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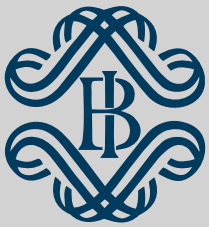
by Luigi Guiso and Tullio Jappelli



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Research Preject on Saving in Italy

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The purpose of the «Temi di discussione» series is to promote the circulation of working papers prepared within the Bank of Italy or presented in Bank seminars by outside economists with the aim of stimulating comments and suggestions.

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Risk Sharing and Precautionary Saving

by Luigi Guiso (*) and Tullio Jappelli (**)

Abstract

The theory of precautionary saving suggests that earnings uncertainty lowers the average propensity to consume but increases the marginal propensity. In this paper we provide a new test of these propositions. We compare the consumption behaviour of households with varying numbers of income earners. If multiple-income households share their income risks, the uncertainty of individual incomes and the need for precautionary saving are attenuated. The data taken from the 1987 Italian Survey of Household Income and Wealth support the theory. Other things being equal households with two income earners have a higher average propensity to consume out of lifetime wealth than households with only one income earner, and a lower marginal propensity to consume. The results suggest that the increase in female labour force participation and in the proportion of multiple income households constitutes a partial explanation for the reduction in saving in the Italian economy in the eighties and for the international variation in saving rates.

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1. Introduction*

The recent theoretical literature has explored the effect of uncertainty on saving and asset accumulation. In principle, precautionary saving may explain discrepancies between the predictions generated by the standard life-cycle model (without uncertainty) and the empirical evidence. For instance, life-span uncertainty may account for the fact that the rate of wealth decumulation after retirement is much slower than predicted by the standard life-cycle model (Davies, 1981; Hurd, 1989); earnings uncertainty may explain the excess sensitivity of consumption to expected income fluctuations (Zeldes, 1989; Caballero, 1990); the interaction between borrowing constraints and earnings uncertainty may explain why consumption tracks income so closely over the individual life-cycle (Deaton, 1991); the increase in social and private insurance arrangements may account for the reduction in private saving rates that took place in the eighties in most industrialized countries (Kotlikoff, 1989; Auerbach and Kotlikoff, 1989).

Simulations run by Zeldes (1989), Skinner (1988) and Caballero (1991) with reference to income risk suggest that precautionary saving may form a large share of total life-cycle saving. At the empirical level, however, very few studies have been devoted to establishing the existence of a precautionary motive for saving and on measuring its magnitude. Moreover, what few available empirical findings are available yield only mixed support for the theory. Friedman (1957) found that households in more risky occupations save more than those in safer occupations, but his finding is not supported by the more recent evidence provided by Skinner (1988).

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Carroll and Samwick (1991) use the history of household incomes in the PSID to construct a proxy for the variance of lifetime earnings and find that earnings uncertainty explains a large part of asset accumulation. Guiso, Jappelli and Terlizzese (1992), using a self-reported measure of uncertainty from the 1989 Italian Survey of Household Income and Wealth, find a positive but weak relation between saving or net worth and the variance of income distribution as perceived by the household.

A common approach of these papers is that they consider the effect of earnings uncertainty on saving treating households as isolated individuals. The intent of the present paper, by contrast, is to provide a test of earnings uncertainty based on the idea that individuals can insure themselves against some of the fluctuations in earnings - as well as other risks - by forming households. As has been shown by Kotlikoff and Spivak (1981) and more recently by Mace (1991) and Cochrane (1991), risk sharing arrangements within the household may go a long way towards substituting for formal insurance markets.

The idea behind our empirical test is to compare the consumption behavior of households with different number of earners. Households with multiple incomes are more easily protected against income shocks than those with sole breadwinner: the formers' need for precautionary saving is lower. Thus, according to the theory of precautionary saving, the saving rate of households with one income recipient should be higher than that of households with multiple earners.

Section 2 summarizes the assumptions required to generate precautionary saving and the conditions under which risk sharing reduces the risk of each income earner in the household. A formal model describing the effect of earnings uncertainty on saving is presented in Appendix I. Section 3 presents the data, which are drawn from the 1987 Italian Survey of Household Income and Wealth, and Section 4 develops the empirical model. The results, presented in Section 5, support the theory of

precautionary saving. Other things being equal, households with two incomes display a higher average propensity to consume (APC) and a lower marginal propensity to consume (MPC) out of lifetime resources than single-income households.

One possible explanation of these findings that cannot be ruled out in principle is that the average propensity to consume of households with two income earners is higher than that of households with one income earner because they spend a larger share of their income on market-produced goods and services. Section 6 furnishes additional evidence to sort out competing explanations for the observed behavior.

In Section 7 we comment on the macroeconomic implications of our results for the understanding of the evolution of the private saving rate, both over time and between countries. In Italy, the dramatic rise in the women's participation rate may well have contributed to the parallel reduction in saving that has taken place over the past two decades. Since the female participation rate varies widely across countries (Graham, 1987; Modigliani, 1990), our findings may also help to explain international differences in saving rates. Section 8 concludes.

2. Risk sharing, uncertainty and saving

The theoretical conditions under which precautionary saving arises in response to uncertainty were originally explored by Leland (1968), Sandmo (1970) and Drèze and Modigliani (1974) using two-period models. Skinner (1988), Zeldes (1989), Kimball (1990) and Caballero (1990) have generalized these early results to multi-period models. The main conclusion of this theoretical literature is that when income risk is uninsurable and utility is time-separable, earnings uncertainty increases saving

and wealth accumulation if the third derivative of the utility function is positive: a sufficient condition is that absolute risk aversion be non-increasing with wealth.

If this condition is met, an increase in income risk implies an increase in precautionary saving. Further, for any given value of the concavity of the utility function, the effect of risk on saving increases with the convexity of the marginal utility. In analogy with the Arrow-Pratt measure of absolute risk aversion, Kimball (1990) has introduced a measure of the strength of precautionary saving, the ratio between the third derivative and the second derivative of the utility function, $p(w) = -v'''(w)/v''(w)$, where v is the second period utility index and w is the household's wealth. For small risks, precautionary saving is proportional to p(w).

The index p(w) is the degree of absolute prudence. Since prudence varies with wealth, precautionary saving can be higher or lower depending on whether prudence is decreasing or increasing with wealth. Kimball (1990) and Weil (1990b) argue that decreasing prudence is a plausible property of utility functions. For instance, proper risk aversion implies decreasing prudence.[1]

Figure 1 summarizes the effect of an increase in income risk on consumption. An increase in risk shifts the consumption function downwards, because a greater amount of lifetime wealth is needed to sustain the same level of consumption. Alternatively, given wealth, current consumption must fall to allow for precautionary saving. If absolute prudence is constant, the consumption function is a linear function of wealth and the shift in consumption is independent of the level of wealth. The broken line indicates that at each level of wealth the ratio of consumption to wealth falls, while the marginal propensity to consume is unaffected.

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[1] A utility function is 'proper' if introducing an additional and independent risk reinforces risk aversion with respect to existing risks (Pratt and Zeckhauser, 1987).

If, however, prudence is a decreasing function of wealth, the precautionary premium, i.e the amount of additional wealth needed to finance the certainty equivalence level of consumption, falls as wealth rises (Kimball, 1990). In this case the consumption function is non-linear in wealth, and an increase in risk shifts the consumption function to the line cc'. As in the previous case the average propensity to consume falls; but with decreasing prudence the marginal propensity to consume increases at each level of wealth. The intuitive reason is that an increase in wealth has two effects: it raises permanent income, and it makes the consumer feel more secure. Both effects stimulate consumption.

Note that with decreasing prudence, a linear approximation to the consumption function - for instance around the point $\bar{w}$ - implies that at high levels of wealth the effect of risk on the APC is positive. This observation will be useful in specifying the empirical model and interpretation the results.

The idea that uncertainty stimulates saving is intuitive, but it proves surprisingly difficult even to test for the existence of precautionary saving, let alone quantify it. The main reason is that the driving variable in precautionary saving, i.e. subjective individual uncertainty about future events, is not observable. Such simulations as Kotlikoff and Spivak (1981), Skinner (1988) and Zeldes (1989) suggest that precautionary saving may be important, but they rely heavily on the parametrization of the income, health or mortality risks.

Time series tests have little power to investigate the amount of precautionary saving. The main problem here is aggregation: precautionary saving may be a response to specific individual risks rather than to aggregate risk; and aggregate measures of risk mainly reflect aggregate uncertainty. Using cross-sectional data, some authors have relied on sample separation rules to test whether the average propensity to consume is lower for some population groups. For instance, Friedman (1957) and

Skinner (1988) test whether farmers and the self-employed - presumably riskier occupations - tend to consume less than individuals in other occupations.

There are three main problems with this type of tests. First, there is no evidence that perceived income uncertainty is actually greater for farmers and the self-employed than for other groups. Second, even assuming that the ordering of income risks is correct, there is a problem of self-selection: if prudence is correlated with risk aversion, and less risk-averse individuals choose the more risky occupations, they may actually consume more than those in safer occupations. Third, the empirical tests do not distinguish between the average and the marginal propensity to consume out wealth. Yet as Figure 1 shows, this distinction is important; with decreasing prudence the effect of risk on the MPC and on the APC takes opposite signs. Failure to distinguish the two effects may bias the results towards accepting the null hypothesis of absence of precautionary saving.

To gauge the potential effect of uncertainty empirically, we propose a new test based on the idea that households with more than one income earner insure part of the risk associated with each individual income. Thus, if the family provides insurance against income risk, the need for precautionary saving is attenuated. It is easy to show that the pooling of different risks reduces the risk of each participant, even if the individual risks are positively correlated.

Given two random variables u_1 and u_2, identically distributed with mean zero, variance σ_u^2 and correlation coefficient ρ, the random variable z, obtained as a linear combination of u_1 and u_2 with weight 1/2, has variance $\sigma_z^2 = \frac{1}{2}(1 + \rho)\,\sigma_u^2$. If $\rho < 1$, then $\sigma_z^2 < \sigma_u^2$.

Households benefit from risk sharing even when the risks are not identically distributed. Suppose that u_1 and u_2 have positive correlation coefficient ρ, but different

variances σ_1^2 and $k^2 \sigma_1^2$ respectively, with $k > 1$. Let z_1 and z_2 be two random variables obtained as a linear combination of u_1 and u_2

$$z_1 = \beta u_1 + (1 - \beta) u_2$$
$$z_2 = (1- \beta) u_1 + \beta u_2.$$

The variance of z_1 is then

$$E(z_1^2) = [\beta^2 + (1 - \beta)^2 k^2 + 2\beta(1- \beta)\rho k] \sigma_1^2 \quad (1)$$

If $\rho < \frac{1}{k}$, the value of β that minimizes $E(z_1^2)$ is

$$\beta = \frac{k(k-\rho)}{1+k(k-2\rho)}, \quad (2)$$

This value of β implies that $E(z_1^2) < \sigma_1^2$ and that $E(z_2^2) < k^2 \sigma_1^2$. Thus, if the value of ρ does not exceed the square root of the ratio between the lowest and the highest variance, there exists a combination of risks such that the transformed individual risk is smaller than the original risk.

This discussion makes it clear that the conditions under which risk sharing is mutually beneficial are quite general, not restricted only to the case of independently and identically distributed risks.[2] The remainder of this paper is given over to describing the data set and an empirical framework that can test whether multiple-earner households do in fact save less than single-income households.

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[2] We do not deal with the problem of determining optimal risk sharing within a household. Anyway, this would be relevant only if the family maximized a function - say, the sum - of individual utilities, and not the utility of the sum of individual consumptions.

3. Data and sample

To implement the test, we use the 1987 Survey of Household Income and Wealth (SHIW), which is a representative survey of the Italian population carried on in the spring of 1988 by the Bank of Italy.[3] To separate the effect of risk from other effects, we restrict the sample in several directions; most importantly, we exclude all but nuclear families (i.e., households consisting of a couple and their children, if any).

Singles are excluded in order to control for economies of scale in consumption. The reason for this becomes apparent if we compare two households, a married couple with both spouses working and a single. Two factors are at work. First, a voluminous literature on equivalence scales has demonstrated that there are substantial economies of scale in the consumption of durables and non-durables. Second, risk sharing within the household may reduce earnings uncertainty. The first factor tends to reduce the APC of the couple with respect to that of the single person, while the second tends to increase it.

Second, we exclude *extended families*, i.e. those with more than two income earners. Apart from the problem of economies of scale, the reasoning here is that it is difficult to determine who is the decision-making unit (or, indeed, units).

Finally, we exclude households in which the *head is older than 55*, the age at which earnings peak, on average. As suggested by Skinner (1988), we do not want to bias the results by neglecting the fact that the elderly are likely to spend down

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[3] The 1987 SHIW is described by Bollino, Cannari and D'Alessio (1989). The survey provides detailed information on labor income, consumption of durables and non-durables, and tangible and financial wealth as well as several demographic characteristics of a random sample of 8,027 households. See Appendix II for details.

accumulated precautionary savings. We also want to isolate the effect of income risk from that of mortality and health risks.

The final sample contains 3,156 couples with or without dependent children. In all cases the head of the household is taken to be the man - hereafter referred to as the 'husband' - and in all cases the man is in the labour force and had labour income of more than 5 million lire in 1987. In 44 percent of the households the woman - hereafter, the 'wife' - is also in the labour force.

The income variable refers to earnings only, for both salaried and self-employed workers. Lifetime resources are computed as the sum of non-human and human wealth. The latter is estimated by discounting the sum of an estimate of expected future earnings over the remaining working life, adjusting for cohort effects (see Appendix III for details). Since non-human wealth is measured at the end of 1987, we subtract from wealth 1987 savings. This measure of wealth differs from initial net worth since savings do not include 1987 capital gains, so that the non-human wealth indicator is only an approximation of beginning-of-period net worth.

As theory suggests, we subtract purchases of durable goods from the definition of consumption. This measure of consumption should also reduce the extent by which our results will be affected by the substitution between market and home production. If the wife elects to work outside the home, the value of time spent in the production of home-produced goods rises (Becker and Ghez, 1975); accordingly, expenditure on goods produced in the market might increase also. As this substitution effect may affect the interpretation of our results, it is treated further in Section 6.

Table 1 reports the sample means of selected variables for the whole sample, and separately for the sample of two-income (1,384 households) and single-income households (1,384 and 1,772 respectively). The ratio of consumption to lifetime wealth is slightly higher in the single-income group. However, the characteristics of

the two groups are different. First, the average number of children in single-income households is twice as high. Second, while the absolute levels of earnings and wealth in single-income households are lower than in two-income households (21.2 million lire versus 33.5 for earnings, and 96.6 versus 127.4 for wealth), the wealth-income ratio is higher (4.56 as against 3.80). Third, single-income households are less well educated, more likely to live in the South and more likely to be headed by a self-employed worker, an operatives and by a labourer. Thus, a proper test of the proposition that two-income households have a higher APC and a lower MPC requires controlling for all relevant factors.

4. The empirical model

We assume that household consumption can be approximated by a linear function of lifetime resources, risk, family size and age.[4] The proxy for risk is a dummy variable F that is assigned the value of 1 if the wife works and 0 if not. To capture the effect of risk on the marginal propensity to consume, the variable F is also

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[4] A closed-form solution for optimal consumption can been obtained only by assuming that the utility function is exponential (see, for instance, Caballero, 1990). Weil (1990a) has generalized this to a class of two-level utility functions with constant elasticity of intertemporal substitution and a constant coefficient of absolute risk aversion. In both cases, the effect of uncertainty is separable and additive with respect to human and non-human wealth. However, constant absolute risk aversion also implies constant absolute prudence. It follows that an increase in income risk lowers APC, but leaves MPC unaffected. Even if the hypothesis that prudence is decreasing in wealth is plausible, utility functions with decreasing prudence do not yield a closed-form solution for optimal consumption when income is uncertain. Thus, several authors suggest linear approximations to the optimal consumption rule under uncertainty (e.g. Skinner, 1988).

interacted with lifetime wealth w. The resulting consumption function for individual i is

$$c_i = \beta_0 + \beta_1 w_i + \beta_2 F_i + \beta_3 F_i w_i + \delta z_i + u_i = \theta' X_i + u_i \quad (3)$$

where c denotes consumption and w lifetime wealth; z is a vector of variables that includes family size, age and age squared of the head of the household; u is an error term. The theory of precautionary saving suggests $\beta_2 > 0$. The hypothesis of decreasing absolute prudence suggests that the effect of risk is a decreasing function of household resources, i.e. $\beta_3 < 0$.

Before turning to the estimation, we must address a problem of endogeneity of the regressors in equation (3). One could assume that the wife's decision to work, and how much to work, is independent from household consumption and estimate equation (3) by ordinary least squares. But in reality the two decisions, i.e. how much to consume and how to allocate time between home and market production, may be taken simultaneously.

If F, the dummy variable for working wife, is indeed endogenous, the ordinary least square estimates of the parameters of equation (3) are inconsistent. To allow for the potential endogeneity of F, we specify the consumption function as a two-regime econometric model with endogenous switching (Lee, 1978). In the first regime, indexed by 1, both husband and wife work.[5] In the second regime, indexed by 0, only the husband works. Consumption in each regime is given by

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[5] Even if we allow the decision to work to be endogenous, lack of data forces us to assume that the number of hours worked by the wife is exogenous with respect to consumption.

$$c_{1i} = \theta' X_i + u_{1i} \qquad \text{if } R_i - R_i^* \geq \varepsilon_i \tag{4}$$

$$c_{0i} = \theta' X_i + u_{0i} \qquad \text{if } R_i - R_i^* < \varepsilon_i \tag{5}$$

where R indicates the real wage of the wife, R* her reservation wage, and u_1, u_0, and ε three stochastic terms.[6] The variable R* is unobservable; however, if R* can be expressed as a linear function of a vector of observable variables W, i.e. if $R_i^* = \lambda' W_i$, we can define the following indicator for the latent variable R*

$$F_i = 1 \qquad \text{if } R_i - \lambda' W_i \geq \varepsilon_i \tag{6}$$

$$F_i = 0 \qquad \text{otherwise.}$$

The endogeneity of F implies that ε is correlated with the errors of the consumption equation. Assuming that the error term ε is normally distributed with zero mean and unit variance and letting ϕ be the density and Φ the cumulative distribution functions of the standard normal evaluated at $\lambda' W$, the expected value of consumption is given by

$$E(c_i) = E(c_i \mid F_i=1)\, P(F_i=1) + E(c_i \mid F_i=0)\, P(F_i=0) =$$

$$= \theta' X_i \Phi + \theta' X_i (1-\Phi) - \Phi \sigma_{1\varepsilon} \frac{\phi}{\Phi} + (1-\Phi) \sigma_{0\varepsilon} \frac{\phi}{1-\Phi} =$$

$$= X_i \theta - \phi (\sigma_{1\varepsilon} - \sigma_{0\varepsilon}), \tag{7}$$

where $\sigma_{1\varepsilon}$ and $\sigma_{0\varepsilon}$ are the covariances between ε and the errors terms of equations (4) and (5), respectively.

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[6] In principle, the coefficients of X in the two regimes are not the same. As indicated in the next section, however, a Wald test that the two are equal cannot be rejected at the 5 percent significance level.

Note that this equation is the same as equation (3) with the addition of the selection term ϕ ($\sigma_{1\varepsilon}$ - $\sigma_{0\varepsilon}$). The estimation proceeds in two steps. In the first step we obtain consistent estimates of the parameters of equation (6) and of the inverse Mill's ratios $\frac{\phi}{\Phi}$ and $\frac{\phi}{1-\Phi}$. Using these terms in equation (7), we obtain consistent estimates of the parameters β_0, β_1, δ and $\sigma_{1\varepsilon}$ - $\sigma_{0\varepsilon}$.

5. Empirical results

Table 2 reports the estimates of the probability of the wife's working (equation 6). We specify the wife's decision to work as a function of demographic characteristics of wives (age, region of residence), proxies of permanent income of husbands (age, education and occupation dummies), and four variables measuring the number and age of children in the household.

The binomial, unconditional estimate is 44 per cent. The conditional probability is a decreasing function of the number and age of children. Wives are also less likely to work if they live in the South and if the husband is self-employed. Since the purpose of the first-stage probit estimation is to provide an instrument for the second stage estimation, the interpretation of the probit coefficients is not essential to the validity of the test of precautionary saving.

The estimated coefficients of the consumption function are displayed in Table 3. To reduce heteroskedasticity, all the variables in equation (7) are divided by lifetime wealth. We impose the restriction that the coefficients of the consumption function are the same in the two regimes ($\delta_1 = \delta_0$), because it is not rejected by a Wald test at the 5 percent level. The order of magnitude of the coefficient of lifetime wealth (0.025) is

consistent with the life-cycle model. Family size positively affects the average propensity to consume, whereas the age coefficients indicate that the ratio of consumption to lifetime wealth is concave in age.

The average propensity to consume of households with two income earners (F=1) is substantially higher than that of single-income households (F=0). The interaction term between F and w is negative and significantly different from zero, so that the effect of risk on consumption depends on the level of total wealth, as implied by decreasing prudence. Evaluated at sample means, the differences between the two APCs and the two MPCs is 0.005 and -0.0024, respectively. If the sample separation rule is indeed correlated with income risk, these results support the theory of precautionary saving.

Since the distribution of wealth is highly skewed, it is preferable to compare APC and MPC at various levels of household resources. The upper panel of Table 4 reports the differences for a number of levels of lifetime wealth. As predicted by the theory, the difference in APC narrows as total resources rise. Although the numbers in Table 4 are small in absolute value, they indicate that at sample mean the effect of risk pooling on the consumption of two-income households is 3.54 million lire, or 10.6 percent of earnings.

One problem with this linear specification is that if prudence is decreasing in wealth, the effect of a reduction in risk on consumption becomes negative at high levels of w. In fact, the estimated effect of a reduction in risk on APC turns negative when w exceeds 2,500 million lire, somewhat more than twice the mean value of lifetime wealth of two-income households.

There are two solutions to this problem. The first is to impose a constraint on the parameters of the consumption function such that the effect of risk is zero for high levels of w. This is equivalent to constraining $\beta_2 + \beta_3 w^* = 0$, where w^* is a given

(arbitrary) value of lifetime wealth. If one chooses a value of w* equal to 3,000 million lire, the constraint cannot be rejected by a Wald test at the one percent level of significance. Under this restriction the difference in APC is similar to the unconstrained case. However, in this case the estimated MPC is constant.

A second approach replaces equation (3) with a specification such APC and MPC differences tend to zero as wealth tends to infinity

$$c_i = \beta_0 + \beta_1 w_i + \beta_2 \exp(-\alpha w_i) + \beta_3 F_i \exp(-\alpha w_i) + \delta z_i + u_i , \qquad (8)$$

where α represents the sensitivity of prudence with respect to wealth. The presence of precautionary saving now implies $\beta_3 > 0$ and $\alpha > 0$ if prudence is decreasing in wealth. Since equation (8) is non-linear in the parameters, we estimate α by a grid search that maximizes the value of the likelihood function.

The estimated coefficients of equation (8) are reported in the third column of Table 3. The coefficient of the interaction term between F and w is positive and highly significant. The estimated value of α is 0.5, and the restriction $\alpha = 0$ is strongly rejected (the likelihood ratio test yields a value of 116). The pattern of the age variable resembles that for the linear specification, while the coefficient of family size is lower.

As shown in the upper panel of Table 4, at the mean value of w the effect of risk on APC is only slightly smaller than in the linear specification. However, in the non-linear specification the APC difference tends to zero as household resources increase. More importantly, the difference in MPC, which was constrained to be constant in the linear specifications, decreases with household resources and tends to zero as these become large. This pattern is consistent with the hypothesis that prudence is decreasing in wealth.

6. Additional issues

Our results are open to the objection that equation (7) implicitly assumes that the marginal utility of consumption does not depend on wives' and husbands' decisions to work or working hours; that is, that in the utility function of the household consumption and leisure are separable goods. But if the two decisions are simultaneous, the variable F may actually be proxying leisure in the utility function, and have little or nothing to do with risk.

A second related issue is that when the real wage rate of the wife rises, so does the value of time spent in non-market activities, e.g. in the production of home-produced goods (Becker and Ghez, 1975). As time at home becomes more costly, purchases of market-produced goods might also increase. The substitution of market-produced goods for home-production has its strongest effects on durables (appliances and cars), but also affects some non-durables, such as housekeeping, laundry and food. If this substitution effect is strong, the findings set forth in the previous section could be attributed to the fact that the APC of two-income households is higher because they have an incentives to substitute market-production for home-production; they could not, accordingly, be regarded as evidence of precautionary saving.

In the present section we attempt to discriminate between these alternative interpretations of our results on the basis of econometric evidence and information on the consumption shares of specific items, such as child care and dining out, that are likely to be substitutes for home production.[7]

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[7] Note, however, that the results would still carry the implication that an increase in the female participation rate reduces the saving rate, albeit through a different channel (see Section 7).

To address the identification problem we add to equation (7) a dummy variable that takes the value of one if both husband and wife are school-teachers employed by the government.[8] Since their earnings are almost perfectly correlated, pooling does not reduce earnings uncertainty, so we can assume that the coefficient of this dummy captures the substitution effect between leisure and consumption. The importance of precautionary saving is then measured as the difference between the dummy F and the dummy for teachers T, i.e. we make the (non-testable) identification assumption that in one group of the sample, school-teachers, there is no risk sharing.

The results are reported in Table 5. The pattern of the coefficients of T is the opposite to that of F, but the coefficients are not very precisely estimated, possibly because the sub-sample counts only 52 couples. In the lower panel of Table 5 we report an estimate of the effect of risk sharing assuming that the coefficients of the additional dummies enables us to identify the effect of leisure on consumption. We subtract the APC of teachers - computed setting F=1 and T=1 in Table 5 - from that of the group in which the wife is in the labour force and at least one of the spouses is not a teacher - i.e. setting F=1 and T=0.

The effect of risk sharing on consumption is substantially lower than that estimated on the basis of Table 3 and reported in the upper panel of Table 5: for instance, at sample means, precautionary saving is now estimated to be 0.87 million lire according to the linear specification (2.7 percent of earnings) and 0.74 million lire (2.2 percent of earnings) according to the non-linear specification.

As far as the substitution between home and market production is concerned, we first note that, in addition to the substitution effect in production, there is also a

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[8] This group in Italy faces virtually negligible uncertainty: in practice, government employees cannot be laid off, and salary depends only on seniority.

substitution effect in consumption that works in the opposite direction, i.e. reducing expenditure in the market. If the wife works, there is less time left for consumption activities, and the demand for market produced goods falls. Becker and Ghez (1975) show that market-consumption will rise only if the substitution effect in production outweighs that in consumption, so the problem may not be serious after all.[9] Furthermore, our measure of consumption excludes expenditures on durables, thus limiting to non-durables the source of ambiguity in the results.

The Becker and Ghez hypothesis suggests that when the opportunity cost of working is high, the wife does not join the labour force. In particular, when there are young children, the wife's time spent at home is relatively valuable. Thus, if the wife works even when young children are present in the family, one would expect a great deal of substitution between home-production and consumption (e.g. in the form of child care services).

We therefore add to equation (7) a dummy variable for the presence of children under 3 years of age, and interact this dummy with F, the variable indicating whether the wife is in the labour force. Under the theory of substitution between home and market production, one would expect a positive coefficient of this interaction term, because having young children and being in the labour force should increase market consumption. However, we find just the opposite.[10] The dummy for young children is negative and not significantly different from zero, the interaction term is negative and significant at the 5 percent level, and all other coefficients have the same signs,

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[9] Carroll and Summers (1989, p. 21-22) discuss the age-consumption profile for a number of countries, concluding that the substitution between consumption and time is not a viable explanation for the association between income and consumption throughout the life-cycle.

[10] For brevity these results are not reported and are available upon request.

magnitude and significance levels.[11] Similar results are obtained when households with either children under 3 years of age or under 6 years of age are excluded from the sample.

Finally, some information is available on the spending items that are most likely to reflect the substitution between time and consumption. The SHIW unfortunately lacks detailed expenditure categories, so we must rely on ISTAT's annual consumer surveyfi, which lacks information on earnings, assets and several demographic characteristics, but contains highly detailed information on spending.[12]

We collect data from 1975 to 1987 on the share of total consumption going to domestic services and laundry and to dining out (see Table 6). Since the survey lacks information on income earners, we break these shares down by family size.[13] The two shares are fairly small and quite stable over time. But over the same time period the women's labour force participation rate rose by 18 percentage points.

While the evidence of this section is anything but conclusive, it indicates that substitution between market and non-market activities and between leisure and consumption cannot be the entire explanation of the difference in APC of households with different number of income earners.

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[11] We choose to test for the effect of children under 3 years of age because Italian law contains several provisions that apply to working women until the child is 3. Repeating the estimation with dummies for children under 6 - school age - or with both dummies does not change the pattern of results.

[12] ISTAT, *Indagine sui consumi delle famiglie*.

[13] It would be most useful to compare the consumption shares of families with one and two income earners, but this information too is lacking. However, as the female participation rate has increased dramatically over the past 10 years, under the theory of substitution between time and consumption one should observe an increase in the consumption of goods that are close substitutes of home-production (for given family size). The numbers in Table 6 do not support this hypothesis.

7. Macroeconomic implications

This section examines the possible relevance of our analysis to the reduction in the private saving rate that has been observed in the Italian economy and to international differences in saving rates.

The slow-down in economic growth from an annual average of 6.2 percent in the late sixties to 2.3 percent in 1981-88 is often cited as the main factor underlying the substantial reduction (more than 5 percentage points) in the Italian private saving rate (see Table 6). However, other factors have also been at work, such as the decline in population growth and the development of credit markets.

We suggest that an additional factor may have been the very rapid increase in the women's participation rate, from 30 to 49 percent in the past decade and a half, while the men's participation rate has held more or less unchanged.[14] In fact, we find that when the increase in the female participation rate is accompanied by a rise in the proportion of multiple-income households, the precautionary component of saving declines.[15] The extent of this reduction depends on the sensitivity of saving to risk, as

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[14] These figures are all the more telling, in that the women's participation was roughly constant from the late fifties to the mid seventies.

[15] A similar point was recently made by Summers and Carroll (1987), who observe that in the United States the increase in two-income households may have reduced income uncertainty and, in turn, precautionary and aggregate saving. In the United States the percentage of married women in the labor force rose from 30.5 in 1960 to 54.6 in 1986. However, data from the 1972 Consumer Expenditure Survey indicate that the APC of married couples is 77.9% for two-income, and 81.2% for single-income households. Thus, Summers and Carroll dismiss the changing composition of households as a viable explanation for the decline in the U.S. saving rate. But the characteristics of the two groups of households are different. Vickery (1979), using the same data set, found that holding other variables constant, households with two-income earners have a higher APC.

well as on the change in family composition. In practice, the share of multiple-earner households has increased by 3 percentage points over the past decade.[16] This implies that our results may possibly account for only a small part of the decline in private saving.

The reduction in saving and the increase in the women's participation have occurred in all industrialized countries, although not at the same time or to the same extent. While demographics, income growth and fiscal policy are usually thought to be the main determinants of the cross-country variation in saving rates, Graham (1987) and Modigliani (1990) have found that other things, there is a strong negative correlation between the labour force participation rate of women and the saving rate. For instance, the Nordic countries, with female participation rates higher than 70 percent, also exhibit relatively low saving rates. In Belgium, Italy and the Netherlands the pattern is just the opposite. The present paper offers one possible explanation for this correlation.

8. Conclusions

Uncertainty over the future is very widely considered to be an important determinants of saving. So far, however, empirical studies have not succeeded in isolating the precautionary motive from the life-cycle and the bequest motives for saving. In this paper we test the theory of precautionary saving in response to earnings

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[16] Given the increase in the female participation rate, the change in the family composition by number of income earners is rather small. Part of the explanation is that over the same period the number of married couples in the labor force declined by 6 percentage points (from 74.5 percent in 1978 to 68.5 percent in 1988).

uncertainty with an approach that differs from those adopted by the previous literature. Theory suggests that risk sharing reduces precautionary saving. Thus, we compare the consumption choices of households with different numbers of income earners.

The empirical results bear out the theoretical predictions. Other things being equal, households with two income earners have an average propensity to consume out of lifetime wealth that is about 0.1 percentage points higher than single-income households; this implies that risk pooling leads to an increase in consumption of roughly 2.5 percent of current earnings. In principle, the substitution between time and consumption and between home and market production may account for the results. However, econometric evidence and data on the share in consumption of items that are likely to be close substitutes for home production fail to support this hypothesis.

If an increase in the female participation rate reduces precautionary saving, our results could explain a small part of the reduction in the overall saving rate experienced by the Italian economy. And as the rise in women's labour force participation and the decline in saving have been observed virtually throughout the industrialized world, these findings may be relevant to an explanation of international disparities in saving.

More generally, this paper suggests that precautionary saving is a phenomenon worth studying, and that households may respond to other, and perhaps more important, risks. It is possible that changes in other sources of uncertainty may have contributed to the fall in the saving rate in Italy. In particular if, as seems likely, the shift from the turbulent seventies to the more stable eighties has brought a reduction in individual uncertainty, then precautionary saving may have declined. Plausible as this conjecture is, it is impossible at the moment to support it with direct evidence.

Appendix I
The effect of income risk on average and marginal propensity to consume

To see how uncertainty about future income affects average and marginal propensity to consume, we consider a two-period model. Future income is uncertain, and given by $\tilde{y} = \bar{y} + \varepsilon$, where ε is a random variable with zero mean and finite variance. Current income $\bar{y}$ is certain, and equal to the expected value of future income. There is no insurance market for income risk. Denoting by c and c_1 consumption in the two periods, the individual solves the following problem

$$\max \quad u(c) + \frac{1}{1+\sigma} E\, v(c_1) \tag{A1}$$

$$\text{subject to} \quad c + s = \bar{y}$$

$$c_1 = (1 + r)\, s + \tilde{y}$$

where u(.) and v(.) are indexes of current and future utilities, s is saving, δ the rate of time preference, and r the real rate of interest. To isolate the effect of uncertainty from the incentive to save induced by the difference between r and δ, we assume that $r = \delta = 0$. It follows that $c_1 = 2\ \bar{y} + \varepsilon - c$. If u(.) and v(.) are continuous and concave in each of their arguments, the necessary and sufficient condition for a maximum is

$$u'(c) = E\, v'(w - c + \varepsilon) \tag{A2}$$

where $w = 2\bar{y}$ is the expected value of human wealth. It is useful to compare (A2) with the certainty case. Letting $\bar{c}$ be the value of c that solves (A2) when $\varepsilon = 0$, the first order condition is:

$$u'(\bar{c}) = v'(w - \bar{c}) \tag{A3}$$

Under certainty, saving is equal to $\bar{s} = \bar{y} - \bar{c}$. If u(c) = v(c), the optimal solution is to consume in each period half of total resources. Thus, $\bar{c} = w/2 = \bar{y}$, and $\bar{s} = 0$.

Consider now the case of uncertainty. If v' is convex, i.e. if - v' is concave, then, for any given c, $Ev'(w - c + \varepsilon) > v'(w - c)$. It follows that $E\, v'(w - \bar{c} + \varepsilon) >$

$v'(w - \bar{c}) = u'(\bar{c})$. Let c^* be the value of c that solves equation (A2). From the concavity of u and v, it follows that $c^* < \bar{c}$. An increase in risk reduces first-period consumption if the marginal utility is convex. The difference $\bar{c} - c^*$ represents precautionary saving.

Kimball (1990) defines absolute prudence as $p(w) = -\frac{v'''(w)}{v''(w)}$. For given risk, the higher p(w), the greater the amount of precautionary saving. The condition $p(w) > 0$ is satisfied by all utility functions that exhibit constant or decreasing absolute risk aversion. In such functions an increase in risk reduces utility and the APC. If absolute prudence decreases with wealth, i.e. if $p'(w) < 0$, an increase in risk raises the MPC, at each level of consumption. If prudence increases with wealth, the opposite holds. With constant prudence, an increase in risk leaves the MPC unchanged.

This proposition can be proved in the following way. Let us define the precautionary premium π as the additional amount of wealth that generates the same level of consumption that the consumer would choose under certainty. Thus, the precautionary premium is implicitly defined by

$$E\, v'(w - \bar{c} + \varepsilon + \pi(w - \bar{c}, \varepsilon)) = v'(w - \bar{c}) \tag{A4}$$

For small risks, expanding the first term of (A4) around $\varepsilon = 0$ and $\pi = 0$, and neglecting terms beyond the second order, one obtains

$$\pi(w - \bar{c}, \varepsilon) = \frac{p(w)\sigma_\varepsilon^2}{2} \tag{A5}$$

The precautionary premium is proportional to the variance of income. If $p'(w) < 0$, the effect of risk on π increases with wealth. Define now the consumption function $c = c(w, \varepsilon)$ as the value of c that solves equation (A2), and the inverse of the consumption function $w = w(c, \varepsilon)$ as the level of wealth that is necessary to sustain a given level of consumption. Using the definition of precautionary premium (A5), we get

$$w(c, \varepsilon) = w(c, 0) + \pi\,[w(c, 0) - c, \varepsilon] \tag{A6}$$

Taking the partial derivative of (A6) with respect to c, we obtain

$$\frac{\partial w(c,\varepsilon)}{\partial c} - \frac{\partial w(c,0)}{\partial c} = \frac{\partial \pi}{\partial w}\left(\frac{\partial w(c,0)}{\partial c} - 1\right) \qquad \text{(A7)}$$

The term on the left-hand-side of equation (A7) is the difference between the inverse of MPC in the presence of risk, and the inverse of MPC in the absence of risk. Since $\frac{\partial w}{\partial c} > 1$, the sign of the left-hand-side depends on the sign of $\frac{\partial \pi}{\partial w}$. This term will be negative if absolute prudence decreases with wealth. In this case, for any level of consumption, $\frac{\partial c(w,\varepsilon)}{\partial w} - \frac{\partial c(w,0)}{\partial w} < 0$.

Appendix II
The 1987 Survey of Household Income and Wealth (SHIW)

The 1987 SHIW covered 8,027 households. The sample chosen by a two-stage stratified procedure (towns and households) was representative of the Italian population. Probability selection was enforced at all stages of sampling. Interviews were done in person, by visiting the residence of the household. The unit of observation is the family, i.e. all persons residing together in the same dwelling who are related by blood, marriage or adoption; individuals with companions or other common-law relationships are treated as families. Families also include one-person units.

The survey was conducted in January and February 1988. Balance sheet items are reported as of December 31, 1987, while income is reported for the previous calendar year. Detailed information about the 1987 SHIW can be found in Bollino, Cannari and D'Alessio (1989). The tape, questionnaire, reference material and description is available upon request from: Research Department, Bank of Italy, Via Nazionale 91, 00186 Rome, Italy.

Definition of variables

HEAD OF THE HOUSEHOLD The head is always the male, who in all cases is in the labour force.

HOUSEHOLD SIZE Total number of persons in the family: head, spouse (including common-law wives), children, other relatives, and non-relatives living in the household. Households with income earners other than the head and the spouse are excluded.

EDUCATION OF THE HOUSEHOLD HEAD AND OF THE SPOUSE Response: (5) no education; (6) completed elementary school (5 years); (7) completed junior high school (8 years); (8) completed high school (13 years); (9) completed university degree (17 to 19 years); (0) post-graduate education (more than 20 years of education). The variable has been coded according to the values given in parenthesis. For the highest class we assume a value of 20 years of education.

OCCUPATION OF THE HOUSEHOLD HEAD AND OF THE SPOUSE Responses: (1) operative or labourer; (2) and (3) clerical and precision craft; (4), (5) and (6) professional, manager and entrepreneur; (7) self-employed.

SECTOR OF OCCUPATION OF THE HOUSEHOLD HEAD AND OF THE SPOUSE Responses: (1) agricultural; (2) and (3) industry; (4) public sector; (5), (6) and (7) services.

RESIDENCE OF THE HOUSEHOLD. Responses: North or Centre (Piemonte, Valle D'Aosta, Liguria, Lombardia, Trentino, Friuli, Veneto, Emilia-Romagna, Marche, Umbria, Toscana, Lazio); South (Abruzzi, Molise, Campania, Basilicata, Puglia, Calabria, Sicilia, Sardegna).

CONSUMPTION OF HOUSEHOLD Sum of expenditures on non-durable consumption items (food consumption, entertainment, education, clothes, medical expenses, housing repairs and additions) in 1987. Durable consumption (vehicles, furniture and appliances, art objects) is not included in the definition of consumption.

EARNINGS OF THE HOUSEHOLD HEAD AND OF THE SPOUSE Question: How much did you earn from your labour activity net of all taxes and contributions in 1987 ? This question is asked of each member of the household, whether employed or self-employed. Household earnings are defined as the sum of net of taxes earnings of the household head and the spouse.

HOUSEHOLD NET WORTH Sum of household's liquid assets (checking accounts, savings accounts, money market accounts, certificates of deposit), financial assets (stocks, government and other bonds), property and business assets, net of liabilities (debt owed on credit cards, on car loans, other forms of consumer debt, and mortgages on houses, properties and additions). The variable is measured at the end of 1987.

HOUSEHOLD LIFETIME WEALTH Sum of human wealth and household net worth. The former is the discounted value of the sum of the head's and spouse's earnings projected until retirement, and is described in Appendix III.

Appendix III
The construction of human wealth

To compute human wealth we proceed as follows. Denote by $Y(\tau,j)$ the earnings of a household member j of age τ. In the sample j is either the husband or the wife, if employed. We assume that individual earnings can be expressed as a function of a vector z of individual characteristics (education, occupation, sector, regional location and family size), a quadratic function of age $\phi(\tau)$ and a normally distributed disturbance u

$$Y(\tau,j) = Z\beta + \phi(\tau) + u$$

Normal earnings, not adjusted for cohort effects, are then defined as

$$Y_p(\tau,j) = Z\hat{\beta} + \hat{\phi}(\tau) + 0.5\,\hat{u}$$

where the hats denote the estimated coefficients from a Generalized Least Squares regression, using as weights the residuals from a first-stage OLS regression. The earnings function estimates are reported in Tables A1 and A2 for husbands and wives, respectively.

Human wealth of individual j of age τ_0 is then computed as

$$H(\tau_0,j) = \sum_{k=1}^{R_j-\tau_o} \left[Y_p(\tau_0+k, j) \right] \left(\frac{1+n}{1+r}\right)^k$$

where $Y_p(\tau_0+k, j)$ is the projected value of normal earnings from the previous equation, R_j is the retirement age of member j and n and r represent, respectively, the rate of growth of productivity and the rate of interest. Retirement age is assumed to be 65 for husbands and 55 for wives; the rate of interest is assumed to be equal to the rate of productivity growth.

Figure 1

The effect of income risk on the average and marginal propensity to consume

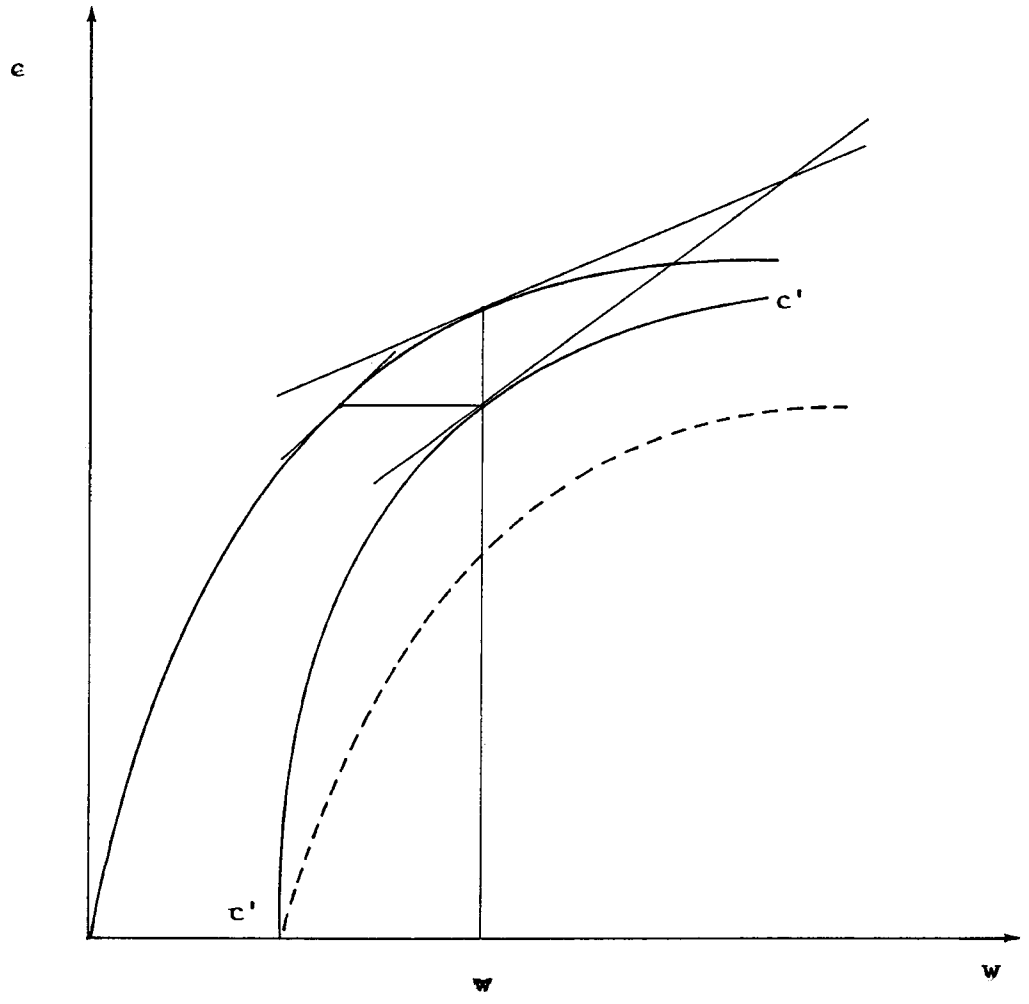

Table 1

Sample means for selected variables

Husbands' characteristics	Total sample	Two-income households	Single income households
Proportion working	1.0	1.0	1.0
Earnings	20.8	20.4	21.2
Age	40.40	40.07	40.70
Years of education	10.70	11.87	9.70
Occupation:			
Operative or labourer	0.34	0.28	0.39
Clerical or precision craft	0.34	0.43	0.27
Professional, manager or self-employed	0.04	0.05	0.04
Self-employed	0.26	0.22	0.30
Employed in:			
Agriculture	0.04	0.03	0.05
Industry	0.33	0.29	0.36
Services	0.33	0.31	0.34
Public sector	0.30	0.37	0.25
Wives' characteristics			
Proportion working	0.44	1.00	0.00
Earnings of those working	-.-	13.05	-.-
Age	36.80	36.90	36.37
Years of education of those working	-.-	11.87	-.-
Occupation			
Operative or labourer	0.12	0.28	0.00
Clerical or precision craft	0.25	0.57	0.00
Professional, manager or entrepreneur	0.02	0.05	0.00
Self-employed	0.04	0.10	0.00
Employed in:			
Agriculture	0.02	0.04	0.00
Industry	0.07	0.17	0.00
Services	0.12	0.27	0.00
Public sector	0.23	0.52	0.00

continued

Table 1 - continued

Households' characteristics	Total sample	Two-income households	Single income households
Living in the North or Centre	0.58	0.70	0.49
Living in the South	0.42	0.30	0.51
Number of children	2.13	1.40	2.71
Earnings, consumption, and wealth [a]			
Consumption	21.6	24.8	19.1
Earnings	26.6	33.5	21.2
Non-human wealth	112.2	127.4	96.6
Human wealth	734.4	897.8	623.5
Lifetime wealth	855.6	1,025.3	723.1
Non-human wealth/earnings	4.22	3.80	4.56
Consumption/earnings	0.81	0.74	0.90
Consumption/lifetime wealth	0.025	0.024	0.026
Observations	3,156	1,384	1,772

a. Consumption, earnings and wealth are expressed in millions of 1987 lire.

Table 2

Probit estimates: probability of wife working

Variable [a]	Estimated coefficient	t-value	Variable mean
Age of wife	0.167	3.95	36.8
Age of wife squared	-0.002	-3.46	1411.80
Years of education of husband	0.088	3.23	10.70
Years of education of husband squared	-0.002	-1.42	135.60
Age of husband	-0.024	-0.51	40.40
Age of husband squared	0.1E-3	0.174	1,689.40
Occupation of husband:			
Operative or labourer	0.135	2.02	0.34
Clerical or precision craft	0.266	4.24	0.34
Professional, manager or entrepreneur	-0.037	-0.30	0.04
Husband employed in:			
Agriculture	-0.132	-0.99	0.39
Industry	-0.182	-2.89	0.33
Services	-0.157	-2.56	0.33
Number of children	-0.162	-4.49	1.58
Number of children less than 3 years old	-0.001	-0.16	0.43
Number of children less than 6 years old	-0.136	-0.18	0.21
Average age of children	-0.006	-0.11	6.90
North or Centre	0.426	8.51	0.58
Constant	-3.500	-5.24	1.00
Number of wives working	1,384		
Sample size	3,156		
Likelihood at binomial	-2,163.7		
Final likelihood	-1,967.4		
Likelihood ratio test			

a. Dependent variable = 1 if the wife is employed, 0 otherwise. Excluded dummies are: self-employed, public sector, South.

Table 3

Generalized Tobit Estimates. Dependent variable: ratio of consumption of non-durables to lifetime wealth.

	Linear effect of risk		Non-linear effect of risk [b]	
Variable [a]	Estimated coefficient	t-value	Estimated coefficient	t-value
Lifetime wealth (w)	0.025	31.60	0.019	34.57
F	6.040	17.67		
F*w	-0.24E-2	2.03		
exp(-αw)			-145.240	-19.41
F*exp(-αw)			103.661	22.71
Family size	0.390	4.32	0.210	2.55
Age of husband	0.854	6.42	0.704	5.47
Age of husband squared	-0.003	-1.77	-0.001	-0.62
Constant	-31.771	-11.16	-17.386	-6.17
Selection term	-0.004	-6.04	-0.004	-13.91
Mean of dependent variable	0.029		0.029	
Corrected R^2	0.638		0.655	
Standard error	0.008		0.008	
Number of observations (n)	3,156		3,156	
F(k; n-k)	793.6		856.2	

a. All variables are divided by lifetime wealth.

b. The value of α that maximizes the likelihood function is 0.5.

Table 4

Effect of risk on average and marginal propensity to consume out of lifetime wealth

A. Effects computed on the basis of the coefficients of Table 3

	$APC_{F=1} - APC_{F=0}$		$MPC_{F=1} - MPC_{F=0}$	
Lifetime wealth [a]	Linear specification	Non-linear specification	Linear specification	Non-linear specification
200	0.0270	0.0367	-0.0024	-0.0180
300	0.0180	0.0200	-0.0024	-0.0100
400	0.0130	0.0130	-0.0024	-0.0070
500	0.0100	0.0093	-0.0024	-0.0050
700	0.0060	0.0056	-0.0024	-0.0030
850	0.0047	0.0042	-0.0024	-0.0021
1,000	0.0040	0.0033	-0.0024	-0.0020
1,500	0.0016	0.0018	-0.0024	-0.0010
3,000	-0.0003	0.0006	-0.0024	-0.0003

B. Effects computed on the basis of the coefficients of Table 5

	$APC_{F=1,T=0} - APC_{F=1,T=1}$		$MPC_{F=1,T=0} - MPC_{F=1,T=1}$	
Lifetime wealth [a]	Linear specification	Non-linear specification	Linear specification	Non-linear specification
200	0.0100	0.0084	-0.0014	-0.0040
300	0.0060	0.0046	-0.0014	-0.0020
400	0.0040	0.0030	-0.0014	-0.0015
500	0.0030	0.0021	-0.0014	-0.0011
700	0.0020	0.0013	-0.0014	-0.0007
850	0.0013	0.0009	-0.0014	-0.0005
1,000	0.0010	0.0008	-0.0014	-0.0004
1,500	0.0001	0.0004	-0.0014	-0.0002
3,000	-0.0006	0.0001	-0.0014	-0.0001

a. In millions of lire.

Table 5

Generalized Tobit Estimates. Dependent variable: ratio of consumption of non-durables to lifetime wealth.
(with dummies for teachers [a])

	Linear effect of risk		Non-linear effect of risk [c]	
Variable [b]	Estimated coefficient	t-value	Estimated coefficient	t-value
Lifetime wealth (w)	0.025	31.43	0.019	34.59
F	6.060	17.69		
F*w	-0.24E-2	-2.01		
exp(-αw)			-145.787	-19.44
F*exp(-αw)			104.040	22.73
Teachers	-2.306	-1.50		
Teachers*w	0.14E2	0.95		
Teachers*exp(-αw)			-23.69	-1.37
Family size	0.393	4.34	0.211	2.56
Age of husband	0.853	6.40	0.706	5.49
Age of husband squared	-0.003	-1.76	-0.001	-0.63
Constant	-31.775	-11.16	-17.422	-6.19
Selection term	-0.004	-5.97	-0.004	-13.88
Mean of dependent variable	0.029		0.029	
Corrected R^2	0.637		0.655	
Standard error	0.008		0.008	
Number of observations (n)	3,156		3,156	
F(k; n-k)	617.1		749.4	

a. The dummy 'Teachers' is 1 if both husband and wife are school or university teachers, 0 otherwise.
b. All variables are divided by lifetime wealth.
c. The value of α that maximizes the likelihood function is 0.5 in both equations.

Table 6

Saving, growth, labour force participation and share in consumption of selected expenditure categories, 1966-88. [a]

	66-70	71-75	76-80	81-85	86-88
Share of consumption expenditure on					
Domestic services and laundry					
2 members	-.-	1.6 [b, c]	1.4 [c]	1.3	1.1[d]
4 members	-.-	1.3 [b, c]	1.2 [c]	1.3	0.9[d]
Dining out					
2 members	-.-	4.8 [b, c]	4.7 [c]	4.8	4.5[d]
4 members	-.-	4.2 [b, c]	4.1 [c]	4.5	4.1[d]
Net private saving rate	17.1	15.2	12.9	9.6	11.9
Rate of growth of national income	6.2	3.1	4.3	1.8	3.1
Labour force participation rate between age 20 and 59					
Men	91.2	90.2	90.8	89.8	88.3
Women	30.0	31.2	39.4	44.8	49.0
Married men	-.-	-.-	-.-	94.0	93.3
Married women	-.-	-.-	-.-	39.2	43.0
Percentage of households with					
One income earner	-.-	-.-	61.0[e]	59.9	58.7[d]
Two income earners	-.-	-.-	32.0[e]	33.3	34.4[e]
More than two income earners	-.-	-.-	7.0	6.8	6.9

a. Consumption shares: *Indagine sui consumi delle famiglie*, ISTAT, various years. Rate of growth of national income and net private saving rate, adjusted for inflation and including net investment in durables: Pagliano and Rossi (1992). Labour force participation rate: ISTAT, *Annuario di Statistiche del Lavoro, Indagine sulle forze di lavoro* and *Bollettino Mensile di Statistica.* Households by income recipients: *Annuario delle Forze di Lavoro* (from 1978 to 1981) and ISTAT (from 1982 to 1987).
b. 1975.
c. 4 and 5 members.
d. 1986-87.
e. 1978-80.

Table A1

Generalized Least Squares estimates.
Dependent Variable: Earnings of husband [a]

Variable	Estimated coefficient	t-value	Variable mean
Years of education	1.486	6.89	10.47
Years of education squared	-0.014	-1.65	132.99
Age	0.685	3.71	44.11
Age squared	-0.005	-2.58	2,041.90
Occupation of husbands:			
Operative or labourer	-11.858	-20.88	0.33
Clerical or precision craft	-12.291	-22.31	0.30
Professional, manager or entrepreneur	1.056	1.03	0.05
Husband employed in:			
Agriculture	-2.493	-2.51	0.06
Industry	3.919	6.98	0.34
Services	2.387	4.32	0.32
Family size	0.125	0.68	3.60
North or Centre	1.540	3.56	0.61
Constant	-5.682	-1.39	1.00
Adjusted R^2	0.277		
Observations	5,122		
Dependent variable mean	23.100		

a. The dependent variable is expressed in millions of 1987 lire. Excluded dummies are: self-employed, employed in the public sector, South.

Table A2

Generalized Least Squares estimates.
Dependent Variable: Earnings of wife [a]

Variable	Estimated coefficient	t-value	Variable mean
Years of education	0.566	3.47	10.99
Years of education squared	-0.004	-0.62	141.95
Age	0.536	3.70	39.42
Age squared	-0.005	-2.89	1631.70
Occupation of wives:			
Operative or labourer	-3.919	-7.86	0.32
Clerical or precision craft	-2.273	-4.61	0.54
Professional, manager or entrepreneur	3.836	2.11	0.07
Wife employed in:			
Agriculture	-3.161	-3.87	0.04
Industry	1.634	3.72	0.17
Services	1.574	4.21	0.27
Family size	-0.317	2.06	3.54
North or Centre	0.892	2.67	0.71
Constant	-2.318	-0.79	1.00
Adjusted R^2	0.193		
Observations	1,912		
Dependent variable mean	13.779		

a. The dependent variable is expressed in millions of 1987 lire. Excluded dummies are: self-employed, employed in the public sector, South.

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