affect the true wealth class at time t ($X_t \perp W_{t-1} | W_t, X_{t-1}$). As a consequence, the covariation actually observed among manifest variables is due to each manifest variable’s relationship to the latent variable.

The Shorrocks index S (Shorrocks, 1978), Kendall’s (1938) tau-b, Bartholomew’s (1973) index and the adjusted share of stayers can be used as synthetic measures to decompress the information contained in this transition matrix. Shorrocks (1978) shows that it is not possible to define one index that has all of the desired properties of a measure of mobility. Therefore it is helpful to present different measures and to interpret results carefully.

The second part of the LMM model consists in spurious change mainly resulting from two sources: measurement errors and other transitory shocks that may affect the households (such as a boom-bust cycle in financial markets).

It is represented by the response matrix $\mathbf{R}_t$, containing the conditional probabilities of manifest variables given the latent one at time t. As mentioned, these probabilities can be interpreted as measures of reliability. In the model, reliability is assumed to be independent of change: movers and stayers answer with a similar reliability (reliability at time $t+1$ is independent of the true state at time t).

For identification purposes, it is typically assumed that the error component is time-invariant: for $2 \leq t \leq T$. If no further constraints are imposed, one needs at least three time points to identify the LMM.

The corresponding LMM has the form:

$$\Pr(W=w)=\sum_{c=1}^{C}\Pr(X_1=x_1)\prod_{t=2}^{T}\Pr(X_t=x_t|X_{t-1}=x_{t-1})\prod_{t=1}^{T}\Pr(W_t=w_t|X_t=x_t)$$

Several generalizations of the models can be achieved by exploiting the ordinal nature of the variables (see, among others Agresti, 2002; Clogg and Shihadeh, 1994).

The models are estimated using the EM algorithm (Dempster et al., 1997). The fit is evaluated using the Pearson χ^2 statistic and the likelihood ratio G^2. When the model is locally identifiable both statistics follow an asymptotic Chi-squared distribution. In order to compare non-nested models, the AIC and BIC criteria were used.

Summing up, the model enables me to decompose the observed mobility into two components: (i) spurious change (mainly due to transitory shocks and measurement errors), and (ii) a persistent component, which is simply the current observation purged of the previous component. As a consequence, results should be interpreted as the regularity of change.

5 Wealth mobility in Italy

5.1 Observed wealth mobility

The observed transitions in the period under study show a considerable movement within the wealth distribution (Table 1). Between 1989 and 1998, some 55 per cent of households move to another bracket. Similarly, around 42 per cent of households change their rank between 1995 and 2004.

The degree of mobility depends on the initial position but is quite high for each wealth class. Households in the third class show the greatest mobility: about 58 per cent move to another class in both time spans.

Between 1995 and 2004 about a quarter of households in the second bracket move to a higher class. Similarly, some 30 per cent of those in the third class fall into a lower one. The corresponding percentages are even higher in the 1989-1998 period.

Most transitions take place between two adjacent states. Big movements between the bottom and the top of the distribution are low-probability events but do still happen. About 9 per cent of households at the bottom in 1995 jump to the top in 2004 and about 15 per cent of the inhabitants of top fall to the bottom of the ladder. The corresponding percentages are even higher in the previous interval: about 15 per cent and 19 per cent respectively.

Table 1. Observed transitions of households by wealth class

1998 / 1989	First class	Second class	Third class	Fourth class	Total	Stayers*
First class	47.6	37.3	11.4	3.8	100.0	12.0
Second class	25.7	41.0	25.9	7.3	100.0	10.2
Third class	6.7	29.4	43.6	20.3	100.0	10.9
Fourth class	1.9	17.4	33.8	46.9	100.0	11.7
2004 / 1995	**First class**	**Second class**	**Third class**	**Fourth class**	**Total**	**Stayers***
First class	64.3	26.5	4.0	5.2	100.0	16.1
Second class	10.6	64.7	17.3	7.4	100.0	16.3
Third class	3.1	27.1	41.8	28.1	100.0	10.4
Fourth class	1.1	13.8	23.3	61.8	100.0	15.5

(*) Share of households in the same bracket at the beginning and at the end of the spell.

The comparison between the two periods shows a marked decrease in the overall degree of mobility. Around 50 and 60 per cent of households in the 1989 two lowest wealth segments move upwards after nine years. In the more recent time span, the corresponding probabilities fall by 17 and 23 points respectively. Similarly, the share of movers among the households at the top of the distribution decreases by 15 points. Households in the third class represent the only exception: their level of mobility remains almost unchanged.

The decline in the overall level of wealth mobility does not seem to depend on the length of the time span. This decline is confirmed even when considering shorter lags (Table 2). Since these results could be affected by measurement errors or transitory shocks, in the next paragraph these changes are analysed using models which allow measurement issues to be addresseded.

Table 2. Measures of observed mobility over different time span

Intervals	Shorrock's	Bartholomew's	Kendall's(*)	Adjusted share of stayers(*)
		2-wave mobility (4-5 years)		
1989-1993	0.49	0.64	0.54	35.1
1991-1995	0.43	0.50	0.65	42.9
1993-1998	0.39	0.48	0.66	47.4
1995-2000	0.40	0.50	0.63	63.2
1998-2002	0.41	0.50	0.64	45.8
2000-2004	0.39	0.49	0.64	47.8
		3-wave mobility (6-7 years)		
1989-1995	0.48	0.59	0.57	35.6
1993-2000	0.43	0.54	0.60	42.3
1998-2004	0.42	0.51	0.62	43.9
		4-wave mobility (9 years)		
1989-1998	0.55	0.69	0.50	26.4
1995-2000	0.42	0.52	0.62	44.2

(*)Measure of immobility.

One of the reasons behind the decline in the level of mobility is likely to be the dynamics of asset prices. According to Cannari et al. (2005) capital gains account for about 40 per cent of the growth in real per capita wealth observed in the period 1989-2004. Moreover, about 20 per cent of observed transitions among wealth classes can be ascribed to capital gains.

The dynamics of capital gains affect mobility mainly through two different channels.

The first concerns the heterogeneity of households' portfolios. Households belonging to the same wealth bracket hold different portfolio compositions depending on a variety of factors such as their preferences, age, level of education, constraints and so on. Therefore, they are more or less likely to experience a shift in their relative position according to the variations in the prices of the assets they own.

The second channel concerns the heterogeneity of prices, for example at geographical level. Cannari and Faiella (2004) show that the prices of dwellings present a high variability both at regional level and between provincial capitals and other municipalities. As a consequence, households belonging to the same wealth class but living in provincial capitals rather than in other municipalities, are more likely to experience higher swings in the value of their dwellings and therefore tend to show a higher mobility.

Whatever the case, the contribution of capital gains to household mobility is likely to be declining in the more recent time span.

For the most important asset, that is dwellings, from 1989 to 1998 the average prices increase by around 63 per cent. From 1995 to 2005 the corresponding figure is around 59 per cent. Similarly, the growth rate declines for the value of short-tem treasury bonds, businesses, mutual funds and foreign securities. The only exception is the variation in stock prices (which remains almost unchanged).

A second reason for decreasing wealth mobility could be the lower contribution of household savings in the accumulation of wealth. This is true for any wealth class, but especially for households in the lowest two brackets. According to SHIW data, for the poorest households the ratio of savings to wealth has fallen from around 70 per cent in 1989 to around 30 per cent in 2004.

Finally, a third possible explanation lies in the changes in the wealth distribution over time. From 1989 to 2004, household wealth shows a significant increase in its average level and in its level of concentration. This aspect may have resulted in a widening of the distances among the average wealth of the classes, making the mobility more difficult.

Conversely, socio-demographic characteristics (both at individual and at household level) do not appear to play an important role in explaining wealth mobility. Table A8 in the appendix presents two models for the probability of upward and downward mobility in the reference period. The initial wealth class has not been included in order to measure the importance of demographics such as level of education, age, geographical area, size of municipality, gender and number of earners. These variables account for at most 6 per cent of total variability. Moreover, the performance of individuals with a higher level of education (which should proxy for individual ability) is not significantly different from the others.

5.2 Model selection

Several models have been tested in order to describe the observed patterns of transition among wealth classes (see Tables B3 and B4 in Appendix B). As expected, assuming the data to be free of error, it is not possible to find a parsimonious model with an adequate fit describing the data generating process. The hypothesis that all the observed transitions are due to noisy data (latent class model) must be rejected as well.

The latent Markov models, assuming the observed changes to be a combination of true and spurious change, are instead plausible models for the data at hand. In the model used in the analysis the transition probabilities are allowed to vary over time, while the measurement properties (reliabilities) are constrained to be time-invariant (within the period of analysis) and are modelled with a quasi-independence model. The measurement part of the model assumes that observations tend to concentrate on the main diagonal (absence of error), while for the other cells the probability of error does not depend on the wealth class (quasi-independence assumption). The only hypothesis in the structure of true latent transitions is that they only depend on the wealth class at the beginning of the period. The Pearson χ^2 statistic, the likelihood ratio G^2 and the analysis of residuals (see Appendix B) indicate that the hypothesis in question cannot be rejected at the usual significance levels.

Table 3 summarizes the measurement part of the model, that is, the relationship among latent and manifest variables. The conditional probabilities show that the manifest indicators of household's wealth have fairly good measurement properties.

Table 3. Estimated response probabilities and standard errors

Observed class Latent class	First class	Second class	Third class	Fourth class	Total
			1989-1998		
First class	96.8(0.75)	1.7(0.56)	1.5(0.51)	0.1(0.14)	100.0
Second class	0.4(0.27)	82.5(1.63)	17.0(1.61)	0.6(0.33)	100.0
Third class	0.0(0.02)	11.5(1.37)	82.5(1.63)	6.0(1.02)	100.0
Fourth class	0.0(0.03)	0.0(0.01)	3.2(0.75)	96.8(0.75)	100.0
Observed class	First class	Second class	Third class	Fourth class	Total
Latent class			1995-2004		
First class	83.1(1.18)	16.5(1.17)	0.2(0.14)	0.2(0.14)	100.0
Second class	2.2(0.47)	77.0(1.32)	19.9(1.26)	0.9(0.30)	100.0
Third class	0.2(0.14)	10.6(0.97)	62.7(1.52)	26.5(1.39)	100.0
Fourth class	0.2(0.15)	0.2(0.14)	0.2(0.14)	99.4(0.25)	100.0

(*) Share of households in the same bracket.

In the 1989-1998 period, households at the top or at the bottom of the distribution only have a 3 per cent chance to be incorrectly classified. This percentage rises to 17 per cent for those in the middle of the distribution.

In the more recent period, the measurement of wealth has been less reliable. While for the richest households the estimated measurement error is still just 1 per cent, for the other classes it ranges from 17 per cent (first bracket) to 37 per cent (third bracket).

It is hard to find a convincing explanation for this decrease in the level of reliability. Nevertheless, a plausible cause might be the increasing complexity of household portfolios (Guiso, Jappelli, 2002) because of which respondents find increasing difficulties in reporting ownership and amounts correctly.

Table 4 provides a comparison between observed and estimated statistics on mobility.

Table 4. Observed versus estimated share of stayers

	Observed		Estimated	
Wealth class	1989-1998	1995-2004	1989-1998	1995-2004
First class	12.0	16.1	12.8	22.0
Second class	10.2	16.3	14.7	21.6
Third class	10.9	10.4	10.0	20.4
Fourth class	11.7	15.5	11.4	12.3
Total	44.8	58.2	49.0	76.2

(*) Share of households in the same bracket

The overall estimated degree of wealth mobility is significantly lower than the observed one. From 1995 to 2004, around 76 per cent of Italian households are estimated to remain in the same wealth segment, about 20 points more than the observed percentage. Some 13 per cent are estimated to improve their relative standing, while around 11 per cent fall in a lower segment. Moreover, about 44 per cent of Italian households are estimated to remain stuck at the lower half of the distribution (first or second bracket), while the observed share is about 32 per cent.

Also between 1989 and 1998, a significant but lower share of observed transitions is likely to be due to spurious change: according to the model about one half of the households do not change their rank in the period (around 5 per cent more than the observed percentage).

Overall, according to the synthetic measures of mobility presented, the influence of spurious change varies between different time spans but it might account for 30-50 per cent of total observed mobility .

5.3 Mobility within the distribution

The level of regular mobility of Italian households is summarized in Tables 5 and 6.

The first table contains the estimated transition probabilities purged from noisy data. Tables 6 presents two descriptive measures based on those probabilities: the mean exit time and the mobility index. The mean exit time ti is the number of spells a household is expected to remain in the same class. It is computed as $t_i = 1/(1 - p_{ii})$, where p_{ii} is the probability of remaining in class i (Prais, 1955). The mobility index is the probability of moving to a distant class (crossing the median position) and staying there. This index arises from the observation that in less mobile societies, not only is the degree of persistence in the same class higher than in more mobile ones, but also the chance to permanently modify one's relative position is less.

The probability of moving to a given class depends strongly on the initial position in the wealth distribution, which, in turn, is significantly related to parents' economic situation (see Checchi et al., 1999 and Mocetti, 2007).

This is particularly important for upward mobility. As expected, access to the upper classes is not a fair game; it appears next to impossible for households in the lower tail of the distribution.

From 1995 to 2004, for households at the bottom of the distribution the estimated probability of moving upwards is about 25 per cent, but movements are mostly limited to the adjacent bracket (Table 5). Assuming these probabilities to be constant over time, for households at the bottom of the distribution it would take, on average, approximately 36 years (four time spans of nine years each) to escape from the poorest class (Table 6).

The degree of mobility is even lower for those in the second class: if their chance of moving in a nine-year spell remained constant over time, this bracket would be an absorbing state, with only 2 per cent of households with a chance to permanently improve their well-being (and about a zero chance to worsen it).

Conversely, households in the third class show the highest level of mobility: some 40 per cent move to another class; the probability of moving downwards is approximately the same as that of moving upwards.

The richest group has a 25 per cent probability of moving downwards, but most transitions are towards a medium-high wealth segment.

Finally, households at the extremes of the distribution have the same probability of permanently exchanging their positions (around 5 per cent).

Table 5. Estimated transitions of households by wealth class

Observed class / Latent class	First class	Second class	Third class	Fourth class	Total
			1989-1998		
First class	49.4(4.2)	39.4(4.1)	9.8(2.5)	1.3(2.5)	100.0
Second class	23.7(2.8)	56.0(3.3)	15.9(2.4)	4.4(1.3)	100.0
Third class	5.7(2.3)	29.6(4.4)	42.4(4.8)	22.3(4.0)	100.0
Fourth class	3.2(2.2)	8.8(3.6)	40.6(6.2)	47.4(6.3)	100.0
Shorrock's: 0.51, Kendall's tau-b: 0.57, Bartholomew's: 0.60, Adjusted share of stayers: 32.1					
Observed class	First class	Second class	Third class	Fourth class	Total
Latent class			1995-2004		
First class	75.3(3.1)	19.4(2.8)	1.7(0.9)	3.6(0.9)	100.0
Second class	0.4(0.5)	97.1(1.3)	1.5(1.0)	1.0(0.8)	100.0
Third class	2.6(1.1)	17.8(2.6)	63.0(3.2)	16.5(2.5)	100.0
Fourth class	1.0(0.5)	4.1(1.0)	19.9(1.9)	75.0(2.1)	100.0
Shorrock's: 0.22, Kendall's tau-b: 0.78, Bartholomew's: 0.28, Adjusted share of stayers: 68.2					

Table 6. Mean exit time and immobility ratios by wealth class

	Mean exit time			Immobility ratio		
	1989-1998	1995-2004	Ratio	1989-1998	1995-2004	Ratio
Wealth class	(a)	(b)	(b/a)	(a)	(b)	(b/a)
First class	2.0	4.0	2.0	0.1	0.0	0.6
Second class	2.3	34.5	17.4	0.1	0.0	0.2
Third class	1.7	2.7	1.6	0.3	0.2	0.7
Fourth class	1.9	4.0	2.1	0.1	0.0	0.5

In order to get a better sense of the phenomenon of mobility I compare the level of mobility across time. This comparison confirms the decrease in the amount of mobility over time shown by observed data.

From 1989 to 1998, the percentage of movers in each class ranges from 44 to 57 per cent. On average, the corresponding probabilities are 20 points lower during the 1995-2004 period. The synthetic measures of mobility indicate that the decline in the overall mobility on a nine-year scale may range from 35 to 50 per cent. The average time spent in each wealth class doubles.

It is worth noting that the decline in wealth mobility is even greater when response errors are taken into account. This emerges clearly from Table 4. The explanation lies in the mentioned worsening of response patterns (see Table 3). Since the measurement of household wealth is more difficult, more errors are removed by the model resulting in a lower mobility. The main reason for the worsening of measument properties is financial assets. Because of the increasing complexity of household's financial portfolios, respondents participating the survey are more likely to make response errors.

The worsening of reliability across the two periods is not in contrast with the assumption of a constant reliability in each period. As a matter of fact, the validity of the latter assumption is confirmed bv the good fit of the models to the data. The correct way to interpret the results is that the mean value of the reliability has shifted downwards in the two periods.

5.4 Robustness checks

The results shown so far draw an image of a society in which wealth mobility strongly depends on measurement issues and transitory shocks, and it is decreasing over time. In order to verify the robustness of these results, I replicate the analysis selecting six different samples and looking at mobility over shorter intervals. The samples consist of four-year successive (and partially overlapping) intervals. For any interval, the corresponding synthetic measures of mobility are computed (Table 7). Moreover, for comparison, I also disaggregate the two nine-year samples (used in the analysis) into three four-year samples (Table 8).

The results confirm the significant decrease in wealth mobility over time. Most of the synthetic measures used in the analysis indicate that on a four-year scale the fall in the level of mobility ranges from 20 to 30 per cent. The adjusted share of stayers, for instance, is around 54 per cent in the 1989-1993 interval. This percentage rises to about 72 per cent between 2000 and 2004.

The decrease of mobility is not a linear function of time. The picture emerging from the following tables indicates that immobility reaches a peak between 1995 and 2000. In this interval some 82 per cent of households (adjusted share) do not change their rank in the wealth distribution in a four-year period (Table 7). This immobility declines in the successive spells.

The dynamics of mobility appear to be uneven across the wealth distribution. In general, households in low-level wealth classes appear to make the greatest contribution to the worsening of the overall mobility.

For the poorest segments, the degree of immobility shows a steady increase over time. While some 68 per cent of households remain in the first class in 1989-1993, this percentage rises to around 87 per cent between 2000 and 2004. For households in the second bracket the degree of persistence in the same class is even higher, jumping from around 57 per cent to about 98 per cent. Moreover, for those households the probability of moving to the highest tail of the distribution almost vanishes. For instance, households in the second bracket have a probability of around 18 per cent of improving their well-being from 1989 to 1993. Conversely, in the 2000-2004 spell, this probability is less than 1 per cent.

Households in the third class experience an increase in the level of immobility as well. Nonetheless, their probability of shifting to another class remains significant. From 2000 to 2004, for instance, most of the overall mobility takes place within the richest groups of households.

Summing up, the period from 1989 to 2004 is marked by an increase in the social distance between households below and above the central position, defined as the border between the second and the third class. The lowest tail of the distribution appears to be a trap from which households are unlikely to escape.

Table 7. Measures of estimated mobility over different time spans

Intervals	Shorrock's	Bartholomew's	Kendall's(*)	Adjusted share of stayers(*)
		2-wave mobility (4-5 years)		
1989-1993	0.34	0.28	0.67	53.9
1991-1995	0.27	0.30	0.78	64.1
1993-1998	0.28	0.24	0.79	68.1
1995-2000	0.15	0.20	0.84	80.1
1998-2002	0.20	0.26	0.83	73.3
2000-2004	0.24	0.21	0.82	71.6

(*)Measure of immobility

Table 8. Estimated transitions of household by wealth class

Observed class / Latent class	First class	Second class	Third class	Fourth class	Total
			1989-1993		
First class	68.3(2.8)	25.4(2.6)	6.0(1.4)	0.4(0.4)	100.0
Second class	25.3(2.9)	56.6(3.3)	14.7(2.4)	3.5(1.2)	100.0
Third class	3.5(1.1)	25.8(2.7)	42.9(3.0)	27.9(2.7)	100.0
Fourth class	3.0(1.0)	1.2(0.7)	33.2(2.8)	62.6(2.9)	100.0
Shorrock's: 0.42, Kendall's tau-b: 0.60, Bartholomew's: 0.47, Adjusted share of stayers: 43.7					
Observed class	First class	Second class	Third class	Fourth class	Total
Latent class			1995-2000		
First class	86.8(1.6)	10.4(1.5)	0.8(0.4)	2.1(0.7)	100.0
Second class	0.3(0.4)	97.5(0.8)	2.2(0.7)	0.0(0.0)	100.0
Third class	3.0(0.8)	7.1(1.2)	88.9(1.4)	1.0(0.5)	100.0
Fourth class	0.1(0.1)	2.1(0.6)	0.2(0.2)	97.6(0.7)	100.0
Shorrock's: 0.07, Kendall's tau-b: 0.57, Bartholomew's: 0.11, Adjusted share of stayers: 88.7					
Observed class	First class	Second class	Third class	Fourth class	Total
Latent class			2000-2004		
First class	86.8(1.4)	10.4(1.3)	0.8(0.4)	2.1(0.6)	100.0
Second class	0.1(0.1)	99.2(0.4)	0.1(0.1)	0.6(0.3)	100.0
Third class	0.1(0.1)	11.6(1.3)	70.7(1.8)	17.6(1.5)	100.0
Fourth class	1.0(0.4)	2.0(0.5)	20.2(1.5)	76.8(1.6)	100.0
Shorrock's: 0.17, Kendall's tau-b: 0.86, Bartholomew's: 0.18, Adjusted share of stayers: 78.2					

6 Concluding remarks

The aim of this paper is to assess the impact of measurement issues on the analysis of mobility. The data used in the analysis are from the Italian survey on households' budgets and the observation period is 1989-2004.

The strategy adopted is first to take into account other non-sampling errors, namely non-response and attrition and then to focus on response error. The framework of latent class models is used to separate true systematic change from spurious change.

The analysis shows the importance of taking into account noisy data coming from measurement errors and transitory shocks. According to the synthetic measures used in the analysis, these aspects might account for 30-50 per cent of the observed mobility.

Once noisy data are taken into account, Italian society emerges as far less mobile than would be expected from manifest data. Overall, in a nine-year interval (from 1995 to 2004), mobility is a phenomenon that concerns less than a quarter of Italian households: some 13 per cent experience upward movements while around 11 per cent fall into a lower class. Overall, some 44 per cent of households remain for the whole period in a low-level wealth segment.

Movements are virtually limited to adjacent wealth segments. Households in the top and the bottom of the distribution have the same 5 per cent probability of moving permanently to a class beyond the median position.

A second result of the analysis is that the bias may also affect the analysis of the dynamics of mobility. The model suggests that changes in measurement properties across time are a possible driver for the observed changes in observed mobility. In the case at hand, the measurement of household wealth seems more difficult in recent years, especially when financial assets are considered: a large share of mobility observed in the more recent period may therefore be due to simply spurious change. As a consequence, the worsening of observed mobility from 1989 to 2004 is likely to be downward biased.

According to the data at hand, measurement issues are likely to play a more important role in the analysis of mobilty than, for instance, socio-demographic characteristics such as age, education level and work status.

7 Tables and figures

*Table A*1. Test for selection on observables:1995-2000

	First equation (probit)		Second equation	
	Dep. variable: Drop-out in 2000*			
Geographical area (reference: North)	param.	p-value*	param.	p-value*
Centre	0.08	0.25	0.07	0.27
South and Islands	0.16	0.02	0.26	0.00
Education (reference: none)				
elementary school	0.06	0.62	0.09	0.47
lower secondary school	0.09	0.53	0.14	0.28
upper secondary school	0.02	0.87	0.05	0.74
university degree	0.04	0.82	0.05	0.72
Age	-0.01	0.21	0.00	0.76
Age squared	0.00	0.33	0.00	0.77
Town size (reference: up to 20,000 inhabitants)				
from 20,000 to 40,000	0.15	0.04	0.13	0.07
from 40,000 to 500,000	0.00	0.96	0.09	0.16
more than 500,000	-0.09	0.31	0.02	0.86
Household wealth class (ref: 1st quartile)				
second quartile	-0.08	0.38	-0.05	0.53
third quartile	0.00	0.99	0.04	0.67
fourth quartile	-0.13	0.23	-0.08	0.46
Household income class (ref: 1st quartile)				
second quartile	0.02	0.82	0.03	0.68
third quartile	0.06	0.55	0.09	0.35
fourth quartile	0.21	0.07	0.24	0.03
Work status (reference: employee)				
self-employed	0.13	0.12	0.12	0.14
not employed	0.10	0.27	0.08	0.32
Number of household members	0.00	0.94	0.02	0.47
Year of first interview (ref:1995)				
1989	1.02	0.00		
1991	1.07	0.00		
1993	1.05	0.00		
Intercept	-1.74	0.00	-1.57	0.00
N. obs.	8,106		8,106	
Pseudo R-square	0.12		0.02	

(*) Inelegible are excluded from the analysis; robust std.errors are computed

Table A2. Test for selection on observables:1995-2004

	First equation		Second equation	
	(probit)			
	Dep. variable: Drop-out in 2004*			
Geographical area (reference: North)	param.	p-value	param.	p-value
Centre	−0.08	0.45	−0.09	0.36
South and Islands	0.34	0.00	0.42	0.00
Education (reference: none)				
elementary school	-0.22	0.10	-0.17	0.19
lower secondary school	-0.14	0.35	-0.07	0.65
upper secondary school	-0.17	0.27	-0.13	0.40
university degree	-0.27	0.15	-0.21	0.25
Age	0.00	0.96	0.01	0.68
Age squared	0.00	0.69	0.00	0.52
Town size (reference: up to 20,000 inhabitants)				
from 20,000 to 40,000	−0.07	0.46	−0.09	0.35
from 40,000 to 500,000	−0.25	0.00	-0.16	0.03
more than 500,000	−0.01	0.95	0.08	0.44
Household wealth class (ref: 1st quartile)				
second quartile	0.22	0.04	0.24	0.02
third quartile	0.20	0.08	0.22	0.04
fourth quartile	0.20	0.11	0.22	0.06
Household income class (ref: 1st quartile)				
second quartile	0.14	0.19	0.15	0.14
third quartile	0.02	0.90	0.07	0.57
fourth quartile	0.24	0.07	0.29	0.03
Work status (reference: employee)				
self-employed	−0.05	0.63	−0.04	0.73
not employed	0.15	0.26	0.12	0.34
Number of household members	−0.01	0.77	0.00	0.87
Year of first interview (ref:1995)				
1989	0.83	0.00		
1991	0.85	0.00		
1993	0.78	0.00		
Intercept	−2.20	0.00	−2.09	0.00
N. obs.	8,076		8,076	
Pseudo R-square	0.17		0.04	

(*) Inelegible are excluded from the analysis; robust std.errors are computed

Table A3. Test for selection on observables

	First equation		Second equation	
	(ordinal probit)			
	Dep. variable: Drop-out wave*			
Geographical area (reference: North)	param.	p-value*	param.	p-value*
Centre	−0.03	0.51	−0.03	0.01
South and Islands	0.12	0.01	0.28	0.56
Education (reference: none)				
elementary school	0.10	0.25	0.15	0.08
lower secondary school	0.16	0.09	0.26	0.03
upper secondary school	0.11	0.26	0.16	0.27
university degree	0.11	0.35	0.17	0.51
Age	0.01	0.27	0.02	0.01
Age squared	0.00	0.02	0.00	0.00
Town size (reference: up to 20,000 inhabitants)				
from 20,000 to 40,000	−0.04	0.43	−0.03	0.62
from 40,000 to 500,000	−0.05	0.33	0.12	0.00
more than 500,000	−0.47	0.00	−0.24	0.00
Household wealth class (ref: 1st quartile)				
second quartile	−0.06	0.40	0.01	0.21
third quartile	0.02	0.77	0.09	0.89
fourth quartile	0.04	0.64	0.12	0.62
Household income class (ref: 1st quartile)				
second quartile	0.19	0.01	0.18	0.01
third quartile	0.25	0.00	0.26	0.00
fourth quartile	0.29	0.00	0.31	0.01
Work status (reference: employee)				
self-employed	−0.05	0.39	−0.04	0.29
not employed	0.18	0.01	0.12	0.04
Number of household members	−0.02	0.30	0.01	0.71
Year of first interview (ref:1995)				
1989	1.74	0.00		
1991	1.72	0.00		
1993	1.44	0.00		
Cut1	1.54		1.41	
Cut2	1.98		1.74	
Cut3	2.28		1.98	
Cut4	2.52		2.19	
N. obs.	8,076		8,076	
Pseudo R-square	0.17		0.02	

(*) Inelegible are excluded from the analysis; robust std.errors are computed

Table A4. Test for selection on unobservables:1995-2004

	Selection equation (probit)		Structural equation (ordinal probit)	
	Dep: Dummy for attrition*		Dep: 2004 wealth class	
Geographical area (reference: North)	param.	p-value*	param.	p-value*
Centre	−0.05	0.75	0.26	0.01
South and Islands	−0.25	0.05	0.18	0.56
Education (reference: none)				
elementary school	−0.01	0.97	0.02	0.08
lower secondary school	0.06	0.84	0.11	0.03
upper secondary school	0.01	0.98	0.10	0.27
university degree	0.09	0.81	0.56	0.51
Age	0.04	0.06	0.02	0.01
Age squared	0.00	0.04	0.00	0.00
Town size (reference: up to 20,000 inhabitants)				
from 20,000 to 40,000	0.21	0.22	−0.19	0.62
from 40,000 to 500,000	0.22	0.08	−0.13	0.00
more than 500,000	−0.71	0.00	−0.28	0.00
Household wealth class (ref: 1st quartile)				
second quartile	−0.26	0.17	0.97	0.21
third quartile	−0.31	0.08	1.59	0.89
fourth quartile	−0.31	0.14	2.42	0.62
Household income class (ref: 1st quartile)				
second quartile	−0.25	0.20	0.27	0.01
third quartile	−0.09	0.69	0.35	0.00
fourth quartile	−0.37	0.12	0.68	0.01
Work status (reference: employee)				
self-employed	0.04	0.82	0.13	0.29
not employed	0.17	0.40	−0.28	0.04
Year of first interview (ref:1995)				
1991	0.12	0.52	0.23	
1993	−0.05	0.80	0.08	
Interviewers' characteristics				
years of experience	0.02	0.00		
Education (reference: none/elementary				
middle / high school	0.07	0.70		
university degree	0.05	0.81		
Intercept	0.06	0.93		
lambda			−0.56	0.31
Cut1			1.12	
Cut2			2.22	
Cut3			3.22	
N. obs.	1,209		1,010	
Pseudo R-square	0.08		0.24	

(*) Inelegible are excluded from the analysis; robust std.errors are computed

Table A5. Test for selection on unobservables:2002-2004

	Selection equation		Structural equation	
	Dep: Dummy for attrition*		Dep: 2004 wealth class	
Geographical area (reference: North)	param.	p-value*	param.	p-value*
Centre	−0.08	0.30	0.17	0.02
South and Islands	−0.15	0.04	−0.06	0.33
Education (reference: none)				
elementary school	−0.15	0.31	0.09	0.39
lower secondary school	−0.19	0.24	0.14	0.23
upper secondary school	−0.14	0.38	0.42	0.00
university degree	−0.09	0.63	0.73	0.00
Age	0.03	0.00	0.05	0.00
Age squared	0.00	0.00	0.00	0.00
Town size (reference: up to 20,000 inhabitants)				
from 20,000 to 40,000	−0.13	0.11	−0.01	0.94
from 40,000 to 500,000	−0.06	0.38	−0.05	0.43
more than 500,000	−0.44	0.00	−0.07	0.61
Household wealth class (ref: 1st quartile)				
second quartile	−0.08	0.40	1.21	0.00
third quartile	−0.07	0.48	2.05	0.00
fourth quartile	−0.10	0.31	2.96	0.00
Household income class (ref: 1st quartile)				
second quartile	−0.05	0.60	−0.05	0.56
third quartile	−0.03	0.81	0.18	0.09
fourth quartile	−0.01	0.93	0.26	0.02
Work status (reference: employee)				
self-employed	−0.07	0.47	0.37	0.00
not employed	0.01	0.94	0.17	0.08
Year of first interview (ref:1995)				
1998	−0.17	0.05	0.01	0.90
2000	−0.24	0.01	−0.01	0.93
2002	−0.46	0.00	−0.04	0.71
Interviewers' characteristics				
years of experience	0.02	0.00		
Education (reference: none/elementary				
middle / high school	0.38	0.00		
university degree	0.44	0.00		
intercept	−0.06	0.87		
lambda			−0.04	0.90
Cut1			1.83	
Cut2			3.11	
Cut3			4.26	
N. obs.	4,842		3,604	
Pseudo R-square	0.06		0.31	

(*) Inelegible are excluded from the analysis; robust std.errors are computed

Table A6. Reliabilty of the main wealth components

	Heise Index		
	Waves	Waves	Waves
Wealth components	1989-1991-1993	1995-1998-2000	2000-2002-2004
Non-financial assets	0.80	0.88	0.82
Financial assets	0.66	0.68	0.62
Financial liabilities	0.67	0.88	0.81
Net wealth	0.80	0.76	0.82

Table A7. Models for the transition process (goodness-of-fit statistics)

Models	*df*	χ^2	G^2	*BIC*	*AIC*
			1989-1998		
Models without spurious change					
Perfect mobility	54	3224.3	2478.2	1472.8	1738.4
Quasi-perfect mobility	38	685.7	561.5	192.0	378.8
Conditional independence (Markovian change)	36	247.0	229.1	-33.7	143.3
Models with spurious change					
Latent class model	34	184.4	181.2	-50.4	116.8
Stationary latent Markov model	42	123.3	118.5	-174.9	31.6
Latent Markov model	32	42.9$*$	46.4$*$	-175.9	-25.6
			$1995-2004$		
Models without spurious change					
Perfect mobility	54	1443.4	921.2	577.7	813.2
Quasi-perfect mobility	38	177.4	159.8	-81.8	83.8
Conditional independence (Markovian change)	36	54.7	58.7	-170.1	-13.2
Models with spurious change					
Latent class model	34	118.8	123.7	-92.5	55.7
Stationary latent Markov model	42	88.7	100.6	-166.4	16.6
Latent Markov model	32	44.9$*$	48.4$*$	-172.9	-15.5

(*) p-value> 0.05

*Figure A*1. Residual analysis for the latent Markov model

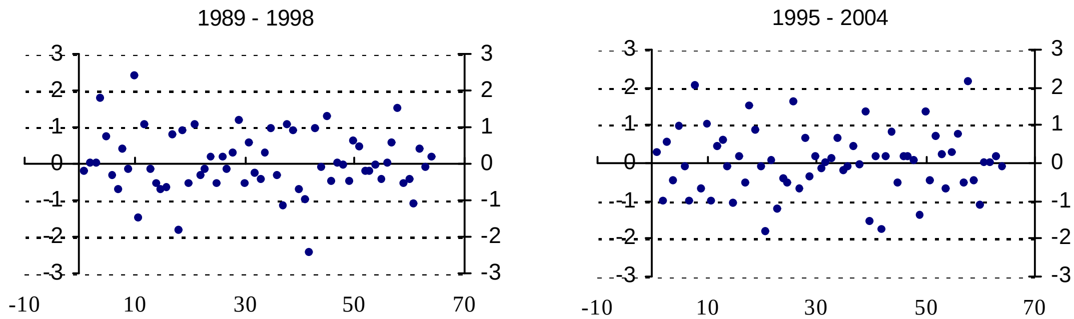


Table A8. Probability of movements across wealth classes

	Probability of			
	upward mobility*		downward mobility*	
Geographical area (reference: North)	param.	p-value**	param.	p-value**
Centre	−0.18	0.20	−0.26	0.06
South and Islands	0.35	0.00	−0.01	0.90
Education (reference: none)				
elementary school	0.50	0.01	0.08	0.66
lower secondary school	0.48	0.01	0.40	0.04
upper secondary school	−0.31	0.12	0.20	0.26
university degree	−0.34	0.25	−0.48	0.09
Age	−0.06	0.08	0.02	0.58
Age squared	0.00	0.13	0.00	0.41
Town size (reference: up to 20,000 inhabitants)				
from 20,000 to 40,000	0.19	0.31	0.06	0.75
from 40,000 to 500,000	0.10	0.52	−0.02	0.90
more than 500,000	−0.66	0.01	−0.15	0.45
Number of earners	0.17	0.09	0.03	0.76
Work status (reference: employee)				
self-employed	−0.05	0.76	−0.34	0.03
not employed	−0.36	0.06	0.56	0.00
Sex (reference: female)				0.30
male	0.10	0.29	0.10	
Intercept	−0.72	0.37	−1.76	0.03
N. obs.	1,010		1,010	
Pseudo R-square	0.06		0.03	

* Upward (downward) mobility: 2004 wealth class > (<) 1995 wealth class

** Inelegible are excluded from the analysis; robust std.errors are computed

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