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MEASURING WEALTH MOBILITY IN ITALY

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PRELIMINARY VERSION

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Abstract

The aim of the paper is to measure the Italian households' mobility across the wealth distribution in the 1989-2004 period. Since estimates of mobility are highly sensitive to measurement errors and transitory shocks, the analysis aims at separating true change from noise. Once measurement issues are taken into account, a more static view of Italian society emerges. In the reference period, Italian households show a lower (than observed) level of mobility, especially among distant classes. Moreover, mobility declines from 1989 to 2004. This is mainly due to the dynamics of asset prices and household savings. On the opposite, socio-demographic characteristics account for only a small fraction of overall mobility.

JEL classification: C33, D3, P46

Keywords: household wealth, attrition, measurement error, mobility, latent class analysis

Contents

1. Introduction[1]

The distribution of personal and household economic well-being within a society is key aspects of the economy. Economists have greatly emphasised that attention must be paid 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 upon 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 higher chance of 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 the individuals rather than if there were an entrenched hierarchy (or underclass).[2]

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).

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).

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[1] The views expressed herein are those of the author and do not necessarily reflect those of the Bank of Italy. I am grateful to Federico Signorini, Giovanni D'Alessio and Luigi Cannari and for their help and advice.

[2] The level of mobility also depends on factors that are not related with one's ability, such as Inheritance and capital gains. In Italy, for instance, in 2002 the total amount of bequests or gifts was about 25 per cent of household net wealth; if the returns earned are included, assuming a real rate of interest of 2 per cent, the proportion rises to 41.3 per cent (Biancotti *et al.* 2004). Moreover, Cannari *et al.*, (2005) estimate that in the 1989-2002 period, about one third of wealth variation was due to capital gains.

The objective is to study the Italian households' wealth mobility in the period 1989-2004. Household wealth is used as a proxy of household economic well-being. The analysis refers to mobility among members of the same generation and it 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.

Since the measurement of mobility is heavily affected by noisy data such as measurement errors, the paper presents a model to separate true from spurious change.

Some studies on wealth mobility are available in the economic literature. However, in the case of Italy this literature is not yet very wide, at least in comparison with the literature on another dimension of the economic well-being, that is, income distribution.

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.

This paper represents an attempt to bridge this gap in the literature. 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 wealth and income (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 for each point of observation the same thresholds. This solution allows me to eliminate from the analysis the mobility (or immobility) due to the changes in the thresholds which, in turn, are due to the changes of wealth distribution over time.

The paper studies the households' changes in their rankings in the period 1989-2004. Since the number of the 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 is the result of two opposite needs. First, since wealth presents a high level of persistence over time, the analysis of mobility requires a sufficiently long period of observation.[3] Unfortunately, the longer 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. Though 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.[4] Since I use the 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 by 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

[3] 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 only affected by variations in asset prices or exceptional events.

[4] 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 pattern of transitions, most of which would not probably 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.

point in time the relative net wealth is then classified according to the quartiles estimated for 1995.[5] The weights used in the analysis refer to 2004, adjusted as described above.[6]

3. Issues in the measurement of household wealth mobility

The measurement of household wealth and its dynamics through survey data is a difficult task. In the case of panel data, three measurement problems stem from non-response in the first wave, attrition and measurement errors[7].

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 by D'Alessio and Faiella (2002).

As to attrition, appendix A contains a detailed analysis on its potential implications for the study of wealth mobility using SHIW data. 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, level of education, profession, economic well-being, and so on. As described in the appendix, the results show no clear association between the attrition probability and the household's observable socio-demographic characteristics. The main determinant for drop-out appears to be the number of times the household has participated in the survey. Anyway, since the presence of *attrition on observables* cannot be completely

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[5] In order to asses the robustness of the models, also different cut-off points were used to classify the household's wealth.

[6] The analysis has be replicated also using the 1995 weights and the results do not change significantly.

[7] Previous studies have addressed those issues in the case of SHIW. The problem of non-response has been studied by D'Alessio e Faiella (2002), while the problem of measurement errors has been investigated by Cannari et al. (1990), Cannari, D'Alessio (1993), Biancotti *et al.* (2004) and more recently by D'Aurizio et al. (2006). Other studies have addressed the problem 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 Financial Accounts. For financial liabilities the corresponding percentage is around 44 per cent. On the opposite, sample estimate of housing wealth financial 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.

rejected, in the analysis the sampling weights are post-stratified to reflect the main socio-demographic characteristics of the population in the more recent year.

The presence of attrition on *unobservables* refers to the possibility that drop-outs may be due to latent variables: for instance households experiencing larger swings in their wealth might be less willing to participate to the survey. As described in the appendix, this hypothesis is not supported by the data at hand and can be ignored.

Summing up, attrition does not appear to have the potential to bias the estimates of mobility. Its modest influence can be tackled with a post-stratification of weights.

The mobility measures might also be affected by measurement errors in the data. These errors may cause units moving up and down even if their true rank in the distribution is unchanged.

The most recent papers about the presence of measurement errors in the SHIW are D'Aurizio *et al.* (2006) and Biancotti *et al*. (2005). The results of both papers suggest that measurement issues are crucial when measuring wealth mobility.

The first paper deals with the problem of under-reporting and shows that it significantly affects the evaluation of household financial wealth.

This phenomenon is likely to affect more heavily the estimates of total financial assets held by the household than its mobility. Assuming that under-reporting behaviour is constant over time, the transition probabilities should be affected only because of the differential propensity to under-report of various segments of the population: some households might be classified into the wrong initial wealth class. However, as under-reporting is likely to have a random component too, it may affect the observed mobility by introducing spurious changes.

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. Detailed results are reported in appendix A. Though 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[8].

4. Models for separating true and spurious change

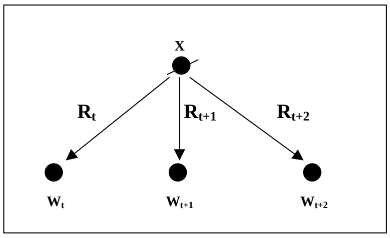
The *latent class analysis* provides a useful framework to test and correct for spurious change errors when categorical variables are concerned.

Such models are based on the assumption that the true variable of interest (the household's wealth for instance) cannot be directly measured. 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.

The simplest model is the (LCA) *latent class model* (Haberman 1979; McCutcheon 1987; Hagenaars 1990; and Vermunt 1997). It can be represented by the figure 1.

Figure 1

LATENT CLASS MODEL



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 a particular level of W_t . Because of the measurement error, such a variable has to be considered only as 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

[8] Unfortunately, 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.

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 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 latent transition or hidden Markov model (see Wiggins 1974, Langeheine and Van de Pol. 1994 and Vermunt 1997).

Figure 2

LATENT MARKOV MODEL

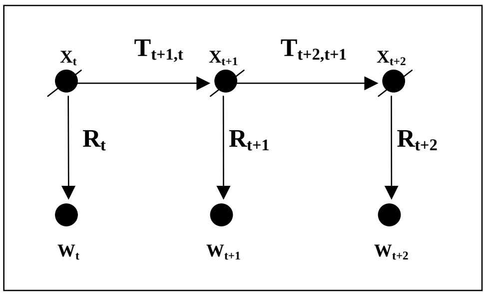


Figure 2 exemplifies the model when three measurements are available. As usual, let $W_{\{t\}}$, t=1,…T be the observed household's wealth class at time *t* and $X_{\{t\}}$ the true household's wealth class a time *t.* Since the objective is to estimate the latent turnover table, the latent variables should have as many latent classes, or true states, as the observed indicator variables have categories (*D*=*C*).

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 $P(X_t = x_t \mid X_{t-1} = x_{t-1})$. The generic element $\tau_{b|a}^{t+1,t}$ 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*.[9] The transition structure for the latent variables has the form of a first-order Markov chain. Moreover, each occasion-specific observed variable depends only on the corresponding latent variable. 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.[10] Shorrocks (1978) shows that it is not possible to define one index that fulfils 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 hit 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*: $P(W_t = w_t \mid X_t = x_t)$. 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 and simplicity of the results, it is typically assumed that the error component is time-invariant: $P(W_t = w_t \mid X_t = x_t) = P(W_{t-1} = w_t \mid X_{t-1} = x_t)$ for 2 ≤ t ≤ T. If no further constraints are imposed, one needs at least 3 time points to identify the LMM.

The corresponding LMM has the form:

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

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9 If the transition matrix is equal to the identity matrix (for any point in time) the latent Markov Model becomes the latent class model.

10 The S index emphasizes persistence along the main diagonal. For simplicity a relative *Shorrocks index* is computed (dividing its value for the maximum) so that it ranges between 0 (absence of transition) and 1 (none of the households remain in the same class). Bartholomew's index emphasises movements off the main diagonal of the transition matrix. It has no upper bound. The higher the index the higher the presence of mobility. Kendall's tau-b is a measure of rank correlation based on the transition matrix. It ranges between -1 and 1. It reaches 1 (or -1 for negative relationships) when all the entries are on the main diagonal. Therefore

Several generalisations of the models can be achieved by exploiting the ordinal nature of the variables (see, among others Agresti 2002 and Clogg and Shihadeh1994).

The models are estimated using the EM algorithm (Dempster, 1979). 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 not nested models, the AIC and BIC criteria were used.

Summing up, the model presented aims at decomposing the variable of interest 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 still do happen. About

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the higher the index the lower the degree of mobility. The *adjusted share of stayers* is the share of households that remain in the same wealth class, normalized with respect to the value one would obtain simply by chance.

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, 1989-1998 AND 1995-2004

(row percentages)

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

(*)Households in the same bracket at the beginning and at the end of the spell, as percentage of all households.

Note: Data consists of a balanced panel of 544 and 1.010 households for the periods 1989-1998 and 1995-2004 respectively. Wealth classes are computed using the 1989 and 1995 quartiles of relative wealth (ratio between household wealth and average wealth).

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 of 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 to address measurement issues.

Table 2

MEASURES OF OBSERVED MOBILITY OVER DIFFERENT TIME SPAN

Intervals	*Shorrocks*	*Bartholomew*	*Kendall'(*)*	*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
1995-2004	0.42	0.52	0.62	44.2

(*) Measure of immobility

5.2 Models for wealth mobility

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.[11] 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

[11] The models estimated under the assumption of absence of non-sampling error are: independence, quasi-independence, symmetry, manifest Markov model. The independence model assumes that all the observed changes are only due to chance. The second tests the same hypothesis without considering the main diagonal of the table (quasi-independence model): the units in the main diagonal are considered stayers and are left aside from the analysis. The independence model is then postulated for the remaining cells. The question to be investigated is whether the off-diagonal cells show particular systematic patterns of association. The results of the models are summarised in table 6. As would be expected, the fit of both models is not satisfactory. The hypothesis that no change occurred between 1995 and 2004 cannot therefore be accepted. A further step was to look for a model that could describe the transition process. Among the others, two possible models are: (1) symmetric change (symmetry model): there are changes but they compensate each other so that the marginal distributions remain the same; and (2) markovian change (conditional independence model): the probability to be in a given wealth class at time *t* only depends on the wealth class at time *t-1*. Previous history has no influence on present status. No hypothesis on the direction of change is postulated.

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 mentioned hypothesis cannot be rejected at the usual levels of significance.

Table 3 summarises 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.

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. For those in the middle of the distribution, this percentage rises to 17 per cent.

In the more recent period, the measurement of wealth is 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) which makes more difficult to report ownership and amounts correctly.

Table 3

ESTIMATED RESPONSE PROBABILITIES (*):1989-1998 AND 1995-2004

(*row percentages*)

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

(*)Response probabilities are time invariant

Table 4 provides a comparison between observed and estimated statistics on mobility. 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 have not changed 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 among different time spans but it might account for 30-50 per cent of total observed mobility[12].

[12] Previous results on economic mobility, based on different methods and different datasets reach fairly coherent results. For instance Glewwe (2004) applying instrumental variable method to panel data from Vietnam finds that at least one third of measured income mobility is due to measurement issues. Moreover, Luttmer (2002), studying economic mobility in Russia and Poland, finds that between 75% and 90% of the

Table 4

OBSERVED VERSUS ESTIMATED PERCENTAGE OF *STAYERS* BY WEALTH CLASS

(*percentages*)

1995	2000	2004	observed	estimated
First class	First class	First class	16.1	22.0
Second class	Second class	Second class	16.3	21.6
Third class	Third class	Third class	10.4	20.4
Fourth class	Fourth class	Fourth class	15.5	12.3
Total			58.2	76.2
		Shorrock's	0.42	0.22
		Kendall's tau-b	0.62	0.78
		Bartholomew's	0.52	0.28
1989	1993	1998	observed	estimated
First class	First class	First class	12.0	12.8
Second class	Second class	Second class	10.2	14.7
Third class	Third class	Third class	10.9	10.0
Fourth class	Fourth class	Fourth class	11.7	11.4
Total			44.8	49.0
		Shorrock's	0.55	0.51
		Kendall's tau-b	0.50	0.57
		Bartholomew's	0.69	0.60

5.3 Mobility within the distribution

The level of *regular* mobility of Italian households is summarised in tables 5 and 6.

The first tables 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* t_i 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).[13] The *mobility index* is the probability to move to a distant class (crossing the median position) and stay there[14]. 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 ones' relative position is lower.

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measured variance of annual shocks to income or expenditure is caused by transitory events that are specific to a single year.

[13] If there were a complete absence of mobility in a society, each household would stay in its class for a theoretical infinite period of time. On the other hand, the more mobile the society the shorter the period during which a particular household would be found in a given class.

[14] Both measures are computed on the hypothesis of constant transition probabilities.

The probability of moving to a given class strongly depends 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, 2006).

This is particularly important for upward mobility. As expected, access to the upper classes is not a fair game; it appears to be 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 overt time, for households at the bottom of the distribution it would take, an average, approximately 36 years (4 time spans of a 9 year length) 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 wellbeing (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 of moving upwards.

The richest group has a 25 per cent probability to move downwards, but most of 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: 1989-1998 AND 1995-2004

(*row percentages*)

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

Wealth class	Mean exit time			Immobility ratio		
	1989 – 1998 (a)	1995 – 2004 (b)	Ratio (b/a)	1989 – 1998 (a)	1995 – 2004 (b)	Ratio (b/a)
First class	1.98	4.05	2.0	0.08	0.05	0.6
Second class	2.27	34.48	17.4	0.12	0.02	0.2
Third class	1.74	2.70	1.6	0.29	0.20	0.7
Fourth class	1.90	4.00	2.1	0.10	0.05	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 significant 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 between 35 and 50 per cent. The average time spent in each wealth class doubles.

Following the national accounts (NA) definitions, the overall variation in wealth can be decomposed into capital gains (which represent the changes in wealth due to the variation in the prices of its components), net savings and net transfers (transfers received net of transfers paid).

One of the reasons behind the decline in the level of mobility is likely to be due to the dynamic 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 affects mobility mainly through two different channels.

The first relates 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 o less likely to experience a shift in their relative position according to the variations of the prices of the assets they own.

The second channel concerns the heterogeneity of prices, for example at geographical level. Cannari and Faiella (2005) 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 same wealth class but living in provincial capitals rather than in other municipalities, are more likely to experience higher swings in 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 have increased by around 63 percent. From 1995 to 2005 the corresponding figure is around 59 per cent. [15] Similarly, the growth rate declines for the value of short-tem treasury bonds, businesses, mutual funds, foreign securities. [16] The only exception is represented by the variation of 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 is especially the case for households in the lowest two brackets. According to SHIW data, for

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[15] Figures are computed on the basis of data available in Cannari et *al*. (2005).

[16] The low level of price volatility over a wide range of financial assets and markets experienced in recent years has attracted the attention of central bankers and financial regulators and of many economists has well: see for instance Bank of Italy (2006) and Claudio and Borio (2006).

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 result 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 B5 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, sex 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.

Summing up, in the observed period, Italian households show a low level of mobility, especially among distant classes. Moreover, the mobility is likely to be mainly driven by the dynamic of asset prices, rather than by individual characteristics.[17]

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.[18] 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 purposes, I also disaggregate the two nine-year samples (used in the analysis) into three four-year samples (table 8).[19]

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[17] Similar conclusions are found by Cannari, D'Alessio (2006).

[18] It is worth noting that at least three measurements are need to estimate Latent Markov Models.

[19] The overlapping 1993-1998 transition matrix is excluded from the analysis.

The results confirm the significant decrease of wealth mobility over time. Most of the synthetic measures used in the analysis indicate that on a four-year scale the fall in level of mobility ranges in a percentage between 20-30 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 4-year time (table 7).[20] This immobility declines in the successive spells.

The dynamics of mobility appears to be uneven across the wealth distribution. In general, households in low-level wealth classes appear to provide the greater 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 over the 1989-1993, this percentage raises 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 to improve 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 overall mobility takes place within the richest groups of households.

[20] This span features for the highest degree of immobility (over a four-year interval) since in addition to the constantly increasing mobility at the bottom, a significant reduction of mobility at the upper tail of the distribution shows up. One plausible explanation may lie in the sharp increase in the prices of risky financial assets. Since affluent households are more likely to hold risky portfolios, the price variation may have widen the distance from medium-low wealth segments.

Summing up, the period from 1989 to 2004 features for the worsening of social distance between households below and over 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 can hardly escape.

Table 7

MEASURES OF ESTIMATED MOBILITY OVER DIFFERENT TIME SPAN

	2- wave mobility (4-5 years)			
Intervals	*Shorrock's*	*Bartholomew's*	*Kendall's (*)*	*Adjusted share of stayers(*)*
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 HOUSEHOLDS BY WEALTH CLASS:
1989-1993, 1995-2000 AND 2000-2004

(row percentages)

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

6. Concluding remarks

This paper aims at measuring the level of intra-generational wealth mobility of Italian households in the 1989-2004 period.

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

The strategy adopted in this paper in order to minimise the impact of these factors consists of two steps. First, population weights are post-stratified to compensate for the presence of attrition. Second, the *latent class models* are used to separate true systematic change from spurious change resulting from measurement error and other types of transitory shocks that may affect household wealth.

Once noisy data are taken into account, the Italian society emerges as far less mobile than it would be expected from manifest data. Overall, in a nine-year interval (from 1995 to 2004), mobility is a phenomenon that only 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 almost limited to adjacent wealth segments. Households in the top and the bottom of the distribution have the same 5 per cent probability to permanently move to a class beyond the median position.

Access to upper classes is not a fair game: it strongly depends on the initial position of the household in the wealth distribution, which in turn strictly depends on the parents' economic situation.

From 1989 to 2004, the level of mobility among wealth classes declines.

This is likely be due to the decreasing contribution of capital gains. In particular, the dwellings, the component that accounts for the largest share of household wealth, have experienced a significant reduction in the variation of their prices.

Moreover, also the contribution provided by household savings to wealth accumulation has declined significantly. This is especially the case for the lower tail of the distribution. As a consequence, households in the poorest two segments experience a growing and systematic increase in the level of immobility.

Conversely, the level of mobility does not appear to be significantly related with individual characteristics such as the level of education and age, suggesting that the role played by individual ability is quite modest.

Appendix A

Sample attrition in the SHIW

This section studies the impact of attrition on the estimation of household’s wealth mobility. For sake of simplicity, only the analysis about the 1995-2004 period is presented. Nonetheless, analogous results apply for 1989-1998 spans.

In the 1995-2004 period a large amount of attrition is observed. Out of 8,135 households participating to 1995 wave, only some 12 per cent (1,010 households) are interviewed again in 2004. The main reason for attrition is survey design: since the panel component only accounts for about a half of total sample, not all the households interviewed in 1995 are eligible for a new interview.[21] Other minor sources of attrition are: the target person may refuse to cooperate, failure in tracing mobile respondent, the agency collecting the data failed to get into contact with the target person (ineligibility). Generally, the response rate for the panel component is about 70 per cent.

To the extent that panel attrition is not random, it affects the sample composition and has therefore the potential to bias the estimate of mobility based on the remaining sample. Following the typology introduced by Fitzgerald *et al.* (1998) attrition may arise in the form of *selection on unobservables* or in the form of *selection on observables* (for a survey of attrition in households panels see Rendtel, 2002).

The *selection on observables* may occur whenever the researcher is interested in the distribution of a variable but simply does not wish to condition on other variables that are likely to be related with. The objective of the present analysis, for example, is the study of relationship among three different measurements of household wealth; other variables that are jointly determined with wealth, like occupation, income geographical area and so on are not conditioned on. Yet, use of any sample that is selected on the basis of those variables

[21] The criteria used for the selection of the panel component is the following: all the existing panel households in 1995 are elegible for a new interview in the 1998 wave (3,645 households). A new refreshement sample is then selected from the (4,490) households that entered in 1995 to reach the target number of panel households (about a half of the sample).

might bias the estimates of transition probabilities, if the drop-out process is significantly related to those characteristics.

Tables A1-A3 presents 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 (categorised in 5 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 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. On the opposite, 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, non clear pattern of association with household wealth emerges.

Anyway, since the presence of *attrition on observables* cannot be completely rejected, in the analysis I use sampling weights adjusted for non-response weights are post-stratified to reflect the main socio-demographic characteristics of the population (see section 3).

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 to 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 a greater experience or 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 from household's wealth. The assignment of interviewers is not based on 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 not therefore supported by the data at hand.

Table A1

Test for *selection on observables*:1995-2000
(probit)

	First equation (probit model)		**Second equation** (probit model)	
	Dep. variable: Drop-out in 2000(*)			
Variable	Parameter	p-value (robust s.e)	Parameter	p-value (robust s.e)
Geographical area (reference: North)				
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
Middle school	0.09	0.53	0.14	0.28
High 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 components	0.00	0.94	0.02	0.47
year of entrance (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
No. of observation		8,106		8,106
Pseudo R-square		0.12		0.02

(*) Ineligibles are excluded.

Table A2

Test for *selection on observables*:1995-2004

(probit)

Variable	First equation (probit model) Parameter	p-value (robust s.e)	Second equation (probit model) Parameter	p-value (robust s.e)
	Dep. variable: Drop-out in 2004(*)			
Geographical area (reference: North)				
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
Middle school	-0.14	0.35	-0.07	0.65
High 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 components	-0.01	0.77	0.00	0.87
year of entrance (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
No. of observation		8,076		8,076
Pseudo R-square		0.17		0.04

(*) Ineligibles are excluded.

Table A3

Test for *selection on observables*:1995-2004

(ordinal probit)

Variable	First equation (ordinal probit model)		Second equation (ordinal probit model)	
	Dep. variable: Drop-out wave(*)			
	Parameter	p-value (robust s.e)	Parameter	p-value (robust s.e)
Geographical area (reference: North)				
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
Middle school	0.16	0.09	0.26	0.03
High 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 components	-0.02	0.30	0.01	0.71
year of entrance (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	
No. of observation		8,076		8,076
Pseudo R-square		0.17		0.02

(*) Ineligibles are excluded.

Table A4

Test for selection on unobservables:1995-2004

(probit with selection)

	Selection equation (probit model)		**Structural equation** (ordinal probit model)	
	Dep. variable: Probability of attrition (*)		Dep. Variable: Wealth class in 2004	
	Parameter	p-value	Parameter	p-value
Variable				
Geographical area (reference: North)				
Centre	-0.05	0.75	0.26	0.04
South and Islands	-0.25	0.05	0.18	0.11
Education (reference: none)				
elementary school	-0.01	0.97	0.02	0.94
Middle school	0.06	0.84	0.11	0.70
High school	0.01	0.98	0.10	0.72
University degree	0.09	0.81	0.56	0.06
Age	0.04	0.06	0.02	0.22
Age squared	0.00	0.04	0.00	0.42
Town size (reference: up to 20,000 inhabitants)				
From 20,000 to 40,000	0.21	0.22	-0.19	0.21
From 40,000 to 500,000	0.22	0.08	-0.13	0.24
more than 500,000	-0.71	0.00	-0.28	0.28
Household wealth class (ref: 1st quartile)				
second quartile	-0.26	0.17	0.97	0.00
Third quartile	-0.31	0.08	1.59	0.00
fourth quartile	-0.31	0.14	2.42	0.00
Household income class (ref: 1st quartile)				
second quartile	-0.25	0.20	0.27	0.06
Third quartile	-0.09	0.69	0.35	0.04
fourth quartile	-0.37	0.12	0.68	0.00
Work status (reference: employee)				
Self-employed	0.04	0.82	0.13	0.42
Not employed	0.17	0.40	-0.28	0.06
year of entrance (ref:1995)				
1991	0.12	0.52	0.23	0.17
1993	-0.05	0.80	0.08	0.69
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		
Constant	0.06	0.93		
Lambda			-0.56	0.31
Cut1			1.12	
Cut2			2.22	
Cut3			3.22	
No. of observation		1209		1010
Pseudo R-square		0.08		0.24

(*) Ineligibles are excluded.

Table A5

Test for selection on unobservables:2002-2004

(probit with selection)

	Selection equation (probit model)		Structural equation (ordinal probit model)	
	Dep. variable: Probability of attrition (*)		Dep. Variable: Wealth class in 2004	
	Parameter	p-value	Parameter	p-value
Variable				
Geographical area (reference: North)				
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
Middle school	-0.19	0.24	0.14	0.23
High 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 entrance (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		
Constant	-0.06	0.87		
Lambda			-0.04	0.90
Cut1			1.83	
Cut2			3.11	
Cut3			4.26	
No. of observation		4842		3604
Pseudo R-square		0.06		0.31

(*) Ineligibles are excluded.

Measurement errors in the SHIW

Measurement error, as the term is used in this paper, refers to deviations of the answers of respondents from their true value because of *observational errors* or *processing errors* (Groves, 1989). The first type is conveniently categorised into different sources: the interviewer, the respondent, the questionnaire, and the mode of data collection. It includes for example the error as a result of respondent confusion, reticence or memory effect or the error due to the inexperience of the interviewer. Other examples are the errors attributable to the wording of the questions, the order or context in which the questions are presented, and the method used to obtain responses. *Processing errors* arise from the data editing and processing, and include for instance errors in data capture, in editing and in the coding of open-ended textual responses.

The presence of these errors may of course bias the analysis of mobility causing units moving up and down even if their true rank in the distribution is unchanged. Moreover, if net worth is measured with a different accuracy across different waves, this may introduce further bias in the measurement of mobility.

To assess the importance of measurement errors in SHIW I replicate the analysis of Biancotti *et al* (2005). For the variables relating to household wealth. In the paper, the authors present a measure of reliability of the main variables related the Italian households' wealth, the Heise index. When at least three repeated measurements are available, the Heise method enables to divide the variance of the measurement in two components: the variance due to the measurement error and the variance of the real latent variable.[22] To gauge how much the mobility measures may be affected by mismeasurement, table A6 in the appendix presents the Heise index for household net wealth and its components (financial and non financial assets and liabilities) and its dynamics across different waves.

The overall level of reliability is fairly acceptable, ranging from 0.6 to 0.8. The interpretation of the Heise index is not always straightforward. Its value depends upon many factors such as the nature of the variable and the validity of the assumptions behind

[22] The Heise index relies on the following assumptions: (1) the true variable and the measurement error are uncorrelated, (2) the error term is additive, (3) the latent true variable follows a AR(1) process. If one of these assumptions does not hold the Heise index provides a biased estimate of the effective reliability (see Biancotti et *al.* 2004).

the index. In fact, among financial assets components such as deposits, shares or mutual funds (other financial assets) present a lower value for the index. Such assets have a high volatility which results in a lower value of the index. The valuables show a low reliability, probably because of the heterogeneity of the assets included in such class and of the difficulty in remembering the value of each component. At the opposite, government securities have a higher reliability since they are not generally subject to strong fluctuations.

Nevertheless, the level reliability fluctuates across different waves especially in the case of financial assets and liabilities.

Table A6

RELIABILITY OF THE MAIN VARIABLES IN SHIW DATABASE

(Heise index)

Wealth components	Heise Index σ^2(true variable)/ σ^2 (observed variable)		
	Waves 1991-1993-1995	Waves 1995-1998-2000	Waves 2000-2002-2004
Non Financial assets	0.71	0.79	0.73
Financial assets	0.79	0.68	0.57
Financial liabilities	0.82	0.54	0.77
Net wealth	0.74	0.82	0.75

Appendix B: Statistical tables

Table B1

OBSERVED TRANSITIONS OF HOUSEHOLD BY WEALTH CLASS: 1995-2000-2004
(percentages)

1995	2000 \ 2004	First class	Second class	Third class	Fourth class	Total
First class	First class	75.1	19.4	3.5	2.0	100.0
	Second class	48.9	40.0	5.3	5.9	100.0
	Third class	0.0	81.5	6.5	12.0	100.0
	Fourth class	12.1	8.7	0.0	79.2	100.0
1995	2000 \ 2004	First class	Second class	Third class	Fourth class	
Second class	First class	54.0	37.1	6.9	2.0	100.0
	Second class	2.3	79.1	16.5	2.1	100.0
	Third class	0.7	61.0	22.1	16.2	100.0
	Fourth class	0.0	25.0	36.5	38.5	100.0
1995	2000 \ 2004	First class	Second class	Third class	Fourth class	
Third class	First class	52.2	39.4	5.4	3.0	100.0
	Second class	3.6	55.8	35.3	5.2	100.0
	Third class	0.7	14.9	46.3	38.1	100.0
	Fourth class	0.0	17.1	45.3	37.6	100.0
1995	2000 \ 2004	First class	Second class	Third class	Fourth class	
Fourth class	First class	0.0	70.6	0.0	29.4	100.0
	Second class	4.4	35.1	34.3	26.2	100.0
	Third class	0.0	32.7	41.1	26.2	100.0
	Fourth class	1.0	5.5	17.6	75.9	100.0

Note: Data consists of a balanced panel (1995-2004) of 1010 households. Wealth classes are computed using the 1995 quartiles of relative wealth (ratio between household wealth and average wealth).

Table B2

OBSERVED TRANSITIONS OF HOUSEHOLD BY WEALTH CLASS: 1989-1993-1998
(row percentages)

1989	1993 \ 1998	First class	Second class	Third class	Fourth class	Total
First class	First class	64.3	22.8	10.2	2.6	100.0
	Second class	18.9	63.4	13.3	4.5	100.0
	Third class	8.1	68.6	14.2	9.1	100.0
	Fourth class	-	-	-	-	100.0
	1998	First class	Second	Third class	Fourth class	

1989	1993		class			
Second class	First class	77.0	7.7	15.3	0.0	100.0
	Second class	15.1	63.3	18.0	3.6	100.0
	Third class	2.9	41.1	48.8	7.3	100.0
	Fourth class	6.2	4.7	35.3	53.8	100.0
1989	1998 1993	First class	Second class	Third class	Fourth class	
Third class	First class	54.9	26.4	18.7	0.0	100.0
	Second class	3.5	67.2	27.9	1.3	100.0
	Third class	0.0	10.9	80.9	8.2	100.0
	Fourth class	3.9	5.1	24.2	66.9	100.0
1989	1998 1993	First class	Second class	Third class	Fourth class	
Fourth class	First class	46.4	36.7	16.9	0.0	100.0
	Second class	3.8	43.8	46.0	6.4	100.0
	Third class	1.0	30.9	59.5	8.7	100.0
	Fourth class	0.0	7.1	20.5	72.4	100.0

Note: Data consists of a balanced panel of 544 households. Wealth classes are computed using the 1989 quartiles of relative wealth (ratio between household wealth and average wealth).

Table B3

Models for the transition process in 1989-1993-1998
(*goodness-of-fit statistics*)

Models	Df	χ^2	G^2	BIC	AIC
Models without non sampling errors					
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 non sampling errors					
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

* p-value> 0.05

Table B4

Models for the transition process in 1995-2000-2004
(*goodness-of-fit statistics*)

Models	Df	χ^2	G^2	BIC	AIC
Models without non sampling errors					
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				
Models with non sampling errors		54.7	58.7	-170.1	-13.2
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

Figura 1

RESIDUAL ANALYSIS FOR THE LATENT MARKOV MODEL

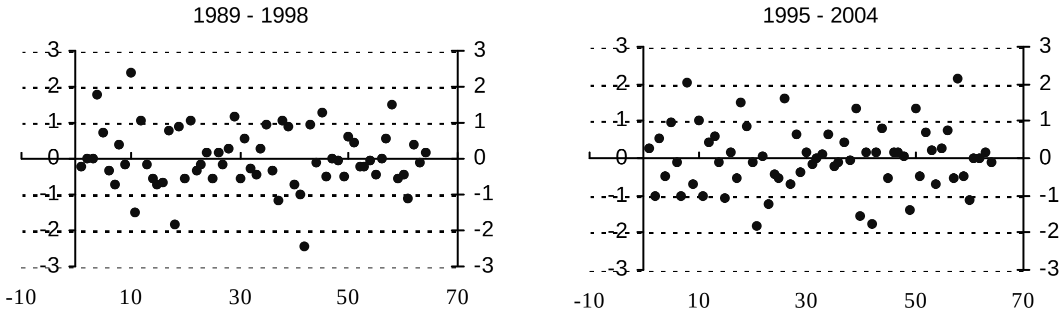

Table B5

Probability of mobility across wealth classes: the role of socio demographics

	Prob. of upward mobility (logit model)		**Prob. of downward mobility** (logit model)	
	Dep. variable: Wealth class in 2004 > wealth class in 1995		Dep. variable: Wealth class in 2004 < wealth class in 1995	
Variable	Parameter	p-value	Parameter	p-value
Geographical area (reference: North)				
Centre	-0.181	0.201	-0.264	0.064
South and Islands	0.348	0.004	-0.015	0.900
Education (reference: none)				
elementary school	0.501	0.010	0.077	0.659
Middle school	0.477	0.008	0.339	0.038
High school	-0.314	0.119	0.195	0.260
University degree	-0.338	0.249	-0.485	0.088
Age	-0.057	0.078	0.017	0.581
Age squared	0.001	0.128	0.000	0.413
Town size (reference: up to 20,000 inhabitants)				
From 20,000 to 40,000	0.196	0.310	0.058	0.750
From 40,000 to 500,000	0.101	0.518	-0.017	0.905
more than 500,000	-0.663	0.008	-0.147	0.454
Number of earners	0.175	0.091	0.030	0.765
Work status (reference: employee)				
Self-employed	-0.050	0.755	-0.339	0.027
Not employed	-0.364	0.061	0.561	0.001
Sex (reference: female)				
Male	0.105	0.287	0.096	0.300
Intercept	-0.724	0.369	-1.766	0.028
No. of observations		1010		1010
Pseudo R-square		0.06		0.03

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