Temperance in French household portfolios*

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Abstract

Using French survey data, we explore empirically whether earnings uncertainty and borrowing constraints decrease households' demand for risky assets, consistent with theoretical predictions. A major empirical problem is the potential endogeneity bias of income risk, as more risk averse households may simultaneously choose safer occupations and invest less in risky assets. Even if we control for households' risk preferences, we find that households respond by increasing their stockholdings in response to earnings uncertainty but not to liquidity constraints.

Keywords: Portfolio choice, background risk, risk aversion, temperance

JEL-classification: C33, C35, D12, D91

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1. Introduction

Important puzzles have been identified in the economics and finance literatures when confronting theoretical predictions with real data: *equity premium*, *non-participation*, *home bias*... Studies using micro-data have proved useful in improving our understanding of them (Guiso *et al.*, 2003). In this paper, exploiting a cross-section of French households, we explore empirically whether earnings uncertainty and borrowing constraints crowd households out from the stock market, consistent with theoretical predictions.

So far, the empirical evidence is mixed. Guiso *et al.* (1996) for Italy, Massa and Simonov (2006) for Sweden or Haliassos and Bertaut (1995) and Vissing-Jorgensen (2002) for the US provide evidence consistent with theoretical predictions, while Alessie *et al.* (2002) for The Netherlands or Arrondel and Masson (2003) for France, do not. An important issue is how to measure income risk and the extent to which it is exogenous (e.g. Lusardi, 1997), as more risk averse households may simultaneously prefer to work in safer occupations and hold less risky portfolios. Here, we follow Guiso *et al.* (1996) in using a comparable self-assessed measure of five years ahead earnings uncertainty, while we introduce the measure of aversion to gamble on lifetime earnings from Barsky *et al.* (1997) to control for its potential selectivity bias.

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2. Portfolio choice and background risk

The classical theory of portfolio choice was developed in a complete markets framework, meaning that all individual risks could be traded. The observation that severe informational restrictions precluded most households from insuring their labor earnings, and yet, was their most important source of lifetime income, motivated the reconsideration of the complete markets assumption (Drèze and Modigliani, 1972).

A theoretical extension to incomplete markets of the static portfolio choice model has formalized the following common wisdom intuition: when risk averse households are confronted with a risk beyond their control or 'background' risk, they should decrease their exposure to avoidable risks in order to adjust their desired total risk exposure (e.g. Kimball, 1993). Households observing this behavior are called *temperant*[1]. Accordingly, those who suffer more from uninsurable earnings risk should choose to be less exposed to financial risk, *ceteris paribus*. Also, since income risk entails an uncertain (future) liquidity requirement, currently (or expected to be) liquidity constrained households should hold even safer portfolios, further away from the optimal financial risk exposure with just uninsurable earnings[2].

The theoretical predictions can be summarized by the following reduced form equation for the share (A/F) of risky assets ($A \geq 0$) in total financial wealth (F):

$$\frac{A}{F} = \mathrm{g}(\sigma_{\mathrm{y}}^2, cl, \gamma, \mathbf{X}) \qquad (1)$$

Where cl is the expected probability of being liquidity constrained, σ_y^2 is the self-assessed earnings variance, γ is the coefficient of relative risk aversion and $\mathbf{X}$ is a vector of covariates that include demographics to proxy for heterogeneity in tastes (marital status, family size, gender, urban/rural residence), household income and wealth as measures of the initial endowment and variables chosen according to the theory, e.g. transaction/information costs lead to incomplete portfolios (King and Leape, 1998), that will in turn be determined by the stock of financial information (proxied by age, education and parents' wealth composition).

3. Empirical analysis

[1] Strictly speaking, Eeckhoudt and Schlesinger (2006, p. 283) define temperance as a preference for separation of two independent zero-mean background risks, rather than the bundling of both.
[2] See Gollier's ch. 18 (2001).

We rely here on the "Patrimoine 98" wealth survey conducted by the French National Institute of Statistics (INSEE) on a nationally representative sample of 10,207 households, for whom detailed information on earnings, income, wealth and socio-demographic characteristics is available. A part of the questionnaire tries to give us a general idea of individuals' degree of exposure and aversion to risk, as subjectively perceived and assessed by them. Only 4,633 individuals (corresponding to 2,954 households) answered to these questions. Table 1 reports averages of earnings, wealth and demographic characteristics for the total sample and for our selected sample.

(Table 1 about here)

The amount of risky assets held (A) in equation (1) is defined by (i) the sum of stocks of privatized public companies, listed shares of private companies and stocks of foreign firms (*direct stockholdings*), and by (ii) those held through mutual funds and managed investment accounts (*indirect stockholdings*). We exclude bonds from the risky asset category, as well as homeownership[3]. 20.5% of the sampled households are direct stockholders, while 30% hold risky assets either directly or indirectly.

To construct a proxy for the subjective variance of household income, we asked each income recipient to attribute probability weights (100 points) to given intervals of real income increases 5 years ahead of the interview[4]. The mean of the standard error of anticipated income shocks[5] (between 4.3% and 4.9% of current earnings) is of an order of magnitude similar to the estimates reported by Guiso *et al.* (1996), but surprisingly low when compared to panel data estimates[6].

To obtain a measure of risk aversion, we asked individuals about their willingness to gamble on lifetime income, as in Barsky *et al.* (1997). The outcome is a range measure (in four brackets) for the relative risk aversion coefficient (γ) under the assumption that

[3] Arrondel and Masson (2003) argue that homeownership status in France is better explained by the flow of services it provides, rather than by the expectation of an investment return.

[4] The sample average of expected income growth (around 1.5%) is roughly consistent with French time series evidence for the preceding period (around 1.8% for 1990-96).

[5] Assuming that five years ahead expected real income is $y_{t+5} = y_t(1+g)$, the formula of the anticipated variance of household income is $var(y_{t+5}) \equiv \sigma_y^2 = \sigma_g^2 y_t^2$, where y_t is current real income, g is the expected growth rate of real income and σ_g^2 its variance. The frequency distribution for the normalized standard deviation σ_y/y_t shows that 41% of the households hold point expectations. Only 8% display a ratio above 15% of current earnings.

[6] The gap between both is commonly explained by overestimation of true 'uncertainty' in econometric regressions, neglected within interval variation, underreporting of the probability of very low income events and/or measurement error in survey responses. See Guiso *et al.* (1996) or Lusardi (1997) for details, and Dominitz (2001) for a reassessment.

preferences are strictly risk averse and of the CRRA type[7]. Controlling for demographic and economic factors, those who are more risk tolerant are also more willing to take risk in financial decisions and more likely to become self-employed (excluding farmers).

Finally, to capture households' ability to gain access to credit markets, two questions in the survey identify both 'discouraging borrowers' and 'turned down applicants'. The variable that proxies for liquidity constraints takes value one if households qualified themselves in either category. 346 of the 2954 surveyed households are liquidity constrained (11,7%).

4. Econometric results

To estimate the demand for risky assets as in model (1), a two-stage decision process is assumed. Households choose first whether or not to hold risky assets (a *Probit* model is used) and then they decide how to allocate total financial wealth between safe and risky assets. The latter stage estimates the conditional demand (of the share) of risky assets, introducing the inverse Mills ratio to correct for the selectivity bias. Economic theory predicts that different sets of explanatory variables explain the different stages, e.g. King and Leape (1998) argue that information costs explain essentially the decision to enter the stock market. Accordingly we introduce education and the presence of risky assets in parents' wealth only in the *Probit* model, while past gains and/or losses in the stock exchange and a proxy for the quality of portfolio management have been introduced only in the conditional demand equation.

(*Table 2 about here*)

Columns 1 and 2 of Table 2 report the two-step estimation results for the narrowest definition of risky assets (*direct stockholdings*). Stock of information variables increase the probability of risky asset ownership: Households whose parents owned stocks are about 10.6 percentage points more likely to hold stocks directly. A second-order polynomial in age confirms that the probability of stockownership attains its minimum for young households, increasing through the life cycle to reach a maximum at the age of 46.

Income and net worth induce stock market participation, consistent with the presence of fixed transaction costs (Vissing-Jorgensen, 2002) and/or risk preferences decreasing in wealth (DARA). Households who expect to be liquidity constrained are less likely to invest in risky assets[8]. Moving a household from the 10th to the 90th percentile of probability to be deterred

[7] Out of the 3,483 respondents, 43.1% are very risk averse ($\gamma \geq 3.76$) and 39.4% are highly so ($2 \leq \gamma < 3.76$). 11.2% display moderate aversion ($1 \leq \gamma < 2$) while only 6.3% qualified as low risk averse ($\gamma < 1$). Chiappori and Paiella (2006) confirm that relative risk aversion is constant.

[8] To avoid endogeneity issues, we included the predicted probability of being liquidity constrained.

from applying for credit in the future reduces the probability of stockownership by 7,6 percentage points.

The conditional asset demand equation (Table 2, column 2) is mainly explained by large Stock Exchange gains in the past and entrust of financial advisors in portfolio management.

Contrary to economic theory predictions, the coefficient of the expected variance of income in the *Probit* equation is positive and significantly different from 0 at the 5-percent level[9]. Households who anticipate lower earnings risk invest less in risky assets: those who reported no risk on earnings were about 5.5 percentage points less likely to hold stocks directly than those in the highest earnings risk decile, *ceteris paribus.* When we estimate a simple *Tobit* model for the share of risky assets, the results below column 3 of Table 2 confirm that the coefficient of income variance is always positive[10].

Since only a small fraction of households report positive amounts of risky assets, we have also explored the sensitivity of the results to a broader definition of risky assets (*direct or indirect stockholding*) for both the two-step and *Tobit* estimation (Table 2, columns 4 and 5, and 6, respectively). For most variables, the estimates are similar to those obtained with the narrow definition. When we restrict the sample to households with an active head, households who have no risk on their earnings were about 12.2 percentage points less likely to hold stocks directly than those in the highest earnings risk decile.

To control for households who, valuing job security, may have self-selected into safer jobs we: (i) have introduced individual measures of aversion to gamble on life time earnings. The positive and significant effect of income risk on either definition of stockholdings remains[11]. (ii) We instrumented the earnings variance by a qualitative variable capturing the frequency and severity of financial distress at home while young. We also included in the instrument set the own subjective probability of unemployment, past own health problems and own subjective transition probability to self-employment as well as different proxies for social status and portfolio composition of the household head's parents.

(Table 3 about here)

Following Wooldridge (2002), we first tested the exogeneity of the earnings variance in the discrete choice equation by 2SLS. Given that we could not reject the null, we tested exogeneity in the conditional demand equation under the null in the participation equation.

[9] On conditional demands we find a non-significant negative effect of income risk.

[10] As *Tobit* estimation constrains both the stock market entry decision and the conditional demand to depend on the same set of variables, *Tobit* results are reported for comparison purposes with Guiso *et al.* (1996).

[11] The coefficients have the expected signs in the participation equation, but the estimates only distinguish great risk averters (CRRA≥3.76) from the rest. Households in the first group were, *ceteris paribus*, about 6.7 percentage points less likely to hold stocks than those in the group of low risk averters.

Although the predicted power of the first stage regression is low (the F statistic is only slightly above 2), the t-statistics in the demand equations (reported as chi square statistics in Table 3) do not allow us to reject the hypothesis of exogeneity in the two-step nor in the *Tobit* specification[12]. Therefore, the non-instrumented model is preferred as long as the instruments are valid, which is the case.

5. Concluding remarks

While the theory of *temperant* portfolio choice predicts a negative impact of uninsurable risks on risky assets demand, its empirical evaluation is quite a difficult task. Using a comparable methodology to Guiso *et al*. (1996), our empirical results do not support the proposition that income risk depresses households' demand for stocks in France (while they do support the negative impact of liquidity constraints). Possible explanations rank from institutions allowing households to better insure earnings risk, problems of measurement error, insufficient information, self-selection in the measures of earnings uncertainty themselves, or model misspecification. On the latter, Arrondel *et al.* (2007) examine the consequences of removing the assumption of statistical independence between income risk and excess rate of return risk, at the household level.

References

Alessie, R., Hochguertel, S. and van Soest, A., 2001. "Household Portfolios *in* The Netherlands", in *Household Portfolios*, Guiso L., Haliassos M. and T. Japelli eds, MIT Press.

Arrondel, L., 2002. "Risk Management and Wealth Accumulation Behavior in France", *Economics Letters*, vol. 74, pp. 187-194.

Arrondel L., Oliver X. and H. Calvo Pardo, 2007. "Temperant Portfolio Choice and Background Risk: Evidence from France", PSE WP2007-16.

Arrondel, L. and Masson, A., 2003. "Stockholding in France", in *Stockholding in Europe*, Guiso L., Haliassos M. and T. Jappelli eds, Palgrave, Hampshire.

Barsky, R. B., Juster, T. F., Kimball, M. S. and Shapiro, M. D., 1997, "Preference Parameters and Behavioral Heterogeneity: an Experimental Approach in the Health and Retirement Study", *Quarterly Journal of Economics*, Vol. CXII, pp. 537-580.

Chiappori, P.A. and Paiella, M., 2006, "Relative Risk Aversion is Constant: Evidence from Panel Data", available at http://www.columbia.edu/%7Epc2167/ChiapporiPaiellaOct2006.pdf

Dominitz, J., 2001. "Estimation of Income Expectations Models using Expectations and Realizations Data", *Journal of Econometrics* 102, pp. 165-195.

Drèze, J. H. and Modigliani, F., 1972. "Consumption under Uncertainty", *Journal of Economic Theory*, vol. 5, pp. 308-335.

Eeckhoudt, L. and H. Schlesinger, 2006, "Putting Risk in its Proper Place", *American Economic Review*, vol. 96, pp. 280-289.

[12] The results for the Tobit specification are unreported in Table 3 for brevity. Following the procedure desribed in Wooldridge (2002) p. 531, we obtain a $\chi^2(1) = 0{,}85$ (p-value of 0,357).

Gollier, C., 2001. *The Economics of Risk and Time*, MIT Press, Cambridge.

Guiso, L., Jappelli, T. and Terlizzese, D., 1996. "Income Risk, Borrowing Constraints and Portfolio Choice", *American Economic Review*, vol. 86, pp. 158-172.

Guiso L., T. Jappelli and M. Haliassos, 2003, *Stockholding in Europe*, Palgrave Macmillan, Hampshire.

Haliassos, M. and Bertaut, C., 1995, "Why Do So Few Hold Stocks?", *Economic Journal*, vol. 105, pp. 1110-1129.

Kimball, M. S., 1993. "Standard Risk Aversion", *Econometrica*, vol. 61, pp. 589-611.

King, M. A. and Leape, J. I., 1998. "Wealth and Portfolio Composition: Theory and Evidence", *Journal of Public Economics*, vol. 69, pp. 155-193.

Lusardi, A., 1997, "Precautionary Saving and Subjective Earnings Variance", *Economics Letters* 57, pp. 319-326.

Massa, M. and Simonov, A., 2006, "Hedging, Familiarity and Portfolio Choice", *The Review of Financial Studies*, 19, pp. 633-685.

Vissing-Jorgensen, A., 2002. "Towards an explanation of Household Portfolio Choice Heterogeneity: Nonfinancial Income and Participation Cost Structures", N.B.E.R. WP8884.

Wooldridge, J. M., 2002. *Econometric Analysis of Cross Section and Panel Data*, the MIT Press, Cambridge, Massachusetts.

Table 1. Sample Characteristics: INSEE "Patrimoine 98"

Average household's characteristics	Respondents	Total sample
Total net wealth (mean in French francs)	749.000	701.500
Financial wealth (mean in French francs)	245.000	220.000
Household income (mean in French francs)	156.750	152.800
Direct stockholdings [(1)]***:***		
Mean share (% of financial wealth)	0,19	0,21
In total sample (% of households)	20,5	15,0
Direct and indirect stockholdings [(2)]***:***		
Mean share (% of financial wealth)	0,27	0,28
In total sample (% of households)	30,0	23,1
Age of head (% of households)		
less than 30 years old	11,5	11,8
30-40 years old	17,3	19,1
40-50 years old	18,8	20,3
50-60 years old	16,1	15,9
60-70 years old	15,3	13,4
more than 70 years old	21,1	19,5
Social status of head (% of households)		
Farmer	4,6	5,1
Self employed (small production unit)	7,0	8,3
Self employed (big production unit)	0,2	0,4
Liberal profession	1,1	1,1
Executive	13,8	11,8
High qualified employee	21,8	18,8
Low qualified employee	20,0	19,4
High qualified workers	18,6	20,9
Low qualified workers	9,9	11,6
Inactive	2,8	2,7
Education of the head (% of households)		
No diploma	16,7	20,8
Primary school	33,4	33,7
High school	14,7	14,5
Some college	14,2	13,0
College	12,7	11,3
More than college	8,3	6,7
Household composition (% of households)		
Single	32,6	30,0
Couple without children	28,7	26,0
Couple with one child	12,0	13,3
Couple with two children	11,6	13,2
Couple with three children or more	5,3	6,9
Single with children	5,9	6,4
Other cases	3,8	4,2
Urban resident (%)	56,1	59,5
Probability of liquidity constraints (% of households)	11,7	9,8
Relative risk aversion (CRRA)[(3)(4)]		
3.76 <= CRRA	41,3	
2 <= CRRA < 3.76	40,2	
1 <= CRRA < 2	11,9	
CRRA < 1	6,5	
Coefficient of variation of earnings[(4)(5)]	4.32-4.94	
Number of households	2.954	10.207

Source: INSEE "Patrimoine 98" survey

(1) Direct stockholding : the household holds equities directly.

(2) Direct and indirect stockholding : the household holds equities either directly or trough mutual funds.

(3) The coefficient of relative risk aversion constructed as in Barsky et al. (1997).

(4) Household's characteristics refer to the head except for income risk and relative risk aversion. For these two variables, when there were two respondents, we imputed the one corresponding to the head of the household.

(5) Since five year ahead real income increases were unbounded above and below in the questionnaire, the two reported values for mean income risk are computed imposing lower and upper bounds of 35% of real income increases, and 50% respectively.

Table 2. The demand for risky assets* :	*Direct stockholding*			*Direct and indirect stockholding*		
Variables	**(1) Probit** Est. (s.e.)	**(2) Demand equation**[(1)] Est. (s.e.)	**(3) Tobit**[(1)] Est. (s.e.)	**(4) Probit** Est. (s.e.)	**(5) Demand equation**[(1)] Est. (s.e.)	**(6) Tobit**[(1)] Est. (s.e.)
Financial wealth (10E-7)	9,863 (1,138)	3,773 (2,548)	1,969 (0,271)	11,898 (1,205)	2,393 (2,203)	2,205 (0,302)
Financial wealth squared (10E-14)	-5,750 (0,900)	-2,702 (1,742)	-1,117 (0,221)	-6,552 (0,901)	-2,089 (1,580)	-1,275 (0,251)
Total net wealth (10E-7)	0,977 (0,600)	-0,647 (1,213)	0,263 (0,164)	1,459 (0,579)	-0,276 (1,090)	0,377 (0,178)
Total net wealth squared (10E-14)	-0,645 (0,489)	0,777 (0,782)	-0,176 (0,121)	-1,104 (0,463)	0,774 (0,764)	-0,249 (0,136)
Income (log.)	0,214 (0,076)	-0,098 (0,172)	0,050 (0,021)	0,240 (0,069)	-0,108 (0,156)	0,063 (0,022)
Income risk (standard error of future income*10E-5)	0,501 (0,251)	-0,425 (0,491)	0,105 (0,069)	0,694 (0,247)	-0,015 (0,444)	0,168 (0,075)
Self-employed	-0,284 (0,112)	-0,279 (0,233)	-0,063 (0,031)	-0,382 (0,107)	-0,552 (0,212)	-0,097 (0,034)
Age(10E-1)	0,519 (0,169)	-0,190 (0,369)	0,132 (0,048)	0,381 (0,153)	0,160 (0,324)	0,149 (0,049)
Age squared (10E-2)	-0,056 (0,016)	0,021 (0,035)	-0,014 (0,004)	-0,045 (0,014)	-0,013 (0,031)	-0,016 (0,005)
Inheritance and gifts received	0,206 (0,070)	-0,104 (0,170)	0,050 (0,020)	0,213 (0,066)	-0,147 (0,147)	0,059 (0,021)
Inter vivos transfers	-0,046 (0,087)	0,239 (0,192)	0,002 (0,025)	0,106 (0,081)	-0,140 (0,175)	0,026 (0,026)
Education						
Primary school	0,104 (0,124)		0,007 (0,035)	0,021 (0,112)		-0,011 (0,037)
High school	0,152 (0,142)		0,039 (0,040)	0,244 (0,127)		0,108 (0,041)
Some college	0,156 (0,142)		0,036 (0,040)	0,186 (0,129)		0,061 (0,042)
College	0,178 (0,152)		0,042 (0,043)	0,130 (0,139)		0,065 (0,045)
More than college	0,284 (0,159)		0,060 (0,044)	0,184 (0,148)		0,065 (0,047)
Marital Status						
Married	-0,162 (0,123)	-0,281 (0,263)	-0,045 (0,035)	-0,205 (0,113)	0,298 (0,227)	-0,024 (0,036)
Unmarried couple (>=5 years)	-0,645 (0,213)	-0,650 (0,546)	-0,178 (0,061)	-0,518 (0,183)	0,197 (0,423)	-0,122 (0,060)
Unmarried couple (<5 years)	-0,246 (0,189)	0,065 (0,445)	-0,053 (0,054)	-0,238 (0,169)	-0,082 (0,375)	-0,055 (0,056)
Widowed	0,064 (0,160)	-0,347 (0,333)	-0,001 (0,045)	0,023 (0,149)	-0,057 (0,298)	0,015 (0,048)
Divorced	-0,484 (0,181)	-0,380 (0,461)	-0,137 (0,052)	-0,407 (0,160)	0,486 (0,365)	-0,089 (0,052)
Number of children at home	-0,027 (0,042)	0,168 (0,092)	-0,001 (0,012)	-0,040 (0,038)	-0,002 (0,081)	-0,014 (0,012)
Number of children away from home	0,058 (0,031)	0,051 (0,074)	0,016 (0,009)	0,023 (0,030)	0,101 (0,066)	0,012 (0,010)
Proxy for liquidity constraints	-1,440 (0,604)	-0,643 (1,643)	-0,443 (0,172)	-1,919 (0,544)	0,821 (1,553)	-0,633 (0,179)
Urban resident	0,142 (0,069)	0,281 (0,161)	0,044 (0,020)	0,076 (0,064)	0,305 (0,132)	0,040 (0,021)
Parents own risky assets	0,371 (0,092)		0,089 (0,025)	0,250 (0,088)		0,070 (0,028)
Constant relative risk aversion (CRRA)						
No answer	0,259 (0,105)	0,365 (0,235)	0,068 (0,030)	0,211 (0,097)	0,253 (0,204)	0,064 (0,031)
2<=CRRA<3.76	0,218 (0,078)	0,305 (0,176)	0,066 (0,022)	0,164 (0,072)	0,161 (0,151)	0,055 (0,023)
1<=CRRA<2	0,163 (0,115)	0,348 (0,244)	0,058 (0,032)	0,010 (0,109)	0,361 (0,217)	0,025 (0,035)
CRRA<1	0,264 (0,146)	0,219 (0,311)	0,077 (0,042)	0,157 (0,139)	0,270 (0,270)	0,076 (0,044)
Gains at Stock Exchange		1,527 (0,407)			1,008 (0,388)	
Losses at Stock Exchange		-0,720 (0,593)			-0,152 (0,533)	
Portfolio management						
Manage portfolio individually		0,518 (0,180)			0,454 (0,176)	
Follow their financial advisor		0,412 (0,186)			0,383 (0,170)	
Financial advisor manager		1,058 (0,235)			0,871 (0,213)	
No indication about managing		0,824 (0,277)			0,520 (0,196)	
Constant	-5,100 (0,898)	-1,924 (2,673)	-1,289 (0,253)	-4,537 (0,810)	-1,840 (2,316)	-1,396 (0,263)
Inverse Mills ratio		0,601 (0,431)			0,203 (0,396)	
$\chi^2(54)$ or Pseudo R2		416,52	0,238		494,43	0,211
Number of observations	2.383	467	2.383	2.383	617	2.383

Source: INSEE "Patrimoine 98" survey.

(1) The dependent variable in demand equation (2) is the logistic transformation of the share (p) of risky assets in financial wealth: log p/(1-p). In Tobit estimation (3), the dependent variable is the share of risky assets in financial wealth.

(2) Since five year ahead real income increases were unbounded above and below in the questionnaire, income risk is computed imposing lower and upper bounds of 50% of real income increases.

* Households' characteristics refer to the head except for income risk and relative risk aversion. For these two variables, when there were two respondents, we imputed the one corresponding to the head of the household. Reference groups are: no diploma, single, CRRA>=3.76, no specific management.

Table 3. Specification tests

Test	*Test Statistic*	*p-value*	*Conclusion*
Instruments correlated with endogenous variable	F (21,2382) = 2,045	0,003	Good instruments
Probability of direct stockholding ownership [1]			
Endogeneity	$\chi^2(1) = 0,087$	0,767	Not endogenous
Validity of instruments	F (21,2382)=0,54	0,966	Good instruments
Probability of direct or indirect stockholding ownership [1]			
Endogeneity	$\chi^2(1) = 0,034$	0,863	Not endogenous
Validity of instruments	F (21,2382) = 1,17	0,266	Good instruments
Share of direct stockholding in financial wealth [2]			
Endogeneity	$\chi^2(1) = 0,792$	0,373	Not endogenous
Validity of instruments	F (21,467) = 0,930	0,546	Good instruments
Share of direct or indirect stockholding in financial wealth [2]			
Endogeneity	$\chi^2(1) = 0,757$	0,386	Not endogenous
Validity of instruments	F (21,617) = 1,130	0,313	Good instruments

Source: INSEE "Patrimoine 98" survey

(1) The probability is estimated by a two-step approach (Wooldridge, 2002, p.473), where the first stage is a linear projection of the earnings variance on the instrument set, while the second is a Probit that includes the predicted errors of the first stage regression. The chi-square statistic reported is actually the (t-statistic)² of the coefficient estimate of the predicted errors. To test for the exogeneity of the instruments, we regress the Probit predicted residuals on the set of instruments.

(2) Given that the earnings variance is exogenous in the participation equation, the conditional demand is estimated following a two-step approach (Wooldridge, 2002, p. 567). In the first stage we estimate the inverse Mills ratio from a probit of the discrete choice variable on the exogenous variables and the set of instruments. The second step estimates by 2SLS the conditional asset demand including the estimated inverse Mills ratio both in the set of regressors and in the set of instruments. The null hypothesis of exogeneity is tested using the usual t-statistic on the second stage estimated coefficient for the predicted errors of the first stage regression (reported as a chi-square statistic). To test whether instruments are exogenous, we regress the 2SLS predicted errors on the set of instruments (including the inverse Mills ratio).