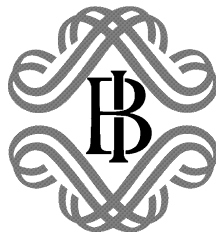# BANCA D'ITALIA

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**Labor Income and Risky Assets under Market Incompleteness:
Evidence from Italian Data**

by Giuseppe Grande and Luigi Ventura

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LABOR INCOME AND RISKY ASSETS UNDER MARKET INCOMPLETENESS: EVIDENCE FROM ITALIAN DATA

by Giuseppe Grande * and Luigi Ventura **

Abstract

Theory suggests that uninsurable income risk induces individuals to accumulate assets as a precautionary reserve of value. Most assets, however, bear rate of return risk, that can be diversified only if every asset is traded by a large number of individuals and arbitrage is frictionless. Using Italian micro-data, we find evidence of income and asset risks that affect consumption. Italian households are particularly well insured against illness but not against job losses. Moreover, we detect a positive, yet weak, effect of asset holding on the variability of consumption streams across households.

Contents

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1. Introduction[1]

Every individual is exposed to idiosyncratic risks, i.e. risks that vanish at the aggregate level. Illness, involuntary job loss, fire and theft are examples of risks that usually affect a limited number of individuals. Individuals can insure against these risks not only by trading market instruments (insurance contracts, financial assets, bank loans and contingent commodities), but also by resorting to programs of social security and public aid, or to informal mechanisms such as family transfers and charitable institutions.

This means that the individual-specific risks that consumers can fully diversify depend on a variety of socioeconomic and institutional factors, and can change from one country to another. A situation in which each idiosyncratic shock is perfectly shared among individuals is called "market completeness". While such a scenario seems to be highly unrealistic, conjecture that household consumption is not significantly affected by some kinds of idiosyncratic risk is far from trivial, and lends itself to empirical scrutiny through the so-called consumption insurance tests (Cochrane, 1991). Moreover, as we shall see below, shocks to human wealth, such as illness or losing one's job, have serious implications for individual welfare and saving decisions.

The presence of idiosyncratic risks that are not fully insurable (sometimes called "background uncertainty") is particularly relevant from a financial perspective. Since very few risks (like theft or casualties, for example) can be traded away in dedicated markets, one of the main instruments available to an individual to insure ex-ante against otherwise undiversifiable risks is to accumulate financial assets as a precautionary reserve of value. Both theory and econometric estimates confirm that precautionary saving is indeed a factor in households' portfolio choices, and it can also help explain Mehra and Prescott (1985)'s equity premium puzzle.

While the literature on precautionary saving emphasizes the insurance role of financial assets, it must be observed that most assets bear rate-of-return risk. In theoretical models,

this risk is usually regarded as highly tradable, because it is assumed that all individuals trade all their assets and that there are no frictions to arbitrage. In reality, both assumptions are apparently unwarranted, and the question arises as to whether financial assets, and in particular risky assets like equities, can sometimes convey sector-specific shocks that the owner cannot diversify as desired by trading in the financial market or by resorting to other instruments. This would constitute further evidence of market incompleteness and would also help to explain the high excess return on risky assets.

This work is intended as a contribution to the empirical literature on background uncertainty and portfolio choice. The next section develops a simple theoretical model of decision under uncertainty, which makes it possible to derive the testable implications of market completeness without resorting to the concept of a social planner. Sections 3 and 4, respectively, review the theoretical literature and the empirical evidence on portfolio choice in the face of uninsurable idiosyncratic risk. In section 5 we address the first empirical issue: using micro-data on Italian households, we look for the presence of uninsurable income risks by applying consumption insurance tests to two idiosyncratic shocks to working activity (illness and involuntary job loss). Then, in section 6, we focus on financial assets, along the lines described above, and look for a correlation between asset-holding and the variability of consumption growth across households. To address this issue, we develop a novel methodology to test for full consumption insurance. Conclusions are summarized in the last section, and the appendix offers a detailed description of the data.

2. Testable implications of market completeness

Let us consider a simple economy with a large number of finitely (but possibly long-) lived individuals who take economic decisions under risk, represented by a set of mutually exclusive and exhaustive states of the world occurring at each period.

At any date-event pair $s_t = (s, t)$ agent h receives an endowment of the only (composite) good existing in the economy, $e_{s_t}^h$, which is not necessarily constant over date-event pairs.

Agent h maximizes, under standard, state-contingent budget constraints, an intertemporal utility function of the form:

$$U^h(c_0^h) + \sum_t^T \rho^t \sum_{s_t} \pi_{s_t} U^h(c_{s_t}),$$

where T is the terminal date of the time horizon, ρ the discount coefficient, which we take to be equal across agents, π_{s_t} the (objective) probability assigned to date-event s_t and $U^h(\cdot)$ the (state independent) utility index for consumption at date-event s_t.

Suppose agents have, at time 0, the possibility of trading a sufficient number (without retrading, equal to the number of date-event pairs) of (non redundant) Arrow securities, i.e. securities yielding one unit of consumption at a particular date-event pair and nothing otherwise. The price of the Arrow security paying off in state s_t will be denoted by q_{s_t}.

The indirect utility function of individual h in terms of his portfolio of assets, y^h, can be written as:

$$U^h(e_0^h - \sum_{s_t} q_{s_t} y_{s_t}^h) + \sum_t \rho^t \sum_{s_t} \pi_{s_t} U^h(e_{s_t} + y_{s_t}).$$

The first order conditions with respect to y_{s_t} are then:

$$U^{h\prime}(c_0)q_{s_t} = \rho^t \pi_{s_t} U^{h\prime}(e_{s_t} + y_{s_t}).$$

By normalizing, for the sake of simplicity, the marginal utility of consumption at time 0 to unity, we can also express the former as

$$q_{s_t} = \rho^t \pi_{s_t} U^{h\prime}(e_{s_t} + y_{s_t}).$$

Agent h's marginal rate of substitution between consumption at any two date-event pairs s_t and $s'_{\hat{t}}$ will be:

$$(1) \qquad \rho^{t-\hat{t}} \frac{\pi_{s_t}}{\pi_{s'_{\hat{t}}}} \frac{U^{h'}(e_{s_t} + y_{s_t})}{U^{h'}(e_{s'_{\hat{t}}} + y_{s'_{\hat{t}}})} = \rho^{t-\hat{t}} \frac{\pi_{s_t}}{\pi_{s'_{\hat{t}}}} \frac{U^{h'}(c_{s_t})}{U^{h'}(c_{s'_{\hat{t}}})} = \frac{q_{s_t}}{q_{s'_{\hat{t}}}}$$

which means that marginal utility growth rates (across date-event pairs) should be perfectly correlated across individuals, regardless of the particular functional form chosen to represent preferences.

Let us now specialize the date-event utility function as follows:

$$(2) \qquad U^h(c_{s_t}) = \frac{c_{s_t}^{1-\mu^h}}{1-\mu^h}.$$

This is a well known and frequently used CRRA utility function, where μ^h represents the degree of relative risk aversion of agent h. Condition (1) now reads:

$$(3) \qquad \rho^{t-\hat{t}} \frac{\pi_{s_t}}{\pi_{s'_{\hat{t}}}} \left(\frac{c_{s_t}}{c_{s'_{\hat{t}}}} \right)^{-\mu^h} = \frac{q_{s_t}}{q_{s'_{\hat{t}}}}$$

which indicates that consumption growth rates are perfectly correlated across individuals, if $\mu^h = \mu \ \forall h$; if they are not, the correlations between individual rates of growth in consumption should always be positive, although not perfect.

It is also worth noticing that in this case individual consumption growth rates are perfectly correlated with per-capita consumption, as can easily be checked by substituting in (3) the geometric mean of individual consumptions and the harmonic mean of individual coefficients of relative risk aversion. The economic intuition of this observation is that, by using the full insurance opportunities provided by the complete set of securities traded on the asset market, agents can completely offset the idiosyncratic shocks affecting their income, thereby making consumption a function of only aggregate risk.

An alternative form for the date-event utility function could be as follows:

$$U^h(c_{s_t}) = -\frac{1}{\mu^h} e^{-\mu^h c_{s_t}}$$

i.e. the negative exponential form, belonging to the class of CARA utility functions. In this case, using logarithms condition (1) reads:

(4) $$c_{s'_{\hat{t}}} - c_{s_t} = \frac{1}{\mu^h} \log K$$

where $K = \left(\dfrac{q_{s_t}}{q_{s'_{\hat{t}}}} \cdot \dfrac{\pi_{s'_{\hat{t}}}}{\pi_{s_t}} \cdot \dfrac{1}{\rho^{t-\hat{t}}}\right)$.

With exponential utilities, then, a testable implication of market completeness can be expressed in terms of absolute changes in consumption from one date-event pair to another.

With market incompleteness all the good results we obtained, and in particular expression (1), are no longer valid. The behaviour of individuals' marginal rates of substitution from one date-event to another cannot be pinned down as we did, as it will depend in a more or less substantial manner (depending on the degree of incompleteness) on the stochastic process followed by the idiosyncratic shocks.

3. Portfolio choice with uninsurable idiosyncratic risk and imperfect financial markets

Uninsurable idiosyncratic risk affects individuals' saving decisions and thereby asset pricing. It also provides a theoretical explanation of two major finance puzzles (Mehra and Prescott, 1985): compared with the predictions of the Consumption Capital Asset Pricing Model, the sample means of risk-free rates are too low ("risk-free rate puzzle") and those of actual stock excess returns are too high ("equity premium puzzle").

To find the implications of background uncertainty for portfolio choice, we need to consider an economy with both uninsurable risk and rate-of-return risk. Weil (1992) builds a two-period model with undiversifiable income risk and two assets, one of which is risky. He shows that, if marginal utility is convex (a weak condition related to Kimball (1993)'s notion of "prudence"), non-tradable income risk generates precautionary savings and increases the

demand for both the safe asset and the risky asset, thus making their returns lower than in the complete market environment. While this finding provides a theoretical explanation of the observed low levels of risk-free rates, it still does not solve the equity premium puzzle. Weil then demonstrates that, if the utility function exhibits Kimball (1993)'s property of "standard risk aversion", precautionary saving will be predominantly allocated on the risk-free asset, consequently raising the equity risk premium. Standard risk aversion is equivalent to the combination of two plausible assumptions: decreasing absolute risk aversion (the absolute holding of risky assets rises as wealth rises) and decreasing absolute prudence (the absolute level of precautionary savings declines as wealth rises). Therefore, background uncertainty induces risk-averse and "prudent" individuals to reduce the portfolio share of risky assets, thereby increasing the excess return on those assets.

Weil (1992)'s result can be regarded as a portfolio choice application of one of the main predictions of the risk-taking theory with multiple sources of risk (see Kimball, 1993): bearing one risk (labor risk) makes a risk-averse agent less willing to bear another risk (rate-of-return risk), even when the two risks are independent. Weil's financial model also illustrates a related proposition, proved by Guiso and Jappelli (1996): the presence of non-tradable risk (labor risk) increases the demand for insurance against insurable risks (in Weil's model, it increases the portfolio share of the riskless asset).

As emphasized by Kocherlakota (1996), two-period models such as Weil's, however, do not adequately characterize saving behaviour in the face of background uncertainty, as they abstract from the presence of what Kocherlakota calls dynamic self-insurance: consumers can resort to asset accumulation to offset partially the effects of income shocks on consumption, selling assets when income is low and buying assets when income is high. This role of asset trading is instead captured by models with infinite horizon. Constantinides and Duffie (1996) point out by numerical simulations that, in infinite horizon economies with "prudent" consumers, market incompleteness explains the size of the equity premium only if the idiosyncratic shocks are highly persistent. For plausible values of the autocorrelation process, infinitely lived consumers can protect themselves from shocks to labor income that are otherwise undiversifiable by accumulating financial assets as a self-insurance device. In other words, financial instruments help smooth consumption not only over time but also

across contingencies, unless the idiosyncratic shocks are very persistent with respect to the life horizon of individuals.

A crucial feature of all these models is that the rate-of-return risk is highly tradable.[2] More specifically, three important assumptions on investors' behaviour are made: (1) all assets are tradable; (2) all investors trade all assets (complete market participation); (3) arbitrage is frictionless. If only one of these three conditions fails to hold, the holding of risky assets exposes investors to idiosyncratic risks that may not be easily diversifiable through other instruments. This is the conjecture that we will focus on in section 6.

It is important to observe that, in standard models of portfolio choice, the effect of an increase in the riskiness of an asset on the demand for that asset is ambiguous: under standard hypotheses on preferences and on the stochastic properties of asset returns, there is no presumption that risk-averters would invest less in a "riskier" asset.[3] Gollier and Schlesinger (1996), however, developing a partial equilibrium model in which the increase in risk takes the simple form of additive white noise, shows that Kimball's hypothesis of standard risk aversion is sufficient to obtain the desirable comparative-statics result: an independent, zero-mean term added to a risky asset leads a risk-averse and prudent investor to reduce the demand for that asset. Note that this result, coupled with the hypotheses of limited market participation and/or frictions to arbitrage, provides a theoretical justification of the equity premium puzzle that is different from the one based on uninsurable income risk.

4. Recent econometric evidence on precautionary saving

According to various surveys, individuals save to provide for old age, to insure against adverse contingencies, to overcome borrowing constraints and to afford intergenerational transfers (education, housing, bequests). Surveys reveal also that the precautionary motive for saving is widespread also among stockholders (Starr-McCluer, 1998). In a recent survey sponsored by the Federal Reserve Board on the consumption behaviour of U.S. stockowners, the precautionary motive was the second most-mentioned reason for saving (Tab. 1).

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[2]   Most assets bear rate of return risk. Even a short-term nominal bond issued by the government can be risky if its maturity is longer than the holder's investment horizon, or if inflation is highly variable.

[3]   See Gollier and Schlesinger (1996) for references to relevant work.

Table   1

MAIN REASONS FOR SAVING OF U.S. STOCKHOLDERS

	percentage [1]
retirement	almost 50
precautionary reasons [2]	38
children's education	19.6
major purchases	17
investments	9

Source: Starr-McCluer (1998).

(1) Percentage incidence of the main answers provided by a representative sample of U.S. households owning stocks. In phone interviews between July and September 1997, 592 households out of 1,500 reported owning stock in some form, excluding equity in closely held corporations. The survey consisted of a special set of open-ended questions set by the Michigan SRC Survey of Consumers. - (2) Unemployment, illness, emergencies, and "rainy days".

As regards Italian households, surveys conducted at the end of the eighties revealed that the main motivation for saving was the need to forestall emergencies. The need to finance purchases of durable goods and homes was also frequently mentioned, whereas the retirement motive seemed to play a less prominent role in the decision to save than it does for U.S. households.[4] The situation in Italy seems to have changed in recent years, but hedging against adverse contingencies is still the most common reason for saving, together with life-cycle considerations.[5]

The theoretical predictions on precautionary savings reviewed in the previous section have recently been compared with data from econometric studies. A fundamental problem faced by these studies is how to measure idiosyncratic shocks to households. For the United States, Carroll and Samwick (1991) use a measure of the variance of lifetime earnings to build a proxy of earnings uncertainty, and find that the latter does remarkably affect consumption and asset accumulation.

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[4] By international standards, the Italian saving rate was very high in the second half of the twentieth century, although it has been declining substantially since the early seventies. This is linked to the limited working of the mortgage, consumer loan and insurance markets, which induces households to save more in order to circumvent liquidity constraints and meet unexpected expenses. The reduced importance of saving for retirement at the end of the eighties can be linked to the fact that at that time the Italian social security system was still very generous. Cf., Ando, Guiso and Visco (1994) and Guiso, Jappelli and Terlizzese (1994).

[5] Cf., for instance, Il Sole 24 Ore (1999).

Other researches use a subjective measure of earnings uncertainty, built on Italian cross-sectional data drawn from the 1989 Survey of Household Income and Wealth (SHIW). Guiso, Jappelli and Terlizzese (1992) and Lusardi (1993) find that subjective earnings uncertainty does generate precautionary saving and increase asset accumulation, although the effect is quite limited (about 2 percent of households' net worth). Guiso, Jappelli and Terlizzese (1996) find that earnings uncertainty is negatively related to the share of risky assets in the household portfolio. They also suggest that this effect, together with that stemming from borrowing constraints, helps to explain about one fourth of the equity premium puzzle estimated for Italy in the 1907-1993 period (cf., Panetta and Violi, 1999). Finally, Guiso and Jappelli (1996) find that earnings uncertainty is positively related to the demand for insurance against casualty, a kind of directly insurable risk. It is important to observe that all these findings also corroborate the hypothesis that consumer preferences are characterized by decreasing absolute prudence.

The point of interest is whether the assumption of tradability of rate-of-return risks is warranted. Each of the three hypotheses mentioned is unlikely to occur in practice: (1) households also own securities that are not listed in security exchanges; (2) most investors do not diversify across different classes of asset (cf., Allen and Gale, 1994, and references therein); (3) it seems indisputable that there are frictions to arbitrage, arising from trading and information costs, from non-rational behaviour and from borrowing constraints.

The main goal of this paper is to find empirical evidence supporting the conjecture that the holding of risky assets can significantly increase the dispersion of consumption growth across households. To our knowledge, this is the first econometric study addressing the issue. Using the SHIW data, we first look for evidence of non-tradable income risks, by testing whether household consumption is affected by two kinds of shock to working activity: involuntary job loss and illness (Section 5). Our approach is complementary to those mentioned above, which use a subjective measure of earnings uncertainty as a proxy of background income risks. We then explore the issue of whether risky assets can expose the holder to idiosyncratic risks that are not fully diversified (Section 6). It is important to observe that, since we test the effect of stock-ownership on consumption, we also take account of ex-post insurance mechanisms, such as intergenerational transfers, that could be used by stockholders to attenuate the impact of portfolio shocks on consumption.

Before entering into the econometric analysis, let us give a cursory look at the data. Table 2 reports the standard deviation of consumption growth for different categories of workers and financial investors. For each panel and each individual category, the table shows the standard deviation of both the growth rate and first difference of annual household consumption. In all panels the variability of consumption of self-employed workers is clearly higher than that of dependent workers. It is reasonable to link this fact to the higher earnings uncertainty that characterizes self-employed workers. As regards different categories of investors, it turns out that stockholders' consumption is more volatile than that of the other categories of investors in all but the 1989-1991 panel. This evidence is consistent with that found for the United States by Mankiw and Zeldes (1991), who also show that stockholder consumption covaries more strongly with excess equity returns.

Table   2

CHANGE IN CONSUMPTION: STANDARD DEVIATIONS [1]

	1989-91		1991-93		1993-95	
	growth rates	first differences	growth rates	first differences	growth rates	first differences
Dependent workers	54.6	11770	47.0	15911	38.0	14661
Self-employed workers	59.7	18720	54.9	22425	46.1	24111
Bond holders	51.3	12309	52.0	17953	42.2 [2]	14151 [2]
Shareholders	52.9	15706	47.4	23483	45.0	34341
Full sample	51.8	12305	49.1	14375	41.9	14971

Source: SHIW (see Appendix).

(1) Non-durable consumption. For each panel and each category, the table shows the standard deviations of both growth rate (in percentage points) and first difference (in millions of lire) of annual household consumption. - (2) Non-asset holders.

5. Consumption and idiosyncratic shocks to working activity in Italy

We test the hypothesis that Italian households are fully insured against two idiosyncratic shocks to working activity: involuntary job loss (Section 5.1) and illness (Section 5.2).

The empirical framework. The empirical analysis follows Cochrane (1991). The rationale of the test is the following: if household consumption is perfectly insured against

individual shocks and the utility functions are stable, the change in marginal utility across two dates (or across two states of nature) should be the same for all households and not be affected by these kinds of shock. Since under certain assumptions on preferences the change in marginal utility can be represented by the change in consumption, consumption insurance can be verified by projecting household consumption growth on variables representing idiosyncratic shocks and testing for the significance of the latter.

Cochrane's test is specified as follows:

$$(5) \qquad\qquad CG^h = \alpha + \beta IV^h + \varepsilon^h$$

for $h = 1, 2, \ldots, n$, where CG^h represents household h's consumption growth, IV^h an idiosyncratic variable and n the number of households in the sample. Regressor IV^h is usually a dummy variable equal to one if a certain kind of idiosyncratic shock affects household h (for instance, the head of the family loses his job). The t-statistic associated with the OLS estimate of β provides a test of full consumption insurance: if β is different from zero at conventional significance levels, the consumption of households hit by the idiosyncratic shock is significantly different from that of the other households, and the hypothesis of market completeness has to be rejected.

As explained in section 2, the endogenous variable (CG^h) can be expressed either in terms of growth rate or in terms of first difference, depending on the specification of preferences. It is also important to observe that Cochrane's test permits the assessment of consumption risk-sharing for different kinds of shock as well as for consumers living in different countries. Finally, note that Cochrane's test is a cross-sectional estimate: panel data are used only to compute the endogenous variable, while parameters are estimated by OLS.

In microeconometric tests of consumption insurance three interrelated issues arise: the measurement of the idiosyncratic shock, the role of personal income and the presence of shifts in the utility functions.

As already mentioned in the previous section, it is very difficult to construct variables representing idiosyncratic shocks to households. As Cochrane emphasizes, consumption growth can differ across households because of factors that are not related to failure of perfect

risk-sharing, but to changes in: preferences; the degree of risk aversion; the rate of time preference. A variable measuring an idiosyncratic shock has to be uncorrelated with all these other sources of heterogeneity; in particular, idiosyncratic variables have to be exogenous to the household. Moreover, measured consumption growth can also differ across households because of measurement errors; therefore, idiosyncratic variables have to be uncorrelated with measurement errors in consumption.

A particularly thorny issue in estimating consumption insurance tests on micro data is the role of personal income. If markets are complete, household consumption is also perfectly insured against idiosyncratic shocks to income. This implication of perfect risk-sharing is exploited by Mace (1991) to devise a test of consumption insurance alternative to Cochrane's. The choice not to include household income among the regressors is justified by Cochrane on the ground that several components of personal income (such as labor income and transfer payments) are decision variables, and that the measurement error in income tends to be highly correlated with that in consumption.[6] We prefer to follow Cochrane's approach and to measure idiosyncratic shocks to income by variables that are completely exogenous to the household.

Since consumption risk-sharing can be properly assessed only for those households whose preferences are stable in the sample period, the empirical model controls for some of the main factors that may involve discontinuities in consumption habits (Attanasio and Weber, 1993). One of them is changes in household composition, like having a baby or a child leaving home. Other factors that may induce preference shifts are changes of home and changes in children's education levels. We dealt with the problem of endogenous shifts in utility functions as follows. Households whose composition changed between two surveys are not included in the sample.[7] As regards the other two factors considered (moving and changes in children's education level), instead of restricting the sample to households for which no event of the kind occurred, we introduce dummy variables as additional regressors and estimate the following extended version of Cochrane's test (cf., equation (5)):

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[6] A household under-estimating (over-estimating) its expenditure is also likely to under-estimate (over-estimate) its revenue. See Cochrane (1991), pp. 960-61.

[7] Cochrane (1991) provides results for both the full sample and the subsample of households whose composition did not change. Most of the estimates turn out to be more significant in the former case. However, as Cochrane emphasizes, this effect is likely to derive from preference shifts accompanying the composition change.

$$(6) \quad CG^h = \alpha + \beta IV^h + \gamma_1 HO^h + \gamma_2 PS^h + \gamma_3 SS^h + \gamma_4 UNI^h + \varepsilon^h$$

for $h = 1, 2, \ldots, n$, where HO^h, PS^h, SS^h and UNI^h are dummy variables to identify households that in the sample period changed their home and included children aged 5-6, 13-14 and 17-19 years, respectively.[8] The t-statistic associated with the cross-sectional OLS estimate of β provides a test of consumption risk-sharing that is more robust to preference shifts.

Finally, to assess the robustness of the results in a dynamic setting, we run panel estimates by introducing temporal dummies among the regressors to control for changes in the growth of aggregate consumption:

$$
\begin{aligned}
CG^{ht} &= \alpha + \beta IV^{ht} + \gamma_1 HO^{ht} + \gamma_2 PS^{ht} + \gamma_3 SS^{ht} + \gamma_4 UNI^{ht} + \\
(7) \qquad & \gamma_5 D90\_91 + \gamma_6 D92\_93 + \varepsilon^{ht}
\end{aligned}
$$

for $h = 1, 2, \ldots, n$, and $t = 1, 2, 3$, where $D90\_91$ and $D92\_93$ are dummy variables equal to one if the data refer to, respectively, $t=1$ (cross-section 1990-91) and $t=2$ (cross-section 1992-93).

The data. The data are taken from the SHIW (a detailed description is in the appendix). Since the test calls for the computation of changes in household consumption, we use four editions of the survey that contain a panel subset: 1989, 1991, 1993 and 1995. SHIW data make it possible to construct two variables representing idiosyncratic shocks to working activity: involuntary job loss and illness.[9]

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[8] In Italy, the main shifts in education levels occur at the following ages: 5-6 years (enrollment at primary school); 13-14 years (enrollment at secondary school or interruption of full-time education); 17-19 years (enrollment at university or interruption of full-time education).

[9] The SHIW also contains information on other idiosyncratic shocks, but the available observations are very limited. Specifically, the survey contains data on payments by insurance companies to households. Insurance payments signal the occurrence of idiosyncratic shocks that are probably not perfectly insured, because insurance companies never provide the customer with full coverage for losses. Some editions of the SHIW also contain data

5.1 *Involuntary job loss*

In this case, the dummy variable IV^h is equal to one if the head of the family lost her job in the period between two consecutive surveys. The test is applied twice, with two different measures of consumption growth: growth rate and first difference. The results are summarized in table 3. The table reports the estimated value of the parameter associated with the idiosyncratic variable (β), together with its p-value; the latter is computed on the basis of the White estimator of the asymptotic variance-covariance matrix, to take account of heteroschedasticity. The upper section of the table reports the results for the original specification of Cochrane's test (equation (5)), applied to the subset of households that did not change composition, while the lower section shows the estimates for the regression which also includes the dummies for preference shifts (equation (6)).

It turns out that the estimated value of β is almost always negative as expected. In several cases the parameter is also significant at 5 percent confidence level. The results are different for the 1991-93 panel: β has the expected sign, but it is not significant at conventional confidence levels. An analogous pattern characterizes the results for first differences.

It is important to observe that the results do not change once we take into account other factors that can also induce preference shifts. The introduction of the dummies for preference shifts clearly improves the efficiency of the estimates: in almost all cases, the significance level is lower (see section (ii) of Table 3). As regards growth rates, in the 1989-1991 sample the p-values fall below 1 percent.

These results are similar to those found by Cochrane (1991) for the United States: in this country too, the loss of a job by the head of a household significantly reduces the growth rate of household consumption.

Panel estimates confirm that the loss of a job by the head of a family has a significant negative effect on household consumption growth (Table 4). Such effect is particularly strong when the test is carried out on consumption growth rates.

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on lottery winnings received by households. When applied to these kinds of idiosyncratic shock, Cochrane's test does not usually allow rejection of the null hypothesis of full insurance. However, since in both cases the number of households that reported being hit by the shock is extremely low, measurement error can be very relevant (in the case of lotteries, the reluctance to provide information can be linked to fiscal issues). For this reason, the estimates are not presented.

Table 3

HOUSEHOLD CONSUMPTION AND INVOLUNTARY JOB LOSS IN ITALY

Test of consumption insurance against the loss of a job by the head of family. The test is applied to three different samples (see the Appendix for data description). To control for shifts in the utility functions, the samples only include households whose composition did not change across two surveys. Section (i) of the table refers to the original specification of Cochrane (1991)'s test (equation (5)), while Section (ii) refers to a specification of the test that also controls for other factors inducing preference shifts (equation (6)). Each test is applied twice, with two different measures of change in consumption: growth rates (in percentage points) and first differences (in millions of lire). Four numbers are reported for each regression: overall number of households; number of households hit by the shock; estimated effect of the parameter associated with the idiosyncratic shock; p-value of being wrong in rejecting the hypothesis that the households are perfectly insured against the idiosyncratic shock (in square brackets). The test is based on the OLS estimator and on White standard errors.

Sample period	GROWTH RATES				FIRST DIFFERENCES			
	n° of households	n° of cases	β	p-value	n° of households	n° of cases	β	p-value
(i) Head losing her or his job in one of the two years and currently being unemployed								
1990-91	1318	22	-27.42	[.02]	1318	22	-5526	[.06]
1992-93	1921	34	-7.57	[.37]	1921	34	-1375	[.63]
1994-95	2131	58	-11.42	[.04]	2131	58	-2755	[.04]
(ii) As in (i), but the test is also conditioned by changes of home and by children's education levels								
1990-91	1318	22	-29.90	[.00]	1318	22	-6000	[.00]
1992-93	1921	34	-7.63	[.30]	1921	34	-1410	[.40]
1994-95	2131	58	-10.80	[.04]	2131	58	-2720	[.02]

Table 3 (cont.)

HOUSEHOLD CONSUMPTION AND INVOLUNTARY JOB LOSS IN ITALY

Test of consumption insurance against the loss of a job by a family member. The test is applied to three different samples (see the Appendix for data description). To control for shifts in the utility functions, the samples only include households whose composition did not change across two surveys, and the test contains dummies for changes of home and in education levels (equation (6)). Each test is applied twice, with two different measures of change in consumption: growth rates (in percentage points) and first differences (in millions of lire). Four numbers are reported for each regression: overall number of households; number of households hit by the shock; estimated effect of the parameter associated with the idiosyncratic shock; p-value of being wrong in rejecting the hypothesis that the households are perfectly insured against the idiosyncratic shock (in square brackets). The test is based on the OLS estimator and on White standard errors.

Sample period	GROWTH RATES				FIRST DIFFERENCES			
	n° of house-holds	n° of cases	β	p-value	n° of house-holds	n° of cases	β	p-value

(iii) At least one family member losing her or his job in one of the two years and currently being unemployed

1990-91	1318	59	-21.04	[.00]	1318	59	-5772	[.00]
1992-93	1921	87	-16.23	[.00]	1921	87	-4078	[.00]
1994-95	2131	125	-9.45	[.00]	2131	125	-2423	[.01]

Table 4

SHOCKS TO WORKING ACTIVITY AND TO RISKY ASSETS: PANEL ESTIMATES

Tests of consumption insurance against shocks to working activity and to risky assets, based on panel estimates (equations (7) and (9)). Data are bi-annual and span the six-years 1990-95 (see the Appendix for data description). To control for taste shifts, in each period the sample only includes households whose composition did not change between the survey related to that period and the previous survey. Each test is applied twice, with two different measures of change in consumption: growth rates (in percentage points) and first differences (in millions of lire). For each regressor, two numbers are reported: the estimated value of the parameter and, in square brackets, the *p*-value of being wrong in rejecting the hypothesis that the parameter is null. An asterisk in the first column indicates that the Hausman test suggested estimating the panel under fixed effects.

	Constant	idiosyncratic variable (see below)	moving	primary school	secondary school	college or job	dummy 1990-91	dummy 1992-93	financial wealth
idiosyncratic variable: job loss by the head of family									
GROWTH RATES	16.02 [.00]	-13.55 [.00]	9.33 [.00]	1.44 [.54]	-0.40 [.84]	2.29 [.16]	1.74 [.30]	-1.92 [.20]	
FIRST DIFFERENCES	2858 [.00]	-2943 [.05]	1069 [.10]	-78 [.92]	280 [.68]	670 [.21]	381 [.49]	-873 [.08]	
idiosyncratic variable: job loss by a family member									
GROWTH RATES	16.42 [.00]	-14.15 [.00]	9.32 [.00]	1.31 [.58]	-0.51 [.80]	2.73 [.09]	1.68 [.32]	-1.99 [.18]	
FIRST DIFFERENCES	2975 [.00]	-3680 [.00]	1067 [.10]	-103 [.90]	261 [.68]	792 [.14]	359 [.52]	-898 [.07]	
idiosyncratic variable: illness of the head of family									
GROWTH RATES	17.93 [.00]	-0.60 [.65]	16.82 [.00]	1.00 [.68]	-1.08 [.60]	1.46 [.37]	0.56 [.73]	-2.46 [.10]	
FIRST DIFFERENCES	3205 [.00]	-204 [.62]	4505 [.00]	-245 [.74]	77 [.90]	618 [.22]	74 [.89]	-1147 [.01]	
idiosyncratic variable: illness of a self-employed head of family									
GROWTH RATES	21.89 [.04]	-2.94 [.67]	35.04 [.00]	-3.69 [.71]	-4.00 [.69]	-2.96 [.69]	-5.25 [.64]	-8.83 [.48]	
FIRST DIFFERENCES	645 [.82]	136 [.94]	6503 [.03]	211 [.93]	-334 [.90]	-288 [.88]	1020 [.73]	610 [.85]	
idiosyncratic variable: non stockholders									
GROWTH RATES	28.92 [.00]	-0.89 [.35]	5.88 [.00]	-1.63 [.31]	-0.38 [.78]	-0.41 [.70]	4.10 [.00]	5.47 [.00]	0.02 [.00]
FIRST DIFFERENCES*	7839 [.00]	-180 [.69]	860 [.20]	-1568 [.02]	-390 [.45]	-175 [.73]	-647 [.08]	667 [.01]	8 [.00]
idiosyncratic variable: stockholders									
GROWTH RATES	28.75 [.00]	0.31 [.88]	5.91 [.00]	-1.61 [.31]	-0.36 [.79]	-0.38 [.72]	0.01 [.72]	4.12 [.00]	5.46 [.00]
FIRST DIFFERENCES*	7776 [.00]	1962 [.03]	816 [.22]	-1596 [.01]	-387 [.45]	-220 [.66]	7 [.00]	-631 [.08]	670 [.01]

The negative effect of a job loss on consumption growth is much more significant if the dummy is equal to one when any household member (not necessarily the head of family) has been dismissed (see section (iii) of Table 3). It is interesting to note that, in this case, the result also holds for the 1989-1991 sample.

5.2 *Illness*

In the estimates reported in table 5, the dummy variable IV^h is equal to one if the head of family lost at least one day of work on account of illness.

In the regressions reported in section (i) of table 5, the effect of illness on consumption growth tends to be negative, as expected (with the exception of the data-set 1991-93), but the estimated value is never significant at the 5 percent significance level.

The test is then applied to the subset of households whose head is self-employed (see section (ii) of Table 5). In this case, illness should be more significant, because it could affect business opportunities more directly. The estimated values of β turn out to be almost always negative, but they are still not significant at the 5 percent level.

The results do not change if the idiosyncratic variable is set equal to the number of days of illness. The effect of longer illness (more than 100 days per year) also tends to be negative, as expected, but not significant at conventional levels. Panel estimates confirm the results obtained with cross-sections (Table 4).

It is important to observe that in this class of tests the measurement error of the idiosyncratic variable can be more relevant. Since data are available only for the reference year of the survey and the latter is conducted every two years, the days of illness in the year not surveyed are not observed (in the three data-sets that we consider, this is the case for the years 1990, 1992 and 1994). We thus face an instance of omission of relevant variables, in that we omit the variable measuring days of illness in the first of the two years between two consecutive surveys.

We maintain that such an omission is without serious consequences. The coefficients of regression in a model with omitted relevant variables incorporate the true coefficients, plus a linear combination of the (true) coefficients of the omitted variables, the weights depending on the correlation between the variables omitted and those included. It is reasonable to argue that

Table 5

HOUSEHOLD CONSUMPTION AND ILLNESS IN ITALY

Test of consumption insurance against illness of the head of family. The test is applied to three different samples (see the Appendix for data description). To control for shifts in the utility functions, the samples only include households whose composition did not change across two surveys, and the test contains dummies for changes of home and in education levels (equation (6)). Each test is applied twice, with two different measures of change in consumption: growth rates (in percentage points) and first differences (in millions of lire). Four numbers are reported for each regression: overall number of households; number of households hit by the shock; estimated effect of the parameter associated with the idiosyncratic shock; p-value of being wrong in rejecting the hypothesis that the households are perfectly insured against the idiosyncratic shock (in square brackets). The test is based on the OLS estimator and on White standard errors.

Sample period	GROWTH RATES				FIRST DIFFERENCES			
	n° of house-holds	n° of cases	β	p-value	n° of house-holds	n° of cases	β	p-value
(i) Head having been ill at least 1 day in the second year								
1990-91	1331	569	-5.29	[.08]	1331	569	-769	[.31]
1992-93	1912	740	3.82	[.10]	1912	740	704	[.33]
1994-95	2173	780	-1.33	[.48]	2173	780	-632	[.32]
(ii) Self-employed head having been ill at least 1 day in the second year								
1990-91	212	70	-2.58	[.71]	212	70	459	[.78]
1992-93	51	4	-9.30	[.63]	51	4	-1997	[.61]
1994-95	22	3	-17.84	[.56]	22	3	-5354	[.62]

between measures of illness in two consecutive periods there is either no correlation or a positive one (consider, for example, chronic illnesses). In the first case, the coefficient of our idiosyncratic variable would not be biased, whereas in the second the bias would be positive (the coefficient would be larger than the true value), thus bringing about a higher t-value and pushing the test towards the rejection of the null hypothesis of perfect risk sharing. Therefore, in this respect the results of our analysis seem to be confirmed a fortiori. It is very interesting to compare these results with those obtained by Cochrane (1991) for US households. The general dummy (at least one day of illness) is not significant, but long illness (lasting more than 100 days) has a negative and highly significant effect, suggesting that, contrary to the Italian case, in the US long spells of illness do affect consumption. This difference is not surprising. First, compared with the United States, in Italy the degree of protection provided by the public health-care system is much higher. Everybody has access to the public health system, whereas in the US the covered population is less than 50 percent and private insurances play a major role (Henriet and Rochet, 1998). Moreover, in government-operated medical care facilities in Italy, diagnostic and therapeutic treatments are generous and user fees are very limited and mostly proportional to income. Second, income or job losses due to illness are much more unlikely to occur in Italy than in the United States. In Italy, dependent workers with serious health problems can keep their jobs for a very prolonged period of time and the probability of dismissal is extremely low. Earnings losses are also very limited, since the social security system helps employers pay wages to ill workers. In the US, on the contrary, labor contracts are usually settled on a bilateral basis and do not provide extensive sick leave or job protection.

6. Consumption and risky assets in Italy

In this section, we look for empirically significant effects of asset-holding on the distribution of consumption growth across households, as evidence supporting the conjecture that the holders of risky assets may be exposed to idiosyncratic shocks conveyed by those assets.

The empirical framework. We cannot directly apply the methodology of the previous section for two reasons. First, the available data do not allow the construction of a measure of idiosyncratic shocks to risky assets. Moreover, even if such a measure were available and

consumption were affected, the estimated effect could be not significantly different from zero, because shocks to risky assets can be of either sign.

An econometric assessment of the effect of risky assets on consumption can be carried out as follows. If markets are complete, households are also able to diversify all shocks stemming from risky assets such as equities or private debt. Therefore, if there are no taste shifts, the holding of these assets should not exert a significant effect on the distribution of changes in marginal utility across two dates (or across two states of nature). Since under certain assumptions on preferences the change in marginal utility can be represented by the change in consumption, this effect can be tested by projecting a measure of the dispersion of household consumption growth on a dummy variable identifying the holders of risky assets. More precisely, we estimate the following regression:

$$(8) \qquad \left| CG^h - \overline{CG} \right| = \alpha + \beta PD^h + \gamma_1 HO^h + \gamma_2 PS^h + \gamma_3 SS^h + \gamma_4 UNI^h + \epsilon^h,$$

for $h = 1, 2, \ldots, n$, where $\overline{CG}$ is the average change in household consumption, $\left| CG^h - \overline{CG} \right|$ is the module of the deviation from the mean of changes in consumption and PD^h is a dummy equal to one if household h holds a specified asset; the definition of the other variables is the same as in equation (6). Under the null hypothesis that the holding of risky assets does not affect the distribution of consumption streams, parameter β should not be different from zero at conventional significance levels. For the reasons explained in section 5, the test is carried out on the sample of households whose composition did not change and is conditioned by other factors that induce preference shifts (change of home or level of education).

We then replicate the test on panel data. In the dynamic setting, however, we also take account of two econometric issues posed by the presence of portfolio dummies. First, since stockholders are comparatively wealthy people and measurement error is proportional to both wealth and consumption, the significance of the stockholder dummy could be due to poor quality data. Second, since both consumption and portfolio choices are decision variables, a simultaneity bias arises between the endogenous variable and the portfolio dummy. To control for the two types of spurious correlation, we also condition the estimate to households' financial wealth. Therefore, the panel estimates take the following form:

$$\left| CG^{ht} - \overline{CG}^t \right| = \alpha + \beta PD^{ht} + \gamma_1 HO^{ht} + \gamma_2 PS^{ht} + \gamma_3 SS^{ht} + \gamma_4 UNI^{ht} +$$

(9)
$$\gamma_5 W^{ht} + \gamma_6 D90\_91 + \gamma_7 D92\_93 + \epsilon^{ht}$$

for $h = 1, 2, \dots, n$, and $t = 1, 2, 3$, where $\overline{CG}^t$ is the average change in consumption across households at date t and W^{ht} is the financial wealth of household h at date t.

The data. In the SHIW, the data on financial assets can be grouped into seven categories: (1) bank deposits; (2) postal deposits; (3) government securities; (4) other bonds (mainly issued by banks) and shares of mutual funds; (5) equities (also including shares that are not traded on stock markets); (6) portfolio management services; (7) foreign assets.

Four different portfolios are considered. The "non stockholders" dummy identifies those households that hold government securities but do not hold equities. The other three dummies are all related to stockholders, but differ in the size of the equity portfolio considered: some, at least 4 million lire, at least 36 million lire.[10]

The results. The results are summarized in tables 4 and 6. When considering growth rates, the dummy "stockholders" is never significant. However, it becomes strongly significant in the case of first differences. The estimated effect, different from zero at 1 percent confidence level, is about 4.7 million lire in the 1989-1991 sample and about 3.4 million in the 1991-93 and1993-95 samples. The effect of risky assets on the dispersion of consumption flows strengthens as the amount of equities in the portfolio increases.

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[10] The limited number of observations prevents us from choosing a higher investment threshold to identify major stockholders. For the SHIW, as for several other surveys of the kind, non-reporting and under-reporting of wealth are as relevant an issue as for income. See Brandolini and Cannari (1994), and references therein. Measurement error of the stock of financial assets tends to bias the test towards the acceptance of the null hypothesis.

No dummy controls for other risky assets (bonds other than government securities, shares of mutual funds, portfolio management services and foreign assets). The reason behind this choice is that the financial characteristics of these assets are heterogeneous. The inclusion of these assets could somehow "bias" the nature of the dummies, which are intended to pick up low-risk portfolios (non-stockholder dummy) and high-risk portfolios (stockholder dummies). Finally, no dummy controls for bank or postal deposits, because the latter consist mainly of liquid assets with a very low degree of risk.

Table 6

HOUSEHOLD CONSUMPTION AND SHARE-HOLDING IN ITALY

Test of the effect of share-holding on consumption growth variability. The test is applied to three different samples (see the Appendix for data description). To control for shifts in the utility functions, the samples only include households whose composition did not change across two surveys, and the test contains dummies for changes of home and in education levels (equation (8)). The endogenous variable is defined as the absolute deviation from the mean of consumption growth. Four numbers are reported for each regression: overall number of households; number of households with a portfolio of the kind indicated; estimated effect of the parameter associated with the financial dummy; p-value of being wrong in rejecting the null hypothesis that the parameter is equal to zero (in square brackets). The test is based on the OLS estimator and on White standard errors.

Surveys	ABSOLUTE DEVIATIONS FROM THE MEAN OF:							
	GROWTH RATES				FIRST DIFFERENCES			
	n° of households	n° of cases	β	p-value	n° of households	n° of cases	β	p-value
(i) non stockholders: dummy equals 1 if the household owns government securities but not stocks								
1989-91	1863	322	0.52	[.83]	1863	322	597	[.27]
1991-93	2893	632	0.63	[.71]	2893	632	1300	[.03]
1993-95	3422	697	-1.72	[.15]	3422	697	1292	[.02]
(ii) stockholders: dummy equals 1 if the household owns some stocks								
1989-91	1863	56	5.97	[.29]	1863	56	4690	[.00]
1991-93	2893	95	-3.04	[.37]	2893	95	3443	[.01]
1993-95	3422	126	0.08	[.97]	3422	126	3440	[.00]

One may wonder whether the estimated effect is due mainly not to risky assets, but to other assets in the portfolio. For this reason, we also apply the test to the "non stockholders" dummy, in order to have a benchmark against which to evaluate the genuine contribution of stocks. While the dummy is never significant when the endogenous variable is expressed in terms of growth rates, in the case of first differences the dummy is not significant for the 1989-1991 sample, but becomes significant in the other two samples.

Although this finding is not surprising, given that in the four years 1992-95 the Italian financial markets were occasionally struck by major turbulence that markedly increased interest rate volatility, panel estimates reveal that the significance of the non-stockholder dummy does not survive in a more robust empirical setting. On the contrary, the dynamic estimate confirms that the dispersion of consumption flows across households is significantly affected by stockholding.

The fact that the result does not hold if the change in consumption is expressed in terms of the growth rate may suggest that this effect can be negligible when compared with the size of household consumption. It is important to point out, however, that in fact first differences are more suitable than growth rates for testing the presence of idiosyncratic risks of wealth-holding. Consumption growth rates are first differences downscaled by consumption levels. Since the stockholders dummy identifies wealthier people, who also have higher levels of consumption, growth rates assign lower weights to the units that contain more information for testing the null hypothesis. If it is sensible to suppose that households with lower consumption levels are more likely to be affected by job losses, the same argument also helps explain why the negative effect of a job loss on consumption growth is much more significant when the test is applied to growth rates.

To sum up, in Italy there is some evidence that risky assets can expose the holders to asset-specific shocks that are not perfectly diversified.

7. Conclusions

Italian households seem to be particularly well insured against periods of illness, even if protracted, but they are not able to insure completely against involuntary job losses. The first result is probably linked to the generosity of the public health care system and to the high level

of protection given to sick workers in Italy, rather than to insurance through ex-ante market instruments (i.e. private insurance contracts and financial assets). As regards the exposure of Italian households to unemployment risks, the available results about precautionary savings suggest that an improvement in job market conditions would reduce households' propensity to save and, at the same time, would increase their willingness to invest in riskier assets.

The econometric analysis also reveals that the dispersion of consumption flows across households sometimes appears to be positively correlated with the holding of risky assets: in these cases, financial instruments, rather than helping to smooth consumption over time and across contingencies, seem to convey sector-specific shocks that the holder cannot fully diversify as desired.

Asset-specific risks can be traded away by investing in widely-held market instruments and by holding well-diversified portfolios. Institutional investors play an important role in this respect, because they can help households to channel savings into a wide range of marketable assets, at the same time easing the burden of portfolio management. Electronic trading in securities may also be an effective way of enlarging market participation and favoring asset diversification, provided that risk-averse and prudent retail investors are careful to hedge adequately against financial risks. Our results indeed indicate that the situation of holders of risky assets, and, in particular, that of shareholders, should be depicted as one in which asset-specific risk cannot be fully traded away.

Appendix: data description

Data are taken from the Survey on Household Income and Wealth (SHIW), conducted by the Bank of Italy every two years on a sample of about 8,000 Italian households (see Brandolini and Cannari, 1994). The main information at the household level provided by the survey is the following: socio-demographic indicators; consumption; means of payment; personal income; financial wealth; real estate. Since 1989, the SHIW has included a panel of about 3,000 households. Since the test requires computing the changes in household consumption across two surveys, we can apply the test to three different data-sets: 1989-1991, 1991-93 and 1993-95.

All data refer to (persons in) families whose composition did not change across two successive surveys.

Consumption growth. Consumption growth rate (in percentage points) and consumption flow (in thousands of lire) in the two-year period between two subsequent surveys. Data refer to total non-durable consumption.

Involuntary job loss. The dummy variable is equal to 1 if at least one household component was employed in 1989 [1991, 1993], lost his or her job in 1990 [1992, 1994] or 1991 [1993, 1995], and in 1991 [1993, 1995] was unemployed; 0 if all family components employed in 1989 [1991, 1993] were still employed in 1991 [1993, 1995] or lost their jobs for other reasons (for instance, education or retirement).

Illness. The following question was addressed to all employed persons: "In 1991 [1993, 1995], how many days of work did you miss on account of sickness (excluding pregnancy)?". Four dummy variables were constructed for the head-of-household: the number of days of illness and dummies equal to 1 if the head missed at least 1, 10 or 100 day[s] of work because of sickness.

Financial portfolios. The following question was asked of all interviewees: "Which class of financial wealth did the outstanding stock of financial assets belong to at the end of 1991 [1993]?". The wealth classes are the following (in millions of lire): 0; 0-2; 2-4; 4-8; 8-12; 12-16; 16-24; 24-36; 36-70; 70-140; 140-300; 300-600; 600-1,000; 1,000-2,000; more than

2,000. The types of asset are the following: bank deposits; post office deposits; government securities; other bonds or shares of mutual funds; stocks or non-listed shares of companies; portfolio management services; foreign assets. In the 1995 survey, financial data are more disaggregated (for instance, government securities are divided into Treasury bills, Treasury bonds, Floating rate certificates and other securities). To make the comparison with the other editions of the survey more straightforward, the data for 1995 were grouped into the above categories.

Moving. The dummy is equal to one if the household changed residence between two surveys.

Education level. The dummies PS^h, SS^h and UNI^h are equal to one if at least one household component is, respectively, 5-6 years, 13-14 years or 17-19 years old.

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