Review of Income and Wealth
Series 47, Number 4, December 2001

BEHAVIOR OF HOUSEHOLD PORTFOLIOS IN FRANCE: THE ROLE OF HOUSING

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The two-dimensional aspects of dwellings occupied by their owner, consumption and investment, make the analysis of households' portfolio choice and the analysis of housing purchases more difficult. But it seems difficult to analyze portfolio decisions without taking account of owner-occupied housing that has an important effect on wealth composition over the life cycle. In this paper we estimated a portfolio choice model where the different dwellings are defined as assets and we showed that we cannot separate investment decisions from housing consumption. Especially, risky assets demand should be greatly influenced by attitudes toward home property.

1. Introduction

As in the United States, wealth portfolios of French households are incomplete and not very varied (Kessler and Wolff, 1991). If we distinguish wealth into nine assets, we note that in 1992 only 0.1 percent of households owned a complete portfolio while 67.8 percent owned a portfolio with less than five assets (Arrondel, 1996). Residential housing (primary residence or secondary residence) was often found in portfolios with few assets and almost always present in portfolios with five assets or more. Dwellings for renting out were found in households' portfolios when there were at least four assets and was often combined with residential housing. Stocks, however, were generally found in varied portfolios and more often combined with residential housing. These observations led us to believe that housing has a great effect on the accumulation of wealth and the diversification process of households.

Whereas much literature, theoretical and empirical, deals with housing tenure choice through models of housing consumption demand, few studies have tried to analyze housing demand simultaneously with demand for other assets according to the portfolio choice theory.[1] This is despite the fact that the dual

Note: The authors would like to thank Anne Laferrère from the Housing Department of the French Institute for Statistics and Economic Studies (INSEE), Edward Wolff and two anonymous referees for helpful comments on a previous version of this text. This paper is strongly inspired by a common work with André Masson (Arrondel and Masson, 1990). It was presented at the International Conference of the American Real Estate and Urban Economics Association at Berkeley (May 31–June 2, 1997). We would like to thank B. Renaud and B. McGregor for their comments. This work was undertaken as part of a research program initiated by the French Ministry of Housing.

[1]Except for the works of Dick-Mireaux and King (1984), King and Leape (1998), Hubbard (1985), Ioannides (1989) for U.S. data, Agell and Edin (1990) for Swedish data, and Arrondel and Masson (1990) for French data.

motives of consumption and investment in housing behavior are now widely recognized (Artle and Varaiya, 1978; Smith, Rosen, and Fallis, 1988; Linneman and Megbolugbe, 1993).

In a previous paper, using French data, we showed empirically that there are portfolio motives in the factors that determine housing demand for owner occupation (Arrondel and Lefebvre, 2001). This paper completes the investigation by analyzing empirically the role of housing in French household portfolios. After examining developments of the portfolio choice theory and the role of housing in it, we conducted a set of tests of the model using data from the survey ''Actifs Financiers'' carried out in 1992 by INSEE (French National Institute for Statistics and Economic Studies).

2. Portfolio Choice and Housing Wealth: Theory and Econometric Specification

First, we present the inter-temporal portfolio choice model, recent developments of the model and how housing could be integrated into it. Then, we outline the econometric method.

2.1. *The Inter-temporal Portfolio Choice Model*

Merton (1969) and Samuelson (1969) have generalized the portfolio choice model of Arrow (1965), integrating it into a life cycle model. At each period, the consumer determines simultaneously his optimal consumption level and wealth composition. He maximizes a Von Neuman–Morgenstern inter-temporal expected-utility function depending on consumption and on all the possible combinations of assets that exist on the market. The capital market is perfect (no taxes, no transaction costs), the path of future incomes and lifetime are known with certainty, all the assets are perfectly divisible, and transactions can be made continuously over time.

If the consumer's utility function is additively separable over time and if returns on assets are independently distributed over time, then portfolio choices are independent of consumption decisions (*first theorem of separation*). In addition, if instantaneous utilities are iso-elastic (CRRA), the fraction of wealth invested in each asset is independent of wealth level and even of the investor's age if the distribution of returns on assets is stationary.[2] Thus, portfolio choice depends only on instantaneous utility and on returns on assets in the considered period.[3] Contrary to consumption decisions, portfolio choices can be described as a myopic behavior since they are independent of time considerations.[4]

[2]If the consumer has labor income, his wealth is assumed to cover non-human and human components. If he does not, his wealth is totally material.

[3]If the prices of assets are distributed according to a log-normal distribution, the demands for assets are the same as those found with the static model of Tobin–Markowitz (Merton, 1971).

[4]Apart from the characteristics of the assets (risk and return), this myopia is related to consumers' risk tolerance (the inverse of absolute risk aversion) which must be a linear function of wealth (Mossin, 1968). Hence, Gollier (1999) shows that if the investor's absolute risk tolerance is increasing and convex, the fraction of risky assets in wealth will decrease as age increases and that it is a positive linear function of wealth.

If we assume there are N assets on the market, the demand for asset i, A_i, is given by (index t omitted):

$$\frac{A_i}{W} = \frac{1}{\gamma} \sum_{j=1}^{N} \frac{\beta_i - r}{\sigma_{ij}}, \qquad i, j = 1, 2, \ldots, N \tag{1}$$

where W denotes the net wealth of the consumer, γ his relative risk aversion coefficient, β_i the expected return on asset i, r the return on the safe asset, and σ_{ij} the covariance between returns on assets i and j.

Merton (1971) later identified the existence of two "mutual funds" that depend only on the technical characteristics of the assets. If there is a riskless asset, the first mutual fund contains only that asset, while the second one is a linear combination of the risky assets. Hence, portfolio choices consist only in determining the risky fraction of wealth (*second theorem of separation*). Hence, if all investors have homogeneous price expectations, they own the "market portfolio" and their risky wealth has the same structure (Merton, 1973). Their portfolios are perfectly diversified and there is only a fraction of their wealth invested in risky assets, which differs from one investor to another according to the inverse of their relative risk aversion (equation (1) with two assets, one risky and one safe).

In recent theoretical developments, portfolio choice models include transaction costs[5] and reconsider the hypothesis about exogeneity[6] and certainty on labor income.[7]

[5]King and Leape (1987, 1998) have shown that it is possible to generate incomplete portfolios if we introduce some market imperfections: transaction and holding costs (in time and money), costly information, no short sales on assets. As a result, the investor not only decides between the riskless asset and the risky "mutual fund" (the second theorem of separation is no longer valid), but he must consider all assets available on the capital market. Thus, his portfolio may be incomplete (Mayshar, 1979). Proportional costs and taxes cannot explain incomplete portfolios by themselves because they can be integrated into the net returns on assets. However they can explain the fact that trade on the market cannot be carried out continuously, but is rather spaced out over time (Constandinides, 1986). In this case, the equivalence with the static portfolio choice model of Tobin–Markowitz (equation (1)) is no longer verified.

Szpiro (1995) introduces an additional constraint on fixed transaction costs: the investor buys an asset i if, and only if, the sum of the discounted expected returns on it is higher than the holding costs. The higher the sum of the discounted expected returns, the easier it is to exceed fixed costs. Moreover, the longer the horizon of the investment, the higher the likelihood of removing constraints. Favorable taxation increases the expected returns and makes it easier to exceed the fixed costs.

[6]Bodie *et al*. (1992) studied the influence of labor supply of households on their risky investments. Very briefly, the main prediction of the model is that the more flexible their labor supply is, the more risky their investments.

[7]Kimball (1992, 1993) defines as "standard" the class of utility functions that guarantee that an additional independent undesirable risk increases the sensitivity to other loss-aggravating ones (i.e. we add an independent risk to the initial loss of the risk). He introduces the concept of temperance (measured by the ratio u''''/u''') which describes a desire to reduce total exposure to risk. He shows that for an additional independent undesirable risk, "demand" of another endogenous risk even independent, decreases if, and only if, absolute risk aversion and absolute prudence (measured by the ratio $-u'''/u''$; Kimball, 1993) are decreasing functions with wealth (this condition is satisfied for CRRA utility function). So, within this framework, in a static portfolio model an increase in income risk makes households less willing to bear a rate of return risk, thus reducing their demand for risky securities, even when the two risks are independent. In other words, the two risks are substitutes. These results also hold in a multi-period portfolio model (Kimball, 1993). Similarly, they should tend to buy more insurance against risks that are insurable (Eeckhoudt and Kimball, 1992).

2.2. *Housing in Portfolio Choice Model*

Introducing housing in a portfolio choice model is difficult because of its characteristics. In fact, compared to financial assets, housing is relatively indivisible and illiquid. Transaction costs are very high in time and in money, even when selling. Imperfections in the housing credit market, institutional constraints, uncertainty about quality, and the fact that every unit is unique can explain this. Tax treatments of owner occupied housing are often preferential, especially in France.[8]

Last but not least, households' decisions on housing are the result of dual behavior that more generally affects durable goods: as a generator of housing services, housing satisfies consumption needs; as an asset, housing is taken into consideration in investment decisions.

We can incorporate the first specificities in a portfolio choice model with market imperfections and transaction costs (Grossman and Laroque, 1990; Bar Ilan and Blinder, 1992). But the dual dimension of home owner-occupation—consumption and investment—makes the model more complex and invalidates some important results of the previous model. First, it refutes the first separation theorem between portfolio choice and consumption decisions. Second, with proportional transaction costs on housing and other specific market imperfections (taxation, down payment, borrowing restrictions, etc.), the market is not traded on continuously, but spaced out over time (Grossman and Laroque, 1990; Bar Ilan and Blinder, 1992). So assets demand (equation (1)), which is the same as in the static portfolio model of Tobin–Markovitz, is no longer valid.

The model of Henderson and Ioannides (1983) considers explicitly and simultaneously the two-dimensional aspect of housing. They show that in the absence of institutional considerations, it is only the difference between the investment demand h_i for housing (owning for portfolio choice motive) and the consumption demand h_c (explaining housing needs) that explains decisions to purchase dwellings for owner occupation and for renting out. If the first variable is greater than the second variable, households become owner-occupiers of their primary residence. If the difference is large enough, they invest in dwelling for renting out as well.[9]

Brueckner (1997) extends this model to investigate the portfolio choice of homeowners. He finds that if the constraint $(h_i - h_c)$ is binding, the homeowner's optimal portfolio is inefficient (in a mean-variance sense). When this constraint is not binding, the consumption motive can be separated from the investment

Income risk also affects the relation between borrowing constraints and the composition of the household's portfolio. Koo (1995) shows that the possibility that consumers will be subject to liquidity constraints in the future makes them less willing to bear risk presently. Then, households who are constrained hold less risky assets than households that are not. More precisely, "liquidity constraints reduce willingness to take risk if absolute risk tolerance is increasing and convex" (Gollier, 2001). In short, the effect of borrowing constraints reinforces the negative effect of income risk on portfolio choice demand for risky assets.

[8]Under these conditions, Flavin and Yamashita (1998) show that "the inclusion of owner-occupied housing change dramatically the efficient frontier because the return to housing is essentially uncorrelated with the return to stocks."

[9]Ioannides and Rosenthal (1994) have tested this model on U.S. data and found some facts in favor of the model.

motive and the portfolio is efficient. This separation is due to the fact that when the constraint is not binding, the consumer can increase his consumption demand without affecting his investment demand by reallocating his housing portfolio between primary residence and dwelling to rent out.

With the same kind of model as Brueckner (1997), Flavin and Yamashita (1998) assume that preferential tax treatments of owner occupied housing and transaction costs create frictions large enough to constrain households to include in their portfolio the level of housing consistent with their consumption demand for housing. So, ownership of housing influences greatly portfolio allocations, and consumption and investment decisions are no longer separable. For instance, if the ratio of housing to net worth declines as the household accumulates wealth, the housing constraint induces a life cycle pattern in financial portfolio. So, young households have a strong incentive to reduce the risk of their portfolio as older households will invest more in risky assets.

2.3. *The Econometric Model*

When portfolios are incomplete, household investment decisions follow a two-step procedure: the *discrete* choice of which of N assets to put in the portfolio, then the *continuous* choice of the demand for each asset chosen in the first step (Leape, 1987; King and Leape, 1998).[10]

Given the combination of assets held, J (there are 2^{N-1} combinations), asset demands depend only on risk aversion and risk-return of the assets as in equation (1) (King and Leape, 1998). So, for household k, we can write demands for assets (defined as a fraction of total net wealth: A_i/W) as:

$$(2) \qquad \log[A_i^k/W^k] = -\log \gamma^k + \sum_J d_J^k C_{iJ}, \qquad J = 1, \ldots, 2^{N-1}; i = 1, 2, \ldots, N$$

where γ^k is relative risk aversion, and C_{iJ} summarizes the way in which demand depends upon the particular combination of assets in the household's portfolio. d_J^k is a dummy variable which indicates the combination of assets held by the household k. Let us assume that relative risk aversion can be represented by a linear form of the household's characteristics. Then we can write (2) as:

$$(3) \quad \log[A_i^k/W^k] = X^k\beta_i + \sum_J d_J^k C_{iJ} + \varepsilon_i^k, \qquad J = 1, \ldots, 2^{N-1}; i = 1, 2, \ldots, N$$

where X^k is the vector of the household's characteristics k, β_i the vector of coefficients to estimate, and ε_i^k a random error term normally distributed with zero mean. This term summarizes the individual unobservable differences in risk aversion and in expectations in risk and return of assets.

The system of asset demands will be estimated with a "switching regression model with endogenous switching" where the influence of the other assets owned plays a role only in the constant term (King and Leape, 1998). The estimation of system (3) needs those of the combination of assets held. The number of possible

[10]The two decisions may depend on different factors (Mayshar, 1981). For example, transaction and holding costs influence primarily the first step of the portfolio choice, while characteristics of risk and return influence mainly the second one.

combinations (2^{N-1}) to choose from is too vast to use a multivariate Probit model. However, if we assume that the effect of the observable and unobservable characteristics of the household on the ownership of a given asset are not influenced by the combination of assets owned, then the discrete choice can be estimated by independent Probit models (Dicks-Mireaux and King, 1984).

There are two econometric problems in the estimation of the system of asset demands (equation (3)) by OLS. The first is a selectivity bias, because in the regression of demand for asset *i*, we use only households which own asset *i*. The second is an endogeneity bias because we use the combination of assets chosen by the household in the set of explanatory variables. To correct the selectivity bias, we can use the well-known two-step method of Heckman (1979) with Greene's (1981) robust estimates of variance. To correct the endogeneity bias, we can use the instrumental variable method of Dubin and MacFadden (1984) in which we substitute the dummy variables of the combination of assets owned by its fitted probability (by Probit model). However, the Heckman method, which introduces the inverse of Mill's ratio in the set of explanatory variables in OLS regressions, often gives rise to large collinearity.[11] We therefore keep this variable in the regressions only when it is statistically significant (at 10 percent). In other cases we use the traditional OLS estimates. In addition, when we want to use instrumental variables to correct endogeneity bias, one of the problems is the choice of the instruments. Bound, Jaeger, and Baker (1995) show that this method is worse than the simple use of dummies when the instruments are not good. Finally, because it was very difficult to obtain individual characteristics correlated with the combination of assets held and uncorrelated with the residual, we did not correct this bias.

3. Data

After presenting data, we list the variables used in the econometric specification.

3.1. *The "Actifs Financiers" Survey*

Periodically, the French National Institute for Statistics and Economic Studies (INSEE) carries out a survey called "Actifs Financiers." That survey tries to assess the total wealth of households and its structure. The one used for our empirical tests was done in 1991–92 on a sample of 9,530 households taken from the data of 1990 census. Households with high income or wealth are over represented in the sample in order to have significant information on wealth (Arrondel, 1996).

[11]To lower collinearity between Mill's ratio and other explanatory variables, we can choose different sets of determinants for each step of the procedure (Probit and conditional demands). But that specification does not correspond to the theoretical model (equation (1)). Moreover, all the explanatory variables introduced in econometric specification could explain the two choices of demand for assets.

The survey attempted to identify different assets—financial or capital assets—owned by each member of the households and the value of these assets.[12] It also sought to identify and appraise debt. Lastly, it collected information on each member of the households such as income, education, professional career (past and present), periods of unemployment, wealth of parents, inter-generational transfers (received and paid) and a range of other socio-economic characteristics.

TABLE 1

PORTFOLIO COMPOSITION OF FRENCH HOUSEHOLDS (1992)

Asset Classifications	Proportion Holding the Asset (%)	Mean Asset Holding (French Francs)	Percentage of Total Wealth
Checking accounts	96.1	11,582	1.76
Savings accounts	77.2	25,770	3.91
Savings bonds	9.0	6,499	0.99
Housing saving schemes	33.0	13,471	2.04
Life insurance and annuities	39.5	30,526	4.63
Residential housing	57.6	360,098	54.63
Primary residence	54.6	323,050	49.01
Secondary residence	8.8	37,048	5.62
Dwelling for renting out	13.8	69,893	10.60
Equity	23.6	37,812	5.74
Bonds	6.3	5,654	0.86
Mutual funds	17.3	20,775	3.15
Stocks	9.1	11,383	1.73
Investment in lands and business assets (not exploited by their owner)	13.5	26,674	4.05
Business assets (exploited by their owner)	10.8	76,866	11.66
Farm	3.5	30,408	4.61
Enterprise	7.2	46,458	7.05
Total	100.0	589,298	100.00

Source: "Actifs Financiers" INSEE 1992 survey.
Note: 1 U.S. dollar = 5.5 francs.

The average portfolio value is 589,298 French Francs (about 107,000 US dollars) but 60 percent of the French households have a portfolio whose value is below the average.[13] The wealthier households are, the more diversified their portfolio, the more risky their investments. French households give priority to investments that

[12]To prevent receiving no reply or evasive answers to questions about the value of assets, different solutions were retained. To assess financial assets, fixed value brackets were given to households. To appraise real estate and other capital assets, households gave themselves a bracket. So, to determine one value for each asset we used the "simulated residual method" (Gouriéroux *et al.*, 1987; Arrondel, 1996).

[13]Two sources of mis-evaluation of assets arise in this type of survey. First, households do not declare assets that they own. Second, they declare an asset but underestimate its value. It was therefore necessary to appraise the quality of our evaluations and compare them with evaluations of the National Patrimonial Accounting (Arrondel *et al.*, 1996). Except for housing, the comparison of results is disappointing. First, available assets tend to be underestimated because many changes occur on them in short periods. Second, the value of transferable securities varies rapidly and households cannot follow price fluctuations. Households therefore often give the purchase price rather than the listing price. However, if households can easily give underestimated valuations for financial assets, it is more difficult to hide housing and other capital assets. This may explain why they are better appraised in the survey. It was impossible to improve valuations in the survey, because we do not know how under-estimation varies across households.

are not very risky, such as saving accounts, housing saving arrangements, life insurance, or to investments that seem of little risk, such as housing. So the rates of ownership of these assets are very high. Transferable securities (bonds, mutual funds, stocks) seem to them more risky, so they invest in them when their portfolio reaches a high amount and when they already own the other assets, especially their primary residence (Arrondel and Lefebvre, 1996).

Housing is a major investment in French households' portfolios: 61 percent of households own at least one dwelling. It is one of the most popular assets, just after current accounts (96.1 percent) and saving deposits (77.2 percent), far ahead of other financial or capital assets. Moreover, housing accounts for nearly 65 percent of households' wealth.[14] However, while 55 percent of households are owner-occupiers of their primary residence,[15] only 8.8 percent own a secondary residence and 13.8 percent a dwelling for letting out. Furthermore, ownership of a primary residence and a secondary residence is more common than ownership of a secondary residence alone. Similarly, ownership of a primary residence and dwelling for renting out is more common than ownership of dwelling for renting out alone.

So, to become owners of their primary residence is one of the main households' saving projects. That also explains the high rate of ownership of housing saving schemes and the amounts invested in them.

3.2. *The Variables*

The choice of variables concerns first the nature of the wealth and the number of assets to use in the regressions, and second the set of explanatory variables to explain portfolio choice.

The inter-temporal model of portfolio choice of Merton (1971) considers the allocation of *net* wealth, i.e. the sum of the demand for the assets minus the discounted sum of debts, capital and interest (Masson, 1986). However, the empirical difficulty concerns the choice of the rate of discounting and we did not try to construct this indicator. Moreover, to be compatible with other studies (King and Leape, 1998), we used the definition of net wealth which involves subtracting the debt in capital from wealth. In addition, our definition excludes business assets that are exploited by their owners because we suppose that the logic of their accumulation is not the same as for other assets. We have distinguished ten assets and three liabilities. The assets are housing saving schemes,[16] short term mutual funds, long term mutual funds, stocks, bonds, primary residence, secondary residence, dwelling to rent out, land and business assets (not

[14]It is possible that this percentage is over estimated because of under-evaluation of financial assets (see note 13).

[15]It is less than the European Community average (59 percent) and less than in the U.S.A. (64 percent). This rate of home ownership is close to the one we can observe in the countries of the North of the European Community.

[16]Housing saving schemes is a contractual saving plan where savings and loan are associated on the same account. Households save regularly during a minimum of four years. They can then obtain a home-mortgage with a borrowing rate which is lower than the market rate (the difference is financed by the public sector).

exploited by their owner) and other assets. The liabilities are mortgages on primary and secondary residences, mortgages on dwellings for renting out, and other mortgages.

To explain individual portfolios, the theoretical models insist first on the importance of transactions and holding costs (with the effects of resources) and information costs (in time and money). The level of resources (human and non-human) measured the importance of these factors. The stock of information must be represented by age, education, and professional activity.

Recent theoretical savings models have placed greater emphasis on studying prudent behavior in the face of an uncertain future and have shown the influence of multiple risk (income, unemployment, family, health) and liquidity constraints on portfolio choice (see above). New individual determinants, especially future expectations of risk and liquidity constraints, could therefore explain wealth accumulation behavior. Unfortunately, these variables are hard to observe in surveys and often need to be inferred using the household's characteristics (Arrondel and Masson, 1996). Hence, we introduced a set of variables to approximate a household's exposure to labor income risk and risk aversion: we took the sector of professional activity of the household (public vs. private) and among those working in the private sector, the existence of past or present unemployment period(s). (We assume implicitly that the probability of unemployment in the future is influenced by unemployment in the past or actual unemployment.) Moreover, the nature of professional activity (employee vs. self-employed)[17] and professional status (retired vs. active) may also partially reflect this effect. Finally, households that are constrained on the capital market or anticipate to be so in the future (unemployed now or in the past, less educated people, working in private sector) are assumed to be more prudent in their investments.

We assume more flexibility of labor supply for young educated, highly qualified employees and non-salaried workers. So age, level of schooling, status of professional activity (retired vs. active) could also partially reflect the influence of labor supply on risky investments.

To take into account housing prices and differences in supply of assets, we distinguish urban areas ($>20{,}000$ habitants) from rural areas. Other characteristics (sociological or demographic) of the household that may influence households' portfolios were also introduced.

4. Econometric Estimation and Results

First, we present the results concerning the discrete aspect of portfolio choice and then the wealth elasticities of demand for each asset.

4.1. *The Discrete Choice of Asset Combinations*

The estimation of Probit models enables us to determine the explanatory factors of the probability of owning real assets (Table 2a), financial assets (Table 2b) and mortgage and liabilities (Table 2c).

[17]For example, the nature of professional activity (employee vs. self-employed) could be an indicator of income risk but also an indicator of risk aversion if a more risk averse household chooses a less risky career. Consequently, the net effect of this variable is ambiguous.

TABLE 2a

PROBIT MODEL FOR OWNERSHIP OF ASSETS
(INVESTMENT IN REAL ASSETS)

Variable	Primary Residence		Secondary Residence		Dwelling for Renting Out		Investment in Land and Business Assets	
	Coefficient	Asympotic *t* Stat.	Coefficient	Asympotic *t* Stat.	Coefficient	Asympotic *t* Stat.	Coefficient	Asympotic *t* Stat.
Constant	–3.042	–14.349	–5.776	–15.355	–2.181	–8.707	–3.731	–13.923
Net wealth (10E–6)[a]	1.159	23.728	0.296	12.577	0.687	25.557	0.443	16.427
Net wealth^2 (10E–12)	–0.027	–21.691	–0.007	–7.258	–0.016	–16.857	–0.018	–9.990
Business wealth (10E–6)[b]	–0.056	–0.985	–0.015	–0.291	0.141	3.460	–0.191	–3.241
Business wealth^2 (10E–12)	–0.017	–2.675	0.000	0.069	–0.016	–4.962	0.024	2.536
Income (10E–05)	0.001	0.044	0.138	4.645	–0.070	–2.477	–0.178	–6.212
Income^2 (10E–10)	–0.005	–2.131	–0.007	–3.504	0.003	1.546	0.011	5.890
Age (10E–1)	0.938	12.996	0.907	7.399	0.250	2.865	0.674	7.464
Age^2 (10E–2)	–0.075	–10.710	–0.066	–5.853	–0.022	–2.676	–0.057	–6.738
Inheritance or *inter-vivos* transfers received	0.102	2.734	0.161	3.063	0.407	9.372	0.479	10.697
Help or *inter-vivos* transfers given	–0.049	–1.080	0.093	1.818	0.162	3.775	0.027	0.623
Professional activity								
Farmer (Ref.)	0.000		0.000		0.000		0.000	
Self employed (small production unit)	–0.034	–0.398	0.796	5.880	–0.006	–0.081	0.464	5.757
Self employed (large production unit)	–0.058	–0.236	0.575	2.582	–0.162	–0.880	0.510	2.793
Liberal profession	0.185	1.123	0.706	3.804	–0.098	–0.685	0.679	4.452
Executive	–0.073	–0.703	0.822	5.403	–0.198	–1.977	0.292	2.687
High qualified employee	0.142	1.532	0.581	3.886	–0.177	–1.945	0.336	3.429
Low qualified employee	–0.005	–0.048	0.612	3.833	–0.188	–1.891	0.231	2.147
High qualified workers	0.101	1.167	0.485	3.169	–0.320	–3.604	0.212	2.259
Low qualified workers	–0.155	–1.507	0.449	2.245	–0.260	–2.186	0.282	2.380
Farmer (retired)	0.406	3.364	–0.099	–0.474	–0.132	–1.103	1.160	9.693
Self employed (retired)	0.367	2.643	0.629	3.252	–0.065	–0.500	0.742	5.691
Salary (retired)	0.217	1.952	0.628	3.454	–0.333	–2.799	0.273	2.263

Education								
No diploma (Ref.)	0.000		0.000		0.000		0.000	
Primary school	0.139	3.137	0.086	1.242	0.042	0.840	0.023	0.462
Secondary school	0.082	1.345	0.169	1.854	0.150	2.170	0.053	0.738
Baccalaureat	0.041	0.624	0.171	1.959	0.116	1.644	0.019	0.263
Graduate studies	0.001	0.018	0.204	2.082	0.037	0.442	–0.083	–0.949
Postgraduate studies	–0.355	–3.729	0.128	1.225	0.061	0.654	–0.118	–1.180
Type of household								
Single (Ref.)	0.000		0.000		0.000		0.000	
Couple without children	0.221	4.223	0.144	1.964	0.045	0.766	–0.033	–0.579
Couple with one child	0.381	6.276	0.270	3.182	0.044	0.657	–0.032	–0.465
Couple with two children	0.644	10.690	0.219	2.491	0.060	0.866	0.003	0.047
Couple with three children	0.811	12.125	0.154	1.511	–0.054	–0.689	–0.122	–1.521
Single parent family	0.066	0.819	0.070	0.539	–0.045	–0.446	–0.094	–0.886
Other	0.588	6.730	0.229	1.989	0.172	2.058	0.170	2.018
Sector of professional activity								
Public sector (Ref.)	0.000		0.000		0.000		0.000	
Private sector, no unemployment period	0.101	1.922	–0.081	–1.142	–0.055	–0.902	0.056	0.835
Private sector, unemployment period in the past	–0.079	–1.252	–0.070	–0.756	–0.149	–1.905	0.066	0.789
Private sector, currently unemployed	–0.319	–3.368	–0.107	–0.734	–0.045	–0.385	0.153	1.303
Retired or no activity	–0.144	–1.549	–0.154	–1.124	–0.086	–0.818	0.009	0.080
Urban area (> 20,000 habitants)	–0.618	–17.298	0.390	8.271	–0.147	–3.708	–0.350	–8.596
Same asset in parents' wealth	0.224	5.361	0.074	1.254	0.108	2.215	0.553	14.521
Number of observations	9225		9225		9225		9225	
Number of households holding the asset	6111		828		1739		1727	
χ^2 (38 d.l.)	3859.7		1293.6		2089.2		2351.0	

Source: "Actifs Financiers" INSEE 1992 survey.

Notes: [a]Net wealth excludes business assets exploited by their owner.

[b]Business wealth includes all the assets used for professional activity.

TABLE 2b

PROBIT MODEL FOR OWNERSHIP OF ASSETS
(FINANCIAL ASSETS)

Variable	Bonds		Short-term Mutual Funds		Mutual Funds		Stocks		Housing Savings Scheme	
	Coefficient	Asympotic *t* Stat.	Coefficient	Asympotic *t* Stat.	Coefficient	Asympotic *t* Stat.	Coefficient	Asymptotic *t* Stat.	Coefficient	Asympotic *t* Stat.
Constant	–2.499	–7.922	–2.474	–9.636	–2.365	–9.241	–2.488	–9.018	–0.136	–0.711
Net wealth (10E–6)[a]	0.516	12.901	0.331	12.305	0.320	11.941	0.343	12.377	0.179	6.690
Net wealth^2 (10E–12)	–0.038	–8.156	–0.010	–4.720	–0.011	–6.065	–0.011	–5.983	–0.010	–4.237
Business wealth (10E–6)[b]	–0.045	–0.897	0.128	2.711	–0.118	–2.534	0.026	0.525	0.063	1.683
Business wealth^2 (10E–12)	0.003	0.711	–0.014	–2.513	0.005	1.434	0.002	0.452	–0.005	–1.562
Income (10E–05)	0.070	1.464	0.090	3.154	0.095	3.361	0.122	4.186	0.169	6.349
Income^2 (10E–10)	–0.009	–1.640	–0.003	–1.507	–0.002	–1.005	–0.003	–1.581	–0.010	–4.036
Age (10E–1)	0.128	1.185	0.217	2.340	0.085	0.959	–0.003	–0.034	–0.130	–1.807
Age^2 (10E–2)	–0.006	–0.623	–0.023	–2.555	–0.001	–0.143	0.002	0.204	–0.002	–0.274
Inheritance or *inter-vivos* transfers	0.174	3.217	0.146	3.369	0.099	2.259	0.124	2.639	0.031	0.915
Help or *inter-vivos* transfers given	0.086	1.648	0.050	1.063	0.090	1.940	–0.037	–0.700	0.069	1.724
Professional activity										
Farmer (Ref.)	0.000		0.000		0.000		0.000		0.000	
Self employed (small production unit)	–0.317	–3.015	–0.136	–1.586	–0.101	–1.036	0.204	1.934	–0.122	–1.747
Self employed (large production unit)	–0.659	–2.632	–0.632	–3.209	–0.115	–0.578	–0.139	–0.665	–0.380	–2.325
Liberal profession	–0.347	–2.028	–0.196	–1.385	0.111	0.742	–0.002	–0.011	–0.138	–1.098
Executive	–0.235	–1.889	–0.069	–0.662	0.239	2.180	0.359	2.976	–0.126	–1.454
High qualified employee	–0.241	–2.023	–0.224	–2.283	0.107	1.025	0.280	2.428	–0.180	–2.311
Low qualified employee	–0.314	–2.357	–0.275	–2.537	0.012	0.102	0.090	0.700	–0.205	–2.486
High qualified workers	–0.484	–3.716	–0.433	–4.284	–0.083	–0.779	0.087	0.728	–0.313	–4.200
Low qualified workers	–0.238	–1.403	–0.484	–3.256	–0.362	–2.122	–0.498	–2.089	–0.504	–5.100
Farmer (retired)	–0.071	–1.177	–0.155	–1.143	0.079	0.547	0.158	0.892	0.252	2.204
Self employed (retired)	–0.012	–0.078	–0.085	–0.597	0.180	1.187	0.681	3.957	0.185	1.481
Salary (retired)	–0.182	–1.272	–0.116	–0.893	0.294	2.128	0.452	2.791	0.117	1.055

Education										
No diploma (Ref.)	0.000		0.000		0.000		0.000		0.000	
Primary school	0.199	2.918	0.279	4.557	0.256	4.184	0.047	0.672	0.050	1.717
Secondary school	0.160	1.667	0.426	5.503	0.362	4.601	0.337	4.034	0.010	0.174
Baccalaureat	0.349	3.963	0.461	5.982	0.367	4.730	0.351	4.222	0.077	1.291
Graduate studies	0.122	0.155	0.349	3.985	0.305	3.491	0.339	3.713	–0.021	–0.304
Postgraduate studies	0.315	2.836	0.550	5.803	0.275	2.848	0.478	4.806	0.037	0.466
Type of household										
Single (Ref.)	0.000		0.000		0.000		0.000		0.000	
Couple without children	–0.209	–3.098	0.041	0.681	–0.028	–0.473	–0.081	–1.254	–0.013	–0.258
Couple with one child	–0.353	–4.101	–0.005	–0.065	–0.100	–1.415	–0.220	–2.850	–0.006	–0.107
Couple with two children	–0.216	–2.524	–0.045	–0.630	–0.143	–1.995	–0.196	–2.596	–0.156	–2.812
Couple with three children	–0.429	–4.009	–0.072	–0.887	–0.261	–3.057	–0.201	–2.293	–0.264	–4.225
Single parent family	–0.180	–1.382	–0.025	–0.234	–0.412	–3.300	–0.154	–1.285	–0.123	–1.552
Other	–0.222	–2.078	–0.272	–2.664	–0.222	–2.216	–0.277	–2.444	–0.102	–1.350
Sector of professional activity										
Public sector (Ref.)	0.000		0.000		0.000		0.000		0.000	
Private sector, no unemployment period	0.033	0.416	0.078	1.233	0.032	0.512	0.251	3.806	0.066	1.382
Private sector, unemployment period in the past	–0.147	–1.324	0.156	1.980	–0.026	–0.324	0.189	2.243	–0.036	–0.610
Private sector, currently unemployed	–0.083	–0.488	0.181	1.462	–0.086	–0.647	–0.100	–0.655	–0.232	–2.462
Retired or no activities	0.173	1.349	0.244	2.186	–0.137	–1.149	–0.030	–0.224	–0.354	–3.857
Urban area (> 20,000 habitants)	0.011	0.221	0.019	0.454	–0.022	–0.537	0.117	2.637	–0.020	–0.612
Same asset in parents' wealth	0.450	9.235	0.301	7.382	0.381	9.167	0.389	8.915	0.174	5.162
Number of observations	9225		9225		9225		9225		9225	
Number of housholds holding the asset	718		1178		1108		951		2490	
χ^2 (38 d.l.)	972.9		1113 1		1044.9		1266.1		708.9	

Source: "Actifs Financiers" INSEE 1992 survey.
Notes: [a]Net wealth excludes business assets exploited by their owner.
[b]Business wealth includes all the assets used for professional activity.

TABLE 2c

PROBIT MODEL FOR OWNERSHIP OF ASSETS
(MORTGAGE AND LIABILITIES)

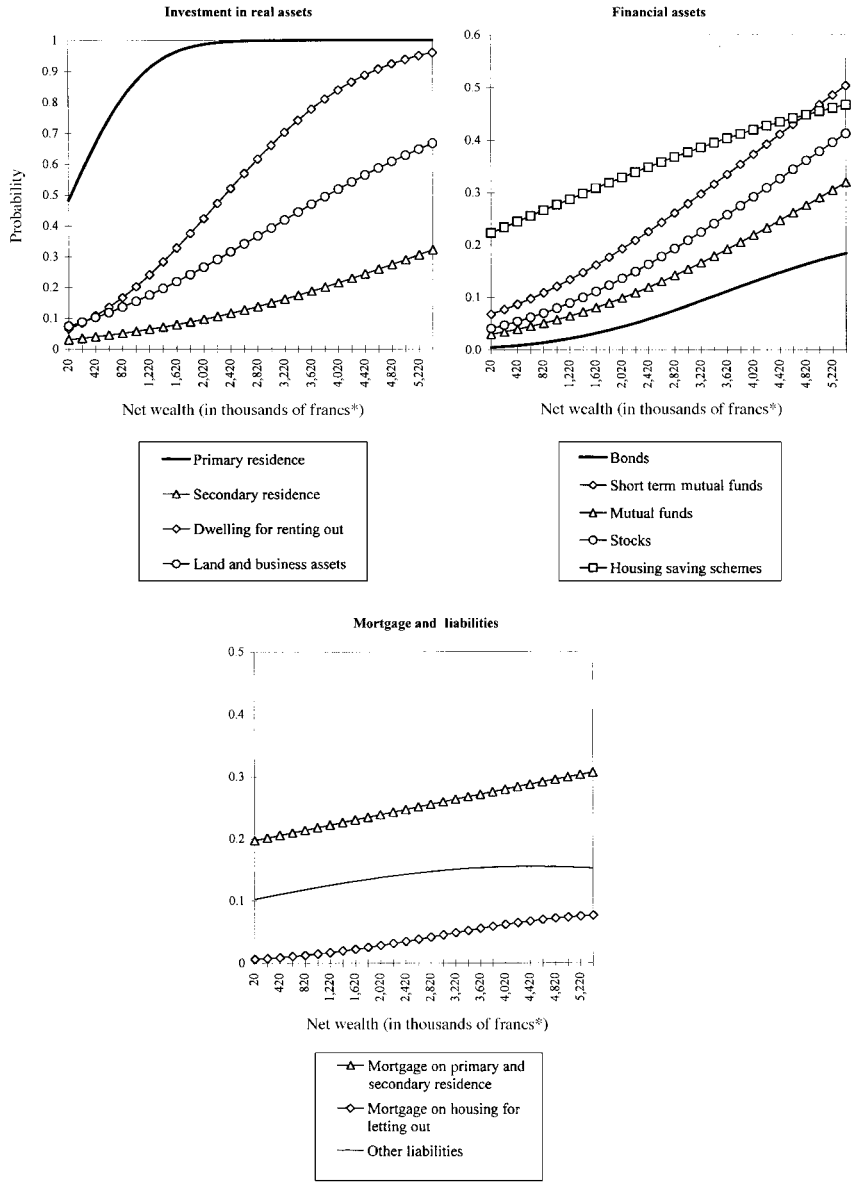
Variables	Mortgage on Primary and Secondary Residence		Mortgage on Dwelling for Renting Out		Other Liabilities	
	Coefficient	Asympotic *t* Stat.	Coefficient	Asympotic *t* Stat.	Coefficient	Asympotic *t* Stat.
Constant	–5.059	–18.488	–4.148	–6.840	–3.453	–11.867
Net wealth (10E–6)[a]	0.073	3.207	0.367	6.006	0.115	2.844
Net wealth^2 (10E–12)	–0.001	–1.680	–0.030	–3.985	–0.013	–2.456
Business wealth (10E–6)[b]	–0.087	–1.977	0.010	0.132	–0.021	–0.387
Business wealth^2 (10E–12)	0.001	0.314	–0.004	–0.464	–0.003	–0.449
Income (10E–05)	0.383	9.621	0.092	2.005	0.132	4.601
Income^2 (10E–10)	–0.042	–7.819	–0.003	–1.021	–0.005	–2.305
Age (10E–1)	1.614	13.766	0.786	3.108	0.990	8.168
Age^2 (10E–2)	–0.193	–14.474	–0.099	–3.620	–0.112	–8.516
Inheritance or *inter-vivos* transfers	0.075	2.065	0.163	2.160	0.136	3.334
Help or *inter-vivos* transfers given	0.040	0.881	0.242	2.867	0.228	4.750
Business activity						
Farmer (Ref.)	0.000		0.000		0.000	
Self employed (small production unit)	0.415	5.312	0.081	0.584	–0.123	–1.453
Self employed (large production unit)	0.275	1.603	–0.032	–0.120	–0.173	–0.910
Liberal profession	0.437	3.127	0.073	0.341	–0.033	–0.221
Executive	0.675	6.938	0.075	0.431	–0.089	–0.841
High qualified employee	0.813	9.388	–0.181	–1.084	0.016	0.167
Low qualified employee	0.671	7.344	–0.120	–0.646	–0.138	–1.352
High qualified workers	0.842	10.297	–0.298	–1.734	–0.110	–1.222
Low qualified workers	0.556	5.454	–0.302	–1.184	–0.062	–0.549
Farmer (retired)	0.837	4.930	0.169	0.509	–0.113	–0.754
Self employed (retired)	1.012	5.731	–0.109	–0.300	0.010	0.064
Salary (retired)	1.409	9.346	0.181	0.589	–0.040	–0.286

Education						
No diploma (Ref.)	0.000		0.000		0.000	
Primary school	0.130	2.693	0.163	1.354	0.090	1.675
Secondary school	0.160	2.626	0.169	1.178	0.089	1.264
Baccalaureat	0.179	2.708	0.235	1.621	0.004	0.055
Graduate studies	0.063	0.852	0.053	0.329	0.026	0.304
Postgraduate studies	–0.140	–1.581	0.283	1.731	0.041	0.424
Type of household						
Single (Ref.)	0.000		0.000		0.000	
Couple without children	0.131	2.135	–0.005	–0.037	0.040	0.603
Couple with one child	0.322	5.056	–0.068	–0.494	0.037	0.515
Couple with two children	0.688	11.044	0.045	0.341	0.066	0.922
Couple with three children	0.845	12.570	0.167	1.191	0.187	2.446
Single parent family	0.060	0.682	–0.149	–0.674	0.086	0.868
Other	–0.031	–0.340	0.047	0.259	0.070	0.744
Sector of professional activity						
Public sector (Ref.)	0.000		0.000		0.000	
Private sector, no unemployment period	0.047	0.975	–0.069	–0.701	–0.070	–1.237
Private sector, unemployment period in the past	–0.039	–0.676	0.069	0.582	–0.021	–0.298
Private sector, currently unemployed	–0.331	–3.472	–0.355	–1.264	–0.177	–1.553
Retired or no activity	–0.559	–4.582	–0.247	–0.935	–0.112	–0.968
Urban area (> 20,000 habitants)	–0.328	–9.524	–0.024	–0.342	–0.173	–4.359
Same asset in parents' wealth	0.174	3.996	0.193	1.841		
Number of observations	9225		9225		9225	
Number of households holding the asset	2897		224		1093	
χ^2 (38 d.l.)	2961.5		338.9		499.9	

Source: Enquête "Actifs Financiers" INSEE 1992.

Notes: [a]Net wealth excludes business assets exploited by their owner.

[b]Business wealth includes all the assets used for professional activity.



Source: Own calculations and "Actifs Financiers" INSEE 1992 survey.
Note: *1 U.S. dollar = 5.5 French Francs.

Figure 1. Effect of Net Wealth on Probability of Ownership

The Wealth Effect

Figure 1 shows the (net) wealth effect (fitted with estimates of Probit models) on the probability of owning different assets, *ceteris paribus*.[18]

[18]All other household characteristics are put at their sample mean.

Two assets show specific profiles. The profile of primary residences is strongly concave, with an ownership probability above 0.85 for wealth of more than 1 million Francs (about 182,000 U.S. dollars). The profile of housing saving schemes is increasing and virtually linear, with the probability always above 0.20.

Other assets can be classified into three groups. In the first group are assets for which the probability of ownership is an increased and convex function of wealth, i.e. mutual funds, stocks, and secondary residences. In the second group are assets for which the probability of ownership increases with wealth with an *S*-shaped profile, i.e. bonds, land, and business assets (not exploited by their owner) and dwellings to rent out. Finally, mortgages on primary and secondary residences vary only between 0.20 and 0.30 along the wealth scale.

These classifications are validated when we compute wealth elasticities of ownership of different assets, measuring variation in the probability of ownership against increasing wealth.[19] These elasticities have been calculated at different levels of wealth (Table 3, the first column of each level of wealth). The wealth elasticities of transferable securities, bonds excepted, and of secondary residences increase when we consider higher and higher levels of wealth. Conversely the wealth elasticities of bonds and real assets (residential, land or commercial) increase in the first instance up to a level of wealth higher than the mean level of decile 9 households and then decrease. The wealth elasticities of primary residences decrease rapidly as wealth increases (over the average level of wealth). Finally, mortgages on residential housing increase as wealth increases (due to purchase of secondary residence) and mortgages on dwellings for renting out follow the same profile as dwellings to let out.

At each level of wealth, the elasticities allow us to classify assets according to the decreased households' interest for them. At the median level in wealth, an increase of wealth leads to the purchase, *if the assets are not already owned*, first of bonds and dwellings for renting out (with mortgage) and afterwards of a group of different assets (land and business assets not exploited by their owner, stocks, mutual funds, and primary residence). At the average level of wealth, an increase in wealth leads first to the purchase of bonds and dwellings for renting out and afterwards of land and business assets not exploited by their owner, stocks and mutual funds (etc.). The same classification can be drawn up for households of decile 9. Finally, the wealthiest households (top centile) give greater importance to secondary residences, then to mutual funds and finally to stocks. For these households, dwelling for renting out ranks only eighth.

To summarize, results reported in Table 3 show that at each level of wealth, at least one type of housing is among the three prevailing investments. Housing is in households' portfolios for a quite low level of wealth. At a level of wealth

[19]The wealth elasticity of owning asset i is calculated from the Probit models according to the definition (see King and Leape, 1998):

$$E'_i = \frac{d\,\mathrm{Prob}(i)/dW}{\mathrm{Prob}(i)/W} = m_i(b_{1i} + 2b_{2i}W)W, \qquad i = 1, \ldots, N$$

with m_i the inverse of Mill's ratio, b_{1i} the wealth coefficient, b_{2i} the coefficient of the square of wealth. All other household characteristics entering in the computation of the inverse of Mill's ratio are fixed at their sample means.

of 1 million Francs (about 182,000 U.S. dollars), the probability of owning the primary residence rises by 85 percent. At a level of 2.5 million Francs (about 455,000 U.S. dollars), the probability of owning a dwelling for letting out is higher than 55 percent. Conversely, owning a secondary residence is less frequent (always inferior to 0.30). We note that portfolios of transferable securities are not very diversified. The probability of holding each of them is always less than 0.50, even for the wealthiest households.[20] Nevertheless, it is in these assets that the wealthiest households make their primary investment. Finally, note that bonds and dwellings for renting out appear very close in their logic of accumulation due to common characteristics (in particular the fact that they are both a source of income).

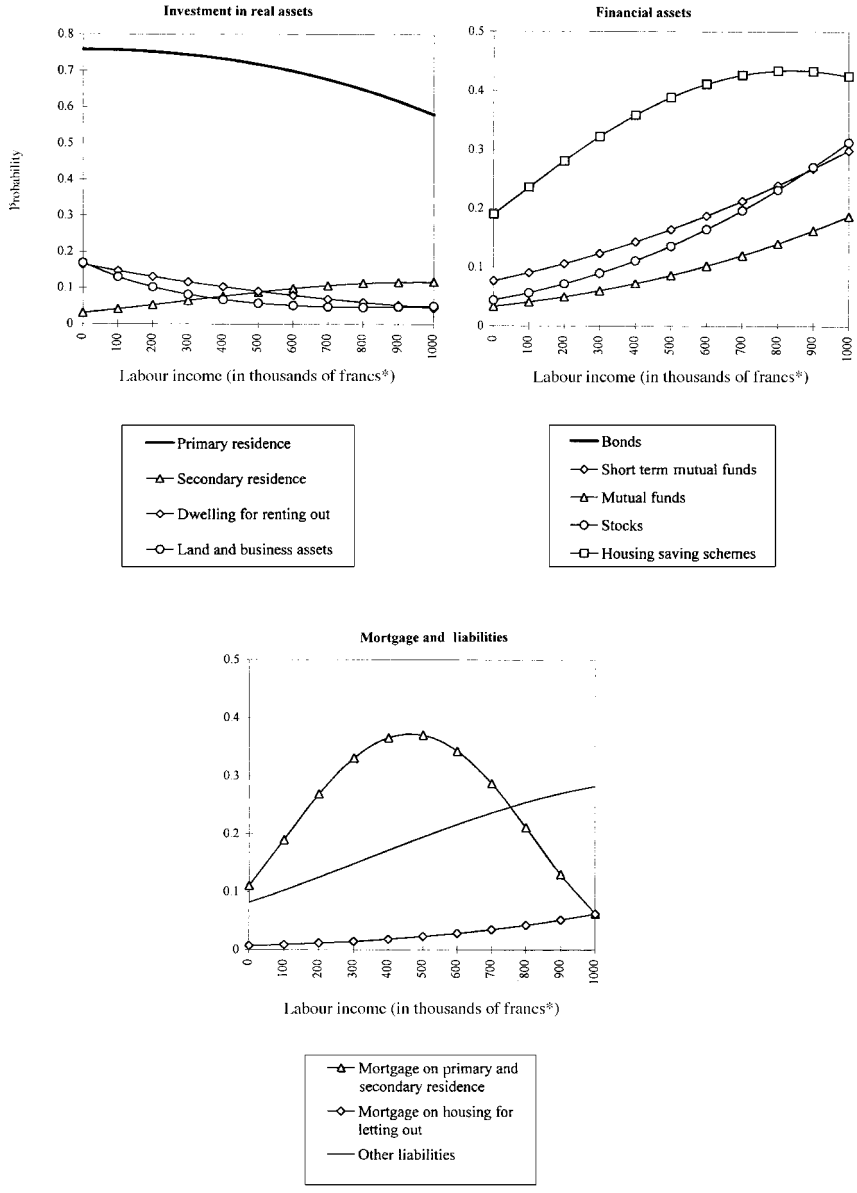
Human Capital Variables

The pattern of ownership probabilities in relation to labor income (Figure 2) clearly differentiates financial assets and secondary residences from primary residences, dwellings for renting out, land and investment in commercial real estate. In the first group the relation between the probability of ownership and labor income increases. Moreover, the profile is concave for the secondary residence and housing saving schemes, and rather convex for transferable securities, bonds excepted. In the second group this relation decreases continuously. To try to interpret these relations we can consider the effect of other variables close to human capital on the probability of owning assets such as social and economic categories, schooling or sector of activity.

First, a high level of schooling, proxy variable for initial stock of information, extends the ownership of transferable securities (bonds, short term mutual funds, mutual funds, stocks). Conversely schooling has a more balanced effect on housing investment, rather negative on primary residences, rather positive on secondary residences (apart from graduate students) and without clear effects on dwellings for renting out (apart from secondary school). Well-to-do wage earners, especially senior executives, more often hold a portfolio of transferable securities than other employed populations. But self-employed persons and farmers are more interested in dwellings for renting out, especially if they have considerable professional wealth. Active farmers are also interested in transferable securities that are less risky, such as bonds and short term mutual funds. Workers in the private sector, apart from those who are currently unemployed, take more risks in their portfolio (they are less risk averse) by holding more stocks. Workers in the private sector who have never been unemployed are more often owner-occupiers of their principal residence, in contrast to those who are presently unemployed (they cannot borrow on the capital market).

Among liabilities, the econometric effect of labor income (Figure 2) clearly distinguishes mortgages on primary and secondary residences and mortgages on dwellings for renting out. The profile of the first is hump-shaped, that of the second increases but remains at a low level (inferior at 0.10 percent). Wage earners

[20]However, when we consider all these assets together, the probability of owning at least one of them is much higher, nearly 0.90 for a financial wealth of 500,000 Francs (about 91,000 U.S. dollars; see Arrondel, 1996).



Source: Own calculations and "Actifs Financiers" INSEE 1992 survey.
Note: *1 U.S. dollar = 5.5 French Francs.

Figure 2. Effect of Labor Income on Probability of Ownership

(active or retired) and retired self-employed are those who have a high probability of borrowing for homes. Those with no diploma or highly educated people have a negative impact on that probability. The self-employed (in small production units) have a high probability of borrowing for dwellings to rent out.

To summarize, employees who are less risk averse and with less risky labor incomes can accept to take risks in their investments and so they hold more risky assets such as stocks (*ceteris paribus*). These households have a level of education or professional experience that enables them to collect and deal with the information needed for managing a portfolio of transferable securities. Conversely, self-employed households whose labor incomes are more risky, invest in real estate for letting out, considered less risky.[21]

Life Cycle Effect, Intergenerational Transfers, and Other Socio-demographic Variables

The probability pattern of ownership according to age, when effects are statistically significant, enables us to characterize the process of asset accumulation (Figure 3). These patterns are concave on the household's life cycle for real assets. Finally, the probability pattern of owning short term mutual funds is concave but at a relatively low level. All other assets are not linked with age. Mortgages on primary and secondary residences follow a very hump-shaped age profile with a maximum between 45 and 50. Mortgages on dwelling for renting out follow a more flat concave age profile with a maximum at 50.

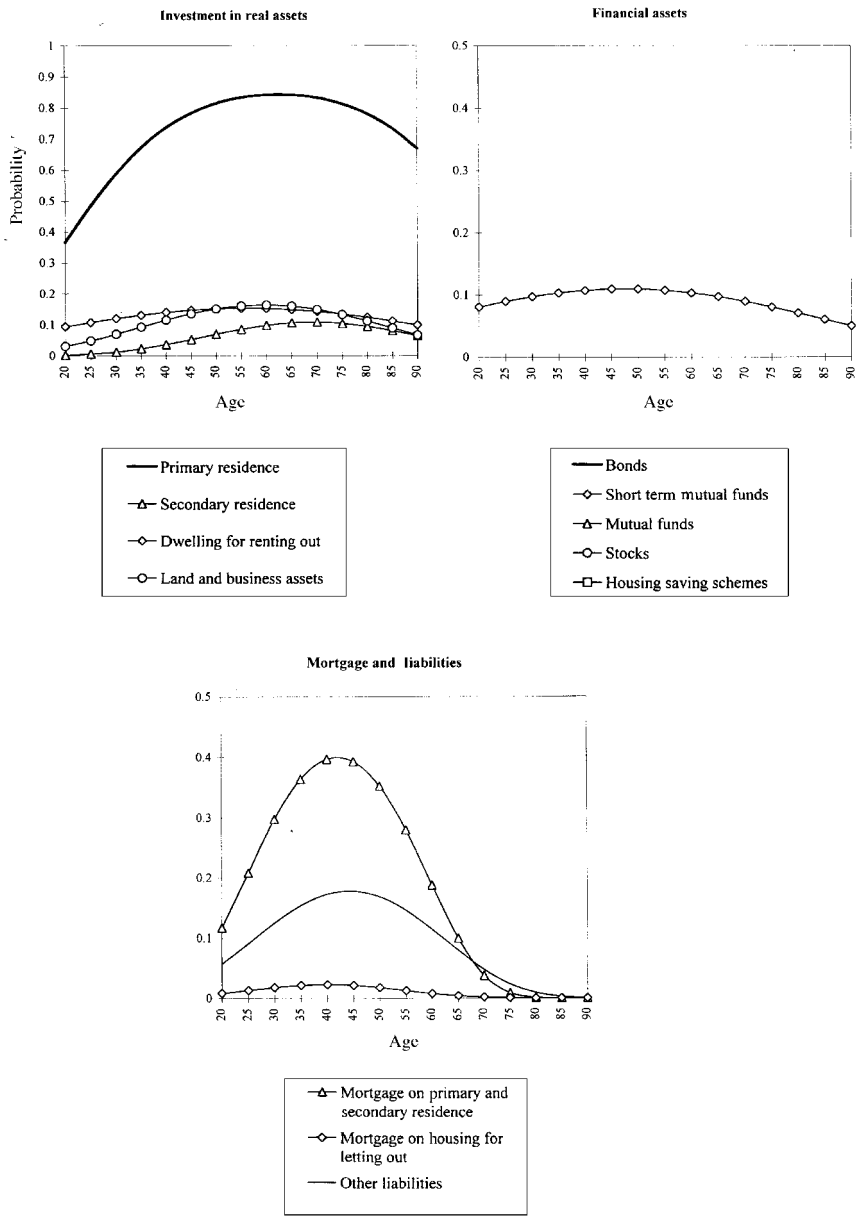
The probability pattern of owning primary and secondary residences (and the probability pattern of having mortgages on them) according to age can be explained by life cycle effects (credit market imperfections, down-payment constraints, children's age, etc.), but also by generation effects. In fact, not all generations of households have enjoyed identical economic environments or housing policies (especially preferential tax treatment). Some have been less favored than others, especially the older generation.

To have a partner and children increases the probability of owning the principal residence and having a mortgage (households are less impatient and have more precautionary needs), but owning a secondary residence is more frequent when couples have only one or two children. Generally, couples with children have a less risky portfolio of transferable securities.

Heirs or donees, given their level of wealth, have a greater probability of owning the whole range of assets, apart from housing savings schemes. This effect is particularly important in the case of real estate for letting out (housing, land and business assets not exploited by their owner). Moreover, all assets are more frequently owned when parents hold the same assets themselves, perhaps because parents also transmit information about wealth management. Parents who have made *inter vivos* gifts to their children more frequently hold mutual funds, but especially dwellings to rent out. Perhaps more altruistic families purchase residences to transfer them later to their children.

Finally, we find that households living in towns (more than 20,000 inhabitants), possess more stocks and secondary residences but fewer primary residences

[21]The decreasing relation between the probability of owning the primary residence and labor income seems very surprising. Because this effect is not the same as those obtained in other surveys (negative in Arrondel and Masson (1989) with data from the CREP 1980 survey, but positive in Arrondel and Masson (1990) with data from the "Actifs Financiers" 1986 survey), it seems difficult to discuss this result (perhaps a problem of measurement error).



Source: Own calculations and "Actifs Financiers" INSEE 1992 survey.

Figure 3. Effect of Age on Probability of Ownership

(and mortgages on them) and investment in real estate to let out. The banking system is more developed in urban areas, so it is easier to invest in stocks. The high housing prices in urban cities and the fact that there are more opportunities for renting homes explain why urban households own their primary residence

less frequently and a secondary residence more often to satisfy their housing consumption needs.[22]

4.2. *Wealth Elasticities*

It is more difficult to explain conditional demand than the discrete choice of ownership for each asset, primary and secondary residences excepted (i.e. housing consumption demand). Apart from wealth and the combination of assets held by the household, few effects appear statistically significant.[23] Consequently, we concentrate our comments on results concerning only wealth elasticities (Table 3).

For each asset, wealth elasticities computed at different levels of wealth enable us to measure the consequences of an increase in wealth on asset demands. These elasticities are the sum of wealth elasticities of ownership, calculated from Probit models, and of wealth elasticities of conditional demand, calculated from econometric models of demand (King and Leape, 1998).[24]

Table 3 shows that for net wealth, conditional upon ownership of assets, investment in housing saving schemes, bonds, money market bonds, primary residence and mortgage and liabilities, changes proportionally less with wealth. The demand for mutual funds (short term or other), dwellings for letting out and secondary residences is homothetic (the coefficients of wealth in equation (3) are not statistically significant). Finally, the conditional demand for stocks, land, and commercial property increases proportionally with wealth.

When we observe total wealth elasticity, assets can be classified into three categories. First, stocks and mutual funds, secondary residences and land or business assets for letting out are clearly luxury assets for which demand increases with wealth.[25] Wealth elasticities of dwellings for letting out and bonds increase up to an intermediate level and subsequently decrease at high levels of wealth. Finally, housing saving schemes and primary residences have wealth elasticities that decrease with wealth, like mortgage and liabilities.

Wealth elasticities allow us to understand how the structure of households' portfolios changes with the size of the portfolio. At the median and average level of wealth, the most demanded assets are dwellings for letting out, stocks, bonds, and land or business assets to let out. Primary residences, often owned at this

[22]For example, the diffusion rate of primary residences in households that live in Paris rises 29.7 percent, compared with 54.6 percent in the whole of France. Conversely, the diffusion rate of secondary residence in households who live in Paris rises 16.6 percent compared with 8.6 percent in the whole of France.

[23]The results of estimation concerning demand for assets can be obtained from the authors upon request.

[24]The wealth elasticities of demand are calculated from the conditional demand models (equation (3)):

$$E_i'' = 1 + c_{1i} W + 2c_{2i} W^2, \qquad i = 1, \ldots, N$$

where c_{1i} is the wealth estimate and c_{2i} that of the square of wealth in the regression of demand for asset i. King and Leape (1998) show that the whole elasticity is the sum of the elasticity of ownership and demand elasticity ($E_i = E_i' + E_i''$)

[25]To be considered a luxury asset, the elasticities must be superior to the average elasticity (and not to one) which differs at each level of wealth. This average elasticity is always superior to one because all new investors in an asset are assumed to purchase the same average amount as old investors (Arrondel and Masson, 1989).

TABLE 3

WEALTH ELASTICITIES BY LEVEL OF NET WEALTH

	Amount of Net Wealth*											
	Median Wealth: 383,500 Francs			Mean Wealth: 674,500 Francs			Decile 9: 1,545,500 Francs			Centile 99: 4,897,000 Francs		
Asset	Ownership	Demand	Total	Ownership	Demand	Total	Ownership	Demand	Total	Ownership	Demand	Total
Investment in real estate												
Primary residence	0.255	0.955	1.210	0.312	0.922	1.234	0.168	0.821	0.989	0.000	0.432	0.432
Secondary residence	0.244	1.000	1.244	0.410	1.000	1.410	0.810	1.000	1.810	1.371	1.000	2.371
Dwelling for renting out	0.452	1.000	1.452	0.712	1.000	1.712	1.127	1.000	2.127	0.377	1.000	1.377
Land and business assets	0.290	1.042	1.332	0.469	1.073	1.542	0.824	1.167	1.991	0.811	1.529	2.340
Financial assets												
Bonds	0.513	0.865	1.378	0.822	0.768	1.590	1.408	0.508	1.916	1.089	–0.080	1.009
Short term mutual funds	0.228	1.000	1.228	0.376	1.000	1.376	0.713	1.000	1.713	0.998	1.000	1.998
Mutual funds	0.261	1.000	1.261	0.433	1.000	1.433	0.831	1.000	1.831	1.248	1.000	2.248
Stocks	0.265	1.156	1.421	0.437	1.272	1.709	0.828	1.624	2.452	1.163	2.978	4.141
Housing saving scheme	0.085	0.813	0.898	0.140	0.677	0.817	0.264	0.289	0.553	0.345	–0.892	–0.547
Mortgage and liabilities												
Mortgage on primary and secondary residence	0.040	0.581	0.621	0.068	0.271	0.339	0.144	–0.640	–0.496	0.341	–3.770	–3.429
Mortgage on housing for letting out	0.352	0.746	1.098	0.568	0.564	1.132	0.996	0.059	1.055	0.647	–1.270	–0.623
Other liabilities	0.145	0.578	0.723	0.233	0.277	0.510	0.404	–0.545	–0.141	0.061	–2.533	–2.472

Source: Own calculations and "Actifs Financiers" INSEE 1992 survey.

Note: *1 U.S. dollar = 5.5 French Francs.

level of wealth, appear only in eighth place and are no longer a luxury good. For average wealth of decile 9, stocks are the most demanded asset, followed by dwelling for renting out, land or business assets (not exploited by their owner) and bonds. The 1 percent of wealthiest households invest first in stocks, then in land and business assets for letting out, and finally in secondary residence and mutual funds. Dwellings for letting out are in sixth place and primary residences in eighth place.

This effect of wealth on the choice of households' portfolios can be explained mainly by the fact that risk aversion decreases as wealth increases and by the presence of information costs.[26] In the light of the real estate crisis of the beginning of the 1990s, housing was considered a safe asset. At the time, households with a relatively small wealth gave greater priority to housing in their portfolio, especially to respond to preferential tax policy. As soon as wealth increases, households buy transferable securities, beginning with bonds, considered less risky than mutual funds or stocks.

4.3. *Miscellaneous Results*

To appreciate the importance of housing on portfolio allocations, we conducted some complementary estimations (Arrondel and Lefebvre, 1996).[27]

We have used a measure of wealth excluding the value of primary and secondary residence, and so we assume implicitly that ownership of these assets does not respond to motives of investment. Then, to take into account the heterogeneity in portfolio management between owner-occupiers and renters and to test the exogeneity of housing decisions on portfolio choice, we introduce the instrumented probability of home ownership (estimated with a Probit model) in the set of explanatory variables. Ownership for the primary residence has a positive effect on the probability of owning all other assets, apart from housing saving schemes.[28] Consequently, we can conclude that home owners' portfolios are different from those of renters, given non-housing (consumption) wealth.[29]

This result therefore confirms that housing wealth has a considerable influence on portfolio choice, especially with respect to explaining risky assets demand, according to the predictions of a model that considers simultaneously the dual dimension of housing with tax preferences for owner-occupied properties (Flavin and Yamashita, 1998).

5. Conclusion

The two-dimensional aspect of home ownership (consumption and investment) increases the difficulty of analyzing households' portfolio choices and

[26]It is difficult to justify this effect with fixed transaction and holding costs because although they are high for transferable securities, they are also high for real assets.

[27]The results of estimation concerning these results can be obtained from the authors upon request.

[28]In particular, as a great majority of landlords also own a primary or secondary residence (83 percent), there is a probable causality effect which is compatible with the model of Henderson and Ioannides (1983): to satisfy their demand for housing, households first buy their primary residence and then invest in dwellings for letting out (see also Bruekner, 1997).

[29]Hochguertel and van Soest (1996) find similar results for Dutch households.

housing purchases. In this paper, we estimated a portfolio choice model where different dwellings are defined as assets. There were two main results from the empirical study.

First, housing shows some specificities in households' wealth accumulation. The probability of holding a primary residence follows a hump-shaped age profile, consistent with the life cycle hypothesis. Moreover, housing assets are in households' portfolios for a low level of wealth while transferable securities attract primarily the wealthiest households.

Second, we showed the difficulty of analyzing portfolio decisions over the life cycle without taking account of the process of accumulation of owner-occupied housing. In particular, risky assets demand should be greatly influenced by attitudes towards home property. For instance, the financial portfolio of young (less wealthy with DARA utility function) households would be less risky than that of older people if the former wish to be homeowners because of preferential tax treatment.

References

Agell, J. and P. A. Edin, "Marginal Taxes and the Asset Portfolios of Swedish Households," *Scandinavian Journal of Economics*, 92, 47–64, 1990.

Arrondel, L., "Patrimoine des ménages: toujours le logement, mais aussi les actifs de précaution," *Economie et Statistique*, no. 296–297, 33–62, 1996.

Arrondel, L., F. Guillaumat-Taillet, and D. Verger, "Montants du patrimoine et des actifs: qualité et représentativité des déclarations des ménages," *Economie et Statistique*, no. 296–297, 145–64, 1996.

Arrondel, L. and B. Lefebvre, "L'arbitrage investissements immobiliers/placements mobiliers," rapport pour le Ministère du Logement, Direction de l'Habitat et de la Construction, Paris, 1996.

———, "Consumption and Investment Motives in Housing Wealth Accumulation: a French Study," *Journal of Urban Economics*, 50, 112–37, 2001.

Arrondel, L. and A. Masson, "Déterminants individuels de la composition du patrimoine: France 1980," *Revue Economique*, 40, 441–502, 1989.

———, "Hypothèse du cycle de vie, diversification et composition du patrimoine: France 1986," *Annales d'Economie et de Statistique*, 17, 1–45, 1990.

———, "Gestion du risque et comportements patrimoniaux," *Economie et Statistique*, 1996, no. 296–297, 63–89, 1996.

Arrow, K. J., *Aspect of the Theory of Risk Bearing*, Yrjö Johnson Lectures, Helsinki, 1965.

Artle, R. and P. Varaiya, "Life Cycle Consumption and Home Ownership," *Journal of Economic Theory*, 18, 38–58, 1978.

Bar-Ilan, A. and A. S. Blinder, "Consumer Durables and the Optimality of Usually Doing Nothing," *Journal of Money, Credit and Banking*, 24, 258–72, 1992.

Bodie Z., R. C. Merton, and W. F. Samuelson, "Labor Flexibility and Portfolio Choice in a Life-cycle Model," *Journal of Economic Dynamics and Control*, 16, 427–49, 1992.

Bound J., D. A. Jaeger, and R. Baker, "Problems with Instrumental Variables Estimation when the Correlation Between the Instruments and the Endogenous Explanatory Variables is Weak," *Journal of the American Statistical Association*, 90, 443–50, 1995.

Brueckner, J. K., "Consumption and Investment Motives and the Portfolio Choices of Homeowners," *Journal of Real Estate Finance and Economics*, 16, 159–80, 1997.

Constantinides, G. M., "Capital Market Equilibrium with Transaction Costs," *Journal of Political Economy*, 94, 842–62, 1986.

Dicks-Mireaux, L. D. L. and M. A. King, "The Effect of Pensions and Social Security on the Size and Composition of Household Asset Portfolio," in Z. Bodie and J. Shoven (eds), *Financial Aspects of the U.S. Pension System*, University of Chicago Press, N.B.E.R., 399–439, 1984.

Drèze, J. and F. Modigliani, "Consumption Decisions under Uncertainty," *Journal of Economic Theory*, 5, 308–35, 1972.

Dubin, J. A. and D. L. MacFadden, "An Econometric Analysis of Residential Electric Appliance Holdings and Consumption," *Econometrica*, 52, 345–62, 1984.

Eeckhoudt, L. and M. Kimball, "Background Risk, Prudence, and the Demand for Insurance," in G. Dionne (ed.), *Contributions to Insurance Economics*, Kluwer Academic Press, London, 1992.

Eeckhoudt, L., Ch. Gollier, and H. Schlesinger, "Changes in Background Risk and Risk Taking Behavior," *Econometrica*, 64(3), 683–9, 1996.
Flavin, M. and T. Yamashita, "Owner-Occupied Housing and the Composition of the Household Portfolio Over the Life-Cycle," N.B.E.R. Working Paper no. W6389, 1998.
Gollier, Ch., *The Economics of Risk and Time*, MIT Press, Cambridge, MA, 2001.
Gollier, Ch. and J. W. Pratt, "Weak Proper Risk Aversion and the Tempering Effect of Background Risk', *Econometrica*, 64(5), 1109–23, 1996.
Gollier, Ch. and R. Zeckhauser, "Horizon Length and Portfolio Risk," N.B.E.R., Technical Working Paper 216, 1997.
Gouriéroux, C., A. Monfort, A. Renault, and A. Trognon, "Simulated Residuals," *Journal of Econometrics*, 34, 201–52, 1987.
Greene, W. H., "Sample Selection Bias as a Specification Error: Comment," *Econometrica*, 49, 795–8, 1981.
Grossman, S. J. and G. Laroque, "Asset Pricing and Optimal Portfolio Choice in the Presence of Illiquid Consumption Durable Goods," *Econometrica*, 58, 25–51, 1990.
Heckman, J. J., "Sample Selection Bias as a Specification Error," *Econometrica*, 47, 153–62, 1979.
Henderson, J. V. and Ioannides, Y. M., "A Model of Housing Tenure Choice," *American Economic Review*, 73, 98–111, 1983.
Hochguertel, S. and A. van Soest, "The Relation between Financial and Housing Wealth of Dutch Households," VSB-CentER Saving Project, Progress Report 40, 1996.
Hubbard, G. R., "Personal Taxation, Pension Wealth, and Portfolio Composition," *Review of Economics and Statistics*, 67, 53–60, 1985.
Ioannides, Y. M., "Housing, Other Real Estate, and Wealth Portfolios," *Regional Science and Urban Economics*, 19, 259–80, 1989.
Ioannides, Y. M. and S. S. Rosenthal, "Estimating the Consumption and Investment Demands for Housing and their Effect on Housing Tenure Status," *The Review of Economics and Statistics*, XX, 127–41, 1994.
Kessler, D. and E. N. Wolff, "A Comparative Analysis of Household Wealth Patterns in France and in The United States," *Review of Income and Wealth*, 37(3), 249–66, 1991.
Kimball, M. S., "Precautionary Motives for Holding Assets," in J. Eatwell, M. Milgate, and P. Newman (eds), *The New Palgrave Dictionary of Money and Finance*, Norton, New York, 158–61, 1992.
———, "Standard Risk Aversion," *Econometrica*, 61, 589–611, 1993.
King, M. A. and J. I. Leape, "Asset Accumulation, Information and the Life Cycle," N.B.E.R. Working Paper Series, no. 2392, 1987.
———, "Wealth and Portfolio Composition: Theory and Evidence," *Journal of Public Economics*, 69, 155–93, 1998.
Koo, H. K., "Consumption and Portfolio Choice with Uninsurable Income Risk," Mimeo, Princeton University, 1991.
Leape, J. I., "Taxes and Transaction Costs in Asset Market Equilibrium," *Journal of Public Economics*, 33, 1–20, 1987.
Linneman, P. D. and I. F. Megbolugbe, "Home Ownership," *Urban Studies*, 30(4–5), 659–82, 1993.
MacLennan, D. and M. Stephens, "Housing, Finance, and the Single European Currency," Mimeo, University of Glasgow, 1997.
Masson, A., "A Cohort Analysis of Age–Wealth Profiles Generated by a Simulation Model in France (1949–1975)," *Economic Journal*, 96, 173–90, 1986.
Mayshar, J., "Transaction Costs in a Model of Capital Equilibrium," *Journal of Political Economy*, 87, 673–700, 1979.
———, "Transaction Costs and Pricing of Assets," *Journal of Finance*, 36, 583–97, 1981.
Merton, R. C., "Lifetime Portfolio Selection under Uncertainty: the Continuous Time Case," *Review of Economic Studies*, 51, 247–57, 1969.
———, "Optimal Consumption and Portfolio Rules in a Continuous Time Model," *Journal of Economic Theory*, 3, 373–413, 1971.
———, "An Intertemporal Capital Asset Pricing Model," *Econometrica*, 41, 867–87, 1973.
Mossin, J., "Optimal Multiperiod Portfolio Policies," *Journal of Business*, 41, 215–29, 1968.
Pratt, J. and R. Zeckhauser, "Proper Risk Aversion," *Econometrica*, 55(1), 143–54, 1987.
Samuelson, P. A., "Lifetime Portfolio Selection by Dynamic Stochastic Programming," *The Review of Economic Studies*, 51, 239–46, 1969.
Smith, L. B., K. T. Rosen, and G. Fallis, "Recent Developments in Economic Models of Housing Markets," *Journal of Economic Literature*, 26, 29–64, 1988.
Szpiro, D., "La diffusion des produits financiers auprès des ménages en France," *Economie et Statistique*, 281, 41–60, 1995.