Homeownership and Investment in Risky Assets in Europe

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Abstract

This study examines how housing influences households' risky asset holdings in multiple European countries, using the 2004 Survey of Health, Ageing and Retirement in Europe (SHARE) data set. This research provides three major findings. First, homeowners in bank-based economies have a significantly lower probability of participating in the stock market, whereas in market-based economies, homeownership has no significant impact on this probability. Second, homeowners tend to invest a lower share of their financial assets in stocks compared to renters. Third, households with a higher home value to wealth ratio invest a lower share of financial assets in stocks in countries with more developed mortgage markets. In contrast, in countries with underdeveloped mortgage markets, households with a higher home value to wealth ratio invest a larger share of financial assets in stocks. The results of this study suggest that recognizing differences in financial market structures is crucial to understanding the relationship between housing investment and stock investment.

Keywords: homeownership, household portfolio, risky asset holdings, SHARE

1. Introduction

In many countries, housing is considered the most important asset in a household's portfolio. Recent data show that the average homeownership rate is 65 percent in the euro area and that, for many homeowners, investment in housing accounts for more than 60 percent of household wealth (Catte, Girouard, Price, & Andre, 2004) (Note 1). There are special features of housing that differentiate it from other elements of a portfolio. First, a house is an indivisible, durable good, the buying and selling of which involves high transaction costs. Adjustment in housing consumption occurs only infrequently (Note 2) because households adjust their housing consumption only if the current consumption deviates from the optimal level to a large enough extent to justify the high transaction costs. Second, housing is both a durable consumption good and an investment good providing a positive expected return. In general, a household's consumption demand for housing is not always equal to its investment demand for housing. When the consumption demand is larger than the investment demand, the household may choose to overinvest in housing, leaving most of its portfolio inadequately diversified (Brueckner, 1997; Flavin & Yamashita, 2002). Third, households often invest in housing through a mortgage contract, and this leveraged position exposes homeowners to risks associated with committed mortgage payments out of an uncertain income stream over a long horizon. Exposure to this "mortgage commitment risk" may induce homeowners to hold more conservative financial portfolios (Fratantoni, 1998; Chetty & Szeidl, 2010). Fourth, house prices are quite volatile over time, and house price risk induces homeowners to lower their investment in risky financial assets (Cocco, 2005).

Previous studies have shown how housing investment influences households' portfolio choices. Using a calibrated life-cycle model, Cocco (2005) showed that investment in housing can reduce stock market participation rates by almost half in the United States. Using a numerical simulation, Flavin and Yamashita (2002) reported that the proportion of financial assets invested in stocks changes considerably according to the ratio of home value to wealth. Yamashita (2003), empirically testing the theoretical model of Flavin and Yamashita (2002), found that households with a higher home value to wealth ratio invest a lower proportion of their financial assets in stocks. Using data from the United States, Fratantoni (1998) and Chetty and Szeidl (2010) showed that an increase in housing investment leads households to reduce their risky asset holdings, primarily because of their increased exposure to mortgage commitment risks. Furthermore, Chetty and Szeidl (2010) reported that house price risks have a smaller effect on households' portfolio choices compared to mortgage commitment risks.

Using a simple mean-variance portfolio framework proposed by Flavin and Yamashita (2002), the present study examines how housing investment affects households' risky asset holdings. This model predicts that a household's financial portfolio is significantly affected by its home value to wealth ratio, which is determined largely by its consumption demand for housing rather than by pure investment demand. Using the 2004 Study of Health, Aging and Retirement in Europe (SHARE), this study investigates whether the predictions of this model match the actual household portfolios. This study shows that risky asset holding patterns vary across countries depending on their financial market structures and degree of financial market development (Note 3 & 4). In market-based economies such as Switzerland and the Netherlands, where the stock market plays a more important role in financial transmissions than banking systems, homeowners tend to hold highly leveraged portfolios, as they have relatively easier access to mortgage credit. Therefore, having a higher home value to wealth ratio exposes homeowners to a greater mortgage commitment risk, which induces them to adjust their portfolio risk by reducing their investment in stocks. On the other hand, in bank-based economies such as Spain and Germany, where banks play a leading role in mobilizing and allocating capital, the proportion of homeowners with mortgage debt remaining against their housing is generally low due to the restrictive mortgage market environments. Without mortgage debt, a higher home value to wealth ratio indicates that a larger share of homeowners' wealth is locked up in highly illiquid housing wealth. This motivates homeowners to diversify their portfolios by investing a larger share in stocks.

This study contributes to the literature in two ways. First, it supports existing studies by affirming the substitution relation between housing investment and financial investment in countries with well-developed mortgage markets. Second, and more importantly, this study identifies the diversification motivation of homeowners when mortgage markets are less developed. To my knowledge, this is the first study to use multinational survey data to examine households' portfolio choices in the presence of housing. The empirical results lend support to the claim that investment in housing affects households' risky asset holdings. More importantly, the results show that recognizing differences in financial market structures is crucial to understanding the relationship between housing investment and financial investment.

The rest of this article is organized as follows. Sections 2 and 3 describe the economic model and data. Next, section 4 reports the empirical results concerning households' portfolio decisions in the presence of housing. Section 5 presents conclusions.

2. Models

A large number of theoretical studies predict that housing plays an important role in the allocation of financial assets between stocks and a riskless asset (Brueckner, 1997; Flavin & Yamashita, 2002; Cocco, 2005; Chetty & Szeidl, 2010). Using a mean-variance portfolio model proposed by Flavin and Yamashita (2002), this study empirically tests predictions regarding the relationship between housing investment and financial investment. In this model, a household is assumed to maximize the expected returns from its portfolio. The household chooses the share of its wealth to invest in risky assets and in a mortgage in consideration of the current value of the home. For simplicity, this model assumes that the household's wealth consists only of financial assets and housing wealth. The household solves the following optimization problem:

$$\max \quad (h\mu_H + x\mu) - A(x\sum x^T + h^2\sigma_P^2)/2 \qquad (1)$$

subject to the constraint

$$1 = h + xl \qquad (2)$$

where x is a vector of shares of financial assets and mortgages in total wealth, h is the share of housing investment in total wealth, μ and μ_H are vectors of the expected returns of financial assets and of the house, $\sum$ and σ_P^2 are the covariance matrix of financial assets and the variance of the house, l is the vector of ones, and A is the household's relative risk aversion.

Financial assets and housing are assumed to be different in terms of adjustment costs. This study assumes that housing adjustment can be made only by selling the existing house and buying a new one. In general, housing adjustment occurs only infrequently due to the high transaction costs. In contrast, the cost of financial asset

(including mortgage) adjustment is assumed to be zero. A household borrows only through mortgages, and the size of a mortgage should be equal to or less than the value of a home.

The size of housing investment is endogenously determined, but it is treated as a state variable. It is assumed that a household constantly evaluates the extent to which the current level of housing consumption deviates from the optimal level and decides to buy a new house only when the benefit from the adjustment is large enough to justify the high transaction costs. Therefore, adjustment toward the optimal level is always lagged, and for a given time period, the current level of housing consumption—measured by the home value to wealth ratio (h)—can be considered a state variable that imposes a constraint on the household's portfolio choices. This constraint imposed by the consumption demand for housing is referred to as the "housing constraint." In other words, a household solves an optimization problem by choosing the share of financial assets, x, at a given housing constraint, h. As a result, the optimal portfolio for the household depends on the state variable of h and on preferences toward risk.
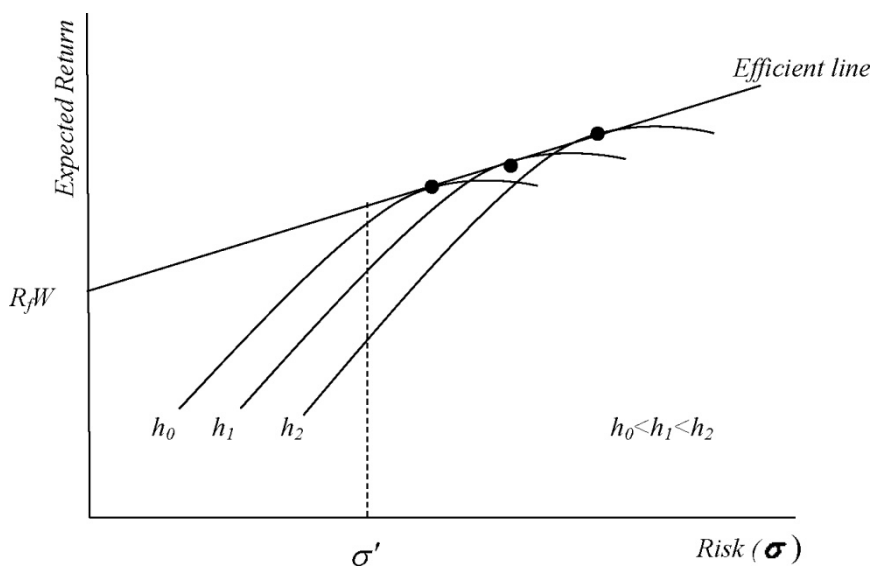

Figure 1. The efficient line and fixed-h efficiency loci

Figure 1 illustrates the household's optimization problem with the constraint imposed by the state variable h. If there is no constraint, the optimal portfolio choice of the household will lie on an "efficient line," which gives the maximal expected return for each level of risk (σ). Now consider a household that has to choose an optimal portfolio with the housing constraint. The household solves an optimization problem to maximize the expected return for each level of risk (σ) at a given value of h, and the solution to this problem yields a "fixed-h" efficiency locus, as in Figure 1. For each value of h, the household moves along a fixed-h efficiency locus that is strictly concave. These fixed-h efficiency loci are tangent to the efficient line, which is the solution to the optimization with no constraint. At each given value of h, the most efficient portfolio lies on the efficient line. Figure 1 illustrates two properties of the fixed-h loci that are critical to understanding the relationship between housing investment and risky asset holdings. First, an increase in housing investment shifts the household's efficiency locus to the right and induces the household to reallocate its portfolio to obtain an efficient portfolio. Second, at a given level of risk (σ), an increase in housing investment forces the household to reduce its investment in risky financial assets and land in a portfolio providing lower expected returns.

This study aims to empirically test this model using data. In order to examine how financial asset choice is affected by varying ratios of home value to wealth (h), this study uses the below estimation model,

$$risky\,asset\,share_i = \alpha + \beta h_i + \lambda z_i + \varepsilon_i \qquad (3)$$

where h_i is the ratio of home value to wealth for household i, z_i is a vector of household portfolio determinants, and ε_i is an error term.

This specification aims to obtain unbiased estimates for housing-related variables, where the dependent variable is the proportion of financial assets invested in stocks. There are two major concerns regarding the use of this

specification. First, a large proportion of households do not participate in the stock market, and this leads to a sample selection problem. This problem is addressed by using the Heckman correction. Second, there is a potential endogeneity issue related to home-related variables. Because households simultaneously determine the share they invest in stocks and in housing wealth, regular OLS estimates might be biased due to endogeneity among variables. This study addresses the endogeneity problem by using the two-stage-least-squares (TSLS) method. The instrument variables used in the first stage are a set of predetermined variables: the number of rooms at home, the number of years since the household moved into the community, the number of years since the household moved into the house, and dummy variables for the region of residence. These variables are obviously correlated with h through the consumption demand for housing and the house value, but they are not necessarily correlated with the share invested in stocks. Using these four variables as instruments, the first-stage regressions for h exhibit reasonable fits in all sample countries (R-squared of 0.419 or above).

3. Data

To examine households' stock holding patterns in the presence of housing, this study uses the 2004 Survey of Health, Ageing and Retirement in Europe (SHARE) baseline study, which surveyed a representative sample of individuals aged 50 and above in Europe (Note 5). The interviews for the baseline study took place in 2004 (Note 6) in 11 European countries. The participating countries are Austria, Belgium, Denmark, France, Germany, Greece, Italy, Netherlands, Spain, Sweden, and Switzerland. These countries differ in terms of their financial market structures and degree of financial market development. Following the definition of Demirguc-Kunt and Levine (1999), the sample countries are classified into three groups: market-based economies (Switzerland, Sweden, the Netherlands, and Denmark), bank-based economies (Spain, Germany, France, Italy, Belgium, Austria, and Greece), and financially underdeveloped economies (Denmark and Greece). According to the mortgage market index of Cardarelli, Igan and Alessandro (2008), the four market-based economies have more developed mortgage markets, while the seven bank-based economies have less developed mortgage markets.

The SHARE provides extensive information on household income and wealth. Therefore, the SHARE is an important source of data when examining a household's portfolio. The 2004 SHARE surveyed 32,405 individuals from 28,517 households in 11 European countries. This study, however, focuses on households that hold meaningful portfolios by applying the following sample selection criteria. Households with (1) gross financial assets less than 500 euros (Note 7), (2) non-positive total net wealth, and (3) non-positive income are excluded from the sample. In addition, this study excludes outliers whose ratios of home value to wealth are higher than four. After applying these exclusion criteria, the final sample contains 15,372 households.

The key variables are defined as follows. A household's (direct) participation in the stock market is defined as holding stocks without the intermediation of institutional investors. The share of wealth invested in stocks (i.e., the risky asset share) is measured by the value of stockholdings as a fraction of the household's total financial assets. The other key variables of this analysis are housing-related. A household is defined as a homeowner when the household owns a single unit of real estate for the purpose of primary residence. The home value to wealth ratio is measured by the house value net of mortgage as a proportion of the household's net wealth.

Table 1. Summary statistic

| | Market-based economies | | | | | Bank-based economies | | | | | |
| | Financially developed | | | Under [1] | | Financially developed | | | | | Under [1] |
	SWI [2]	Sweden	NLD [3]	DNK [4]	Spain	DEU [5]	France	Italy	Belgium	Austria	Greece
Age	65	68	65	65	67	66	67	66	67	66	64
% of High school graduates	24.8	18.5	25.9	38.3	11.5	52.1	31.3	21.5	28.1	47.0	25.5
% of College graduates	34.8	32.5	25.9	43.8	15.1	36.5	25.4	14.4	33.8	32.8	24.4
Family size	2.0	1.8	2.0	1.8	2.6	2.0	2.0	2.5	2.0	2.0	2.3
Married (%)	65.5	63.7	72.2	64.5	66.2	66.2	65.1	70.7	69.0	62.5	67.5
% of stockownership	30.9	47.3	21.3	42.3	9.5	16.3	20.2	7.9	21.6	8.0	10.3
Share invested in stocks (%) [6]	31.0	22.1	28.9	18.9	37.8	22.0	25.8	41.4	.30.7	27.3	35.1
% of Homeownership	57.8	71.7	60.9	75.9	87.9	53.8	76.8	83.1	81.4	63.6	89.3
% of Mortgage holding [7]	83.1	51.7	77.4	64.0	9.3	27.2	12.2	4.5	14.2	13.0	4.6

Net Wealth (thousand euros)	221.3	119.9	198.0	151.2	190.7	130.0	216.7	196.8	225.3	157.3	163.1
Financial asset (thousand euros)	52.8	36.0	26.5	40.1	6.8	25.8	19.1	13.1	27.3	16.1	12.4
Financial-asset-to-net-wealth ratio	0.42	0.39	0.36	0.39	0.05	0.41	0.13	0.09	0.20	0.21	0.08
Home value (thousand euros)	328.8	87.9	285.7	134.8	150.5	206.5	188.3	157.7	176.7	159.6	106.1
Mortgage outstanding (thousand euros)	101.1	24.4	55.1	49.8	37.6	41.3	15.1	21.9	15.3	13.8	17.5
Home-value-to-wealth ratio [8]	0.63	0.54	0.76	0.60	0.88	0.75	0.80	0.84	0.75	0.82	0.70
Mortgage-to-home value ratio	0.31	0.21	0.20	0.33	0.14	0.17	0.07	0.11	0.08	0.06	0.13
No of observations	655	1671	1846	876	1232	1749	1648	1222	2241	1099	1133

Note. Country classification depending on the financial market structures are reported in Appendix Table 1. The values of household net wealth, financial asset, home value, mortgage outstanding are all measured in 2005 Euro. The reported net wealth, financial asset, financial-asset-to-net-wealth ratio, home value, mortgage outstanding, home-value-to-wealth ratio, and mortgage-to-home-value ratio are all median values. 1) Financially underdeveloped. 2) Switzerland. 3) Netherlands. 4) Denmark. 5) Germany. 6) The share invested in stocks is measured by the values of stockholdings as a proportion of financial asset, conditional on stock market participation. 7) The proportion of mortgage holding is the proportion of households with remaining mortgage balances, conditional on homeownership. 8) Home-value-to-wealth ratio is measured by the ratio of home equity (home value minus remaining mortgage balance) to net wealth ratio.

Following the traditional finance theories, the model specification includes a set of determinants of risky asset holdings; a household's net wealth (gross wealth minus the household's liabilities), the household's total income (the sum of labor, rental, interest, business, and transfer incomes). It also controls for a set of demographic variables; age of the household head, age-squared, a dummy variable for high school graduates and college graduates, family size, marital status, and risk preference. The risk preference variable is a dummy variable that is equal to 1 if the household head said he/she is willing to take risks, and zero otherwise. Most specifications use the logarithm of net wealth and the logarithm of total income variables. All income and wealth variables are measured in 2005 euros. The TSLS specifications control for the ownership of one's own business and the ownership of real estate other than one's primary residence.

Table 1 presents a summary of statistics for key variables. The average age of the household heads is between 64 and 68 years. The proportion of married couples ranges from 65 percent in Italy to 53 percent in Austria. The average family size is two. The (direct) stock market participation rates vary significantly across countries. The rates are relatively higher in market-based economies such as Switzerland and Sweden and generally lower in bank-based economies. For households participating in the stock market, the average level of conditional shares of financial assets invested in stocks ranges from 22 percent to 41 percent across countries. There exists considerable variation in housing-related statistics. Homeownership rates range from 53.8 percent in Germany to 89.3 percent in Greece. Generally, homeownership rates are lower in central Europe and higher in southern Europe. Among homeowners, the proportion of households that have remaining mortgage debt against their housing wealth also varies. In particular, in market-based economies, more than half of homeowners hold mortgage debt against their housing wealth, while this proportion is less than 10 percent in bank-based economies. In market-based economies, home equity (home value net of mortgage balance) accounts for about 60 percent of households' net wealth. On the other hand, in bank-based economies, home equity accounts for almost 80 percent of households' net wealth, suggesting that most of the wealth of homeowners is locked up in housing. Table 1 also reports the median values for the wealth variables. The (median) value of household net wealth ranges from 119,932 euros in Sweden to 225,264 euros in Belgium. The (median) value of total financial wealth ranges from 6,830 euros in Spain to 52,764 euros in Switzerland. The total financial wealth as a proportion of net wealth is higher in market-based economies than in bank-based economies. In southern European countries, the proportion is lower than 10 percent. As such, the composition of household portfolios varies significantly across countries depending on the market structure of each economy.

4. Results

4.1 Determinants of Stock Market Participation

This section first explores households' stock market participation using probit regressions. The dependent variable is a dummy variable indicating that a household owns stock directly. This probit model specification includes household wealth, income, (Note 8) a dummy variable for risk preference, age and age-squared, dummy variables for high school and college graduates, marital status, and family size. Because this study focuses on the effect of housing investment on risky asset holdings, a dummy variable for homeownership is also included in the model. Table 2 reports the probit estimates for stock market participation in 11 European countries. All of the estimates reported are marginal effects.

Table 2 shows that the major determinants of stock market participation are household wealth, income, education level, and attitude toward risks. First, the coefficients for the wealth quartile dummies are positive and statistically significant at the 1 percent level in all sample countries, which indicates that wealthier households have a higher probability of stock market participation. Second, income also has a positive effect on the probability of stock market participation in all but one country. The coefficients for the income quartile dummies are positive and statistically significant in 10 countries. Third, a household's risk preference is another important determinant of stock market participation. The coefficients for the risk preference variable are positive in all countries and statistically significant in all but two countries. Fourth, a higher education level is positively associated with an increased probability of stock market participation.

One of the major findings of this study is reported in the first row of Table 2, which shows the probit estimates for the homeownership variable. This estimate can be interpreted as the difference in the probability of stock market participation between homeowners and renters. The results show that the impact of homeownership on the probability of stock market participation differs according to the degree of mortgage market development. In three countries with well-developed mortgage markets (Switzerland, Sweden, and the Netherlands), the estimates for the homeownership variable are statistically insignificant, indicating no significant difference in the probability of stock market participation between homeowners and renters. In contrast, in countries with underdeveloped mortgage markets (Spain, Germany, France, Italy, Belgium, and Austria) and in a financially underdeveloped economy (Denmark), the estimates for the homeownership variable are negative and statistically significant at the 5 percent level, indicating that the probability of stock market participation is significantly lower for homeowners than for renters. These controlled experiments with probit models suggest that homeownership is negatively associated with the probability of stock market participation only when households have limited ability to borrow against their housing wealth through mortgage lending. This result implies that financial market environments can influence households' stock market participation decisions. (Note 9)

Table 2. Probit results for stock market participation

| | Market-based economies | | | | | Bank-based economies | | | | | |
| | Financially developed | | | Under [1] | | Financially developed | | | | | Under [1] |
	SWI [2]	Sweden	NLD [3]	DNK [4]	Spain	DEU [5]	France	Italy	Belgium	Austria	Greece
Homeownership	.004(.028)	-.031(.021)	-.023(.021)	-.082(.029)***	-.255(.046)***	-.104(.020)***	-.159(.028)***	-.044(.024)**	-.058(.023)***	-.031(.012)***	.007(.013)
Age	.021(.013)	.035(.010)***	-.006(.008)	.066(.012)***	.004(.006)	-.005(.009)	-.025(.008)***	.010(.005)**	.007(.007)	.007(.004)*	-.004(.006)
Age squared	.000(.000)*	.000(.000)***	.000(.000)	.000(.000)***	.000(.000)	.000(.000)	.000(.000)***	.000(.000)**	.000(.000)	.000(.000)**	.000(.000)
High school	.198(.031)***	.019(.021)	.025(.016)	.040(.032)	-.046(.010)***	.097(.033)***	-.002(.016)	.020(.008)***	.065(.014)***	.015(.012)	.046(.017)***
College	.145(.029)***	.067(.018)***	.113(.016)***	.009(.033)	.094(.019)***	.171(.038)***	.126(.019)***	.000(.008)	.096(.014)***	.048(.017)***	.072(.018)***
Family size	.016(.014)	-.036(.016)**	.002(.008)	-.045(.018)**	-.022(.004)***	-.033(.009)***	-.026(.009)***	.001(.003)	-.001(.007)	-.003(.003)	-.033(.005)***
Married	.039(.032)	.019(.026)	-.011(.018)	.056(.031)*	.053(.010)***	.060(.015)***	.044(.016)***	.020(.008)***	.046(.013)***	-.010(.008)	.058(.009)***
Willing to take risks	.046(.059)	.228(.016)***	.279(.041)***	.064(.030)**	.035(.039)	.121(.039)***	.124(.039)***	.027(.020)*	.264(.031)***	.105(.037)***	.202(.046)***
2nd Income quartile	.106(.050)**	-.009(.030)	.080(.027)***	.063(036)*	.128(.042)***	.012(.029)	-.034(.021)	.030(.030)	.071(.021)***	.008(.017)	-.057(.009)***
3rd Income quartile	.146(.049)***	.148(.029)***	.063(.026)**	.064(.039)*	.099(.037)***	.134(.032)***	.047(.024)**	.141(.048)***	.095(.022)***	.024(.018)	-.045(.010)***

4th quartile	Income	.263(.046)***	.113(.030)***	.127 (.025)***	.062(.042)	.105(.036)***	.161(.033)***	.076(.025)***	.102(.038)***	.079(.021)***	.030(.018)*	-.037(.010)***
5th quartile	Income	.169(.045)***	.176(.032)***	.068(.024)***	.162(.044)***	.157(.039)***	.173(.030)***	.141(.029)***	.133(.040)***	.099(.022)***	.057(.020)***	-.020(.012)
2nd quartile	Wealth	.220(.047)***	.138(.025)***	.276(.036)***	.235(.032)***	.029(.025)	.137(.032)***	.263(.040)***	.029(0.24)	.105(.027)***	.165(.068)***	.011(.018)
3rd Wealth quartile		.348(.047)***	.246(.024)***	.292(.045)***	.236(.035)***	.118(.033)***	.234(.040)***	.322(.042)***	.137(.043)***	.205(.030)***	.224(.082)***	.076(.023)***
4th Wealth quartile		.522(.044)***	.326(.023)***	.368(.043)***	.382(.032)***	.261(.042)***	.342(.044)***	.449(.044)***	.122(.039)***	.373(.031)***	.308(.090)***	.051(.023)***
5th Wealth quartile		.549(.043)***	.414(.020)***	.584(.039)***	.439(.029)***	.224(.042)***	.495(.045)***	.479(.043)***	.212(.055)***	.506(.028)***	.435(.094)***	.197(.036)***
No of observation		441	1107	1161	645	655	867	1032	751	1670	715	514
Pseudo R-squared		.2034	.1586	.1651	.0876	.2166	.2015	.1668	.1737	.1905	.2125	.2490

Note. Robust standard errors are in parentheses. Dependent variable is a dummy variable indicating stock market participation. All the estimates reported in this table are marginal effects. 1) Financially underdeveloped. 2) Switzerland. 3) Netherlands. 4) Denmark. 5) Germany.

"***" represents significant at the 1% level, "**" significant at the 5% level, and "*" significant at the 10% level.

Finally, this section briefly discusses the impact of demographic characteristics on the probability of stock market participation. The results do not show a clear role of age. Family size generally has a negative impact on the probability of stock market participation, which suggests that larger family size is associated with an increased background risk (e.g., labor income risk or health risk). Married couples are generally more likely to participate in the stock market.

4.2 The Impact of Homeownership on Conditional Risky Asset Shares

This section goes beyond analyzing stock market participation by investigating the determinants of risky asset shares conditional on stock market participation. In particular, this section investigates how homeownership affects a household's choices concerning its risky asset share using a TSLS model. As determinants of conditional risky asset shares, the specification includes a logarithm of household (net) wealth and (total) income, a dummy variable for risk preference, ownership of one's own business, ownership of other real estate asset, a dummy variable for having no remaining mortgage debt, and other demographic variables. Because this section examines how homeownership affects the proportion of financial assets invested in stocks, the model also includes a dummy variable for homeownership. Table 3 reports the TSLS estimation results using the risky asset share as the dependent variable.

Table 3 shows the second major finding of this paper: the proportion of financial assets invested in stocks is significantly lower for homeowners compared to renters. The estimates for the homeownership variable are negative and statistically significant in eight countries (Switzerland, Sweden, the Netherlands, Spain, Germany, France, Italy, and Belgium). This result suggests that, holding household wealth and demographic characteristics constant, renters invest a higher share of their financial assets in stocks than homeowners, on average. Once households decide to acquire a home, homeowners are exposed to an increased portfolio risk, which induces them to hold a more conservative financial portfolio. This implies that there is a trade-off relationship between housing and financial assets in the overall portfolio.

The results also show the impact of household resources on conditional risky asset shares. There is a strong relationship between household wealth and the share invested in stocks, but the effect is in different directions in different countries. The effect of household income also varies across countries. The lack of a pattern with regard to the influence of household resources on conditional risky asset share suggests that this influence works through different channels than the influence on stock market participation. For instance, once households decide on whether to participate in the stock market, other factors (e.g., stock market performance or tax rules for capital gains) may dictate the relationship between household resources and conditional risky asset shares. Ownership variables of own business, other real estate, or remaining mortgage debt are expected to have and do show mixed effects on risky asset shares.

Some demographic variables also have an impact on risky asset shares. First, a household's risk preference generally has a positive impact on the share invested, which indicates that less risk-averse households tend to invest a larger share of their financial assets in risky assets. Second, education and family size have mixed effects

on share invested in stocks across countries. Third, being married has a generally negative impact on risky asset shares, unlike its impact on the probability of stock market participation.

4.3 The impact of Housing on Conditional Risky Asset Shares

This section looks closely at how the share of net wealth invested in housing affects the proportion of financial assets invested in stocks. Theoretical studies have focused on how households' home value to wealth ratio influences their decisions concerning conditional risky asset shares (Brueckner, 1997; Flavin & Yamashita, 2002; Cocco, 2005). Table 4 reports TSLS results on how this ratio affects conditional risky asset shares. To focus on the impact of the housing constraint on portfolio choices, renters are excluded from this analysis. The dependent variable is the share of financial assets invested in stocks. The explanatory variables are the same as in the analyses used for Table 3, except for the homeownership variable. In this specification, a home value to net wealth ratio variable is included instead of a dummy variable for homeownership.

Table 4 shows that the home value to wealth ratio has a significant impact on homeowners' choices concerning their risky asset shares. However, the relationship between this ratio and risky asset shares varies across countries according to the degree of mortgage market development. In countries with well-developed mortgage markets (Sweden, the Netherlands, and Switzerland), a higher home value to wealth ratio is associated with a lower risky asset share. Households of these countries have relatively high levels of leveraged housing wealth; the proportion of homeowners holding mortgage debt is higher (ranging from 52 percent in Sweden to 83 percent in Switzerland), and the remaining mortgage balances account for 20-30 percent of home values. With easier access to mortgage credit, households are pushed to a highly leveraged position in housing wealth when consumption demand for housing increases. This increased exposure to mortgage commitment risk forces homeowners to adjust their portfolio risk level by reducing their investment in stocks. This negative correlation between the home value to wealth ratio and risky asset shares reflects substitution effects between housing investment and financial investment in countries with more developed mortgage markets.

Table 3. Homeownership and the conditional risky asset share: TSLS results

| | Market-based economies | | | | | Bank-based economies | | | | | |
| | Financially developed | | | Under [1] | | Financially developed | | | | | Under [1] |
	SWI [2]	Sweden	NLD [3]	DNK [4]	Spain	DEU [5]	France	Italy	Belgium	Austria	Greece
Homeownership	-.111(.041)***	-.140(.042)***	-.224(.133)*	.007(.022)	-.125(.065)*	-.157(.061)***	-.062(.024)**	-.129(.075)*	-.186(.094)**	-.028(.045)	-.055(.086)
Log of wealth	.094(.015)***	.034(.008)***	.051(.025)**	-.018(.008)**	-.073(.019)***	.062(.021)***	-.033(.012)***	-.048(.037)	.042(.016)***	.100(.022)***	.107(.032)***
Log of income	.026(.015)*	.017(.009)*	-.057(.012)***	.019(.009)**	-.028(.018)	.014(.014)	.003(.011)	-.129(.034)***	.000(.011)	-.035(.020)*	.007(.026)
Willing to take risks	.255(.054)***	.025(.009)***	.209(.032)***	.034(.016)**	-.038(.046)	-.057(.031)*	.106(.033)***	.026(.067)	.017(.017)	-.059(.064)	-.035(.045)
Own business	-.069(.035)*	.001(.012)	-.007(.029)	.065(.018)***	-.079(.036)**	.052(.030)*	-.082(.022)***	-.023(.041)	-.014(.020)	.192(.062)***	.067(.057)
Own other real estate	-.114(.027)***	.004(.011)	.007(.021)	.024(.014)	.031(.034)	.024(.020)	-.064(.016)***	.063(.036)*	.025(.016)	-.041(.036)	-.036(.047)
No mortgage debts	-.026(.038)	.007(.016)	-.044(.054)	-.002(.013)	-.370(.063)***	-.011(.020)	-.010(.026)	.015(.061)	.022(.019)	.067(.041)	.190(.055)***
Age	.002(.014)	-.014(.008)*	.049(.011)***	.018(.008)**	-.024(.030)	.031(.012)***	-.010(.010)	.041(.043)	-.024(.009)***	.002(.029)	.047(.052)
Age squared	.000(.000)	.000(.000)**	.000(.000)***	.000(.000)	.000(.000)	.000(.000)*	.000(.000)	.000(.000)	.000(.000)***	.000(.000)	.000(.000)
High school	-.043(.031)	.004(.012)	-.019(.031)	.044(.026)*	.198(.066)***	-.029(.042)	-.002(.024)	.017(.043)	-.009(.019)	.117(.063)*	-.091(.051)*
College	.075(.032)**	-.007(.011)	.013(.028)	.035(.026)	-.120(.031)***	.015(.042)	.017(.024)	-.093(.048)*	.069(.019)***	.225(.066)***	-.027(.050)
Family size	.017(.012)	-.017(.008)**	-.016(.009)*	.039(.012)***	-.005(.018)	-.013(.007)*	.005(.012)	-.012(.023)	-030(.007)****	-.038(.018)**	.046(.021)**
Married	.007(.029)	-.012(.015)	-.051(.025)**	-.025(.022)	-.071(.065)	-.097(.034)***	.023(.026)	-.087(.065)	-.055(.019)***	-.153(.059)***	-.199(.061)***
No of observation	151	593	285	289	59	181	219	58	392	58	57
R-squared	.1595	.0631	.1302	.1181	.4991	.0953	.1170	.2153	.1273	.3439	.1836

Note. Robust standard errors are in parentheses. Dependent variable is the share of financial wealth invested in stocks. The second stage regressions are adjusted for sample selection using the Heckman procedure. 1) Financially underdeveloped. 2) Switzerland. 3) Netherlands. 4) Denmark. 5) Germany.

"***" represents significant at the 1% level, "**" significant at the 5% level, and "*" significant at the 10% level.

In contrast, in countries with underdeveloped mortgage markets (France, Belgium, Germany, Austria, Greece, Italy, and Spain), a higher home value to wealth ratio is associated with a higher risky asset share. In these economies, only a small proportion of households have mortgage debts remaining against their housing wealth. In a market with limited access to mortgage credit, a higher home value to wealth ratio is more likely to indicate a larger share of household wealth invested in highly illiquid housing. Under these circumstances, it is natural for homeowners with higher housing asset shares to desire to invest a larger share in stocks in order to diversify their portfolios. This positive relationship between the home value to wealth ratio and the risky asset share sheds light on homeowners' diversification motives in countries with underdeveloped mortgage markets. The results in this section are consistent with the simulation results reported by Flavin and Yamashita (2002), who showed that the relationship between the home value to wealth ratio and the risky asset share is negative for households with mortgages and positive for those without mortgages.

This section briefly discusses the impact of household resources and other demographic variables. First, household wealth has a strong effect on risky asset shares, but the direction of this effect varies across countries. Second, risk preference has a positive and significant impact only in countries where stock market participation rates are higher than 20 percent (Switzerland, Sweden, the Netherlands, and France). Finally, the results show a weak relation between risky asset shares and education, age, family size, and marital status. Thus, although these variables may affect the decision of whether to participate in the stock market, they have only a limited impact on households' portfolio choices.

5. Conclusion

Housing is the single most important asset in many households' portfolios. This paper explored how investment in housing affects the composition of a household's portfolio. In particular, this study examined stock holding patterns in the presence of housing in multiple European countries. The results reveal that stock holding patterns differ according to the financial market structure of each country. First of all, stock market participation rates are significantly higher in market-based economies than in bank-based economies. Second, the degree of mortgage market development influences the relationship between housing investment and risky asset holdings. In market-based economies, which have more complete mortgage markets, there exists a substitution effect between housing wealth and stocks. An increase in housing investment (measured by the home value to wealth ratio) exposes households to a higher mortgage commitment risk, which induces them to hold more conservative financial portfolios by reducing their share invested in stocks. On the other hand, in bank-based economies, which have underdeveloped mortgage markets, homeowners whose wealth is mostly locked in housing wealth are motivated to diversify their portfolios by investing a larger share in stocks. The observed relationship between housing wealth and risky asset shares is consistent with the theoretical predictions of Flavin and Yamashita (2002).

The results of this study have implications for the interaction between housing and financial markets in Europe. On the one hand, less developed mortgage markets and illiquidity of housing wealth could incur welfare costs since selling and buying houses are more difficult. Such a financial market environment may lead households to be more risk averse and to be less likely to participate in the stock market. Therefore, improving the efficiency of mortgage markets could be one way to increase households' welfare level. On the other hand, in economies with more advanced housing finance systems, an increased risk in the housing sector can easily be transmitted to the financial market, complicating policymakers' jobs. In particular, in light of the financial market instability that most European countries recently experienced, there are concerns that increased instability in the housing sector could become a risk factor for the macroeconomic performance of countries with advanced mortgage markets.

Table 4. The impact of housing investment on the risky asset share: TSLS results

| | Market-based economies | | | | | | Bank-based economies | | | | |
| | Financially developed | | | Under [1] | | | Financially developed | | | | Under [1] |
	SWI [2]	Sweden	NLD [3]	DNK [4]	Spain	DEU [5]	France	Italy	Belgium	Austria	Greece
Home to wealth ratio	-.521(.168)***	-.103(.055)*	-.273(.110)**	.043(.073)	.286(.145)**	.246(.139)*	.577(.170)***	.540(.150)***	.361(.140)***	.324(.150)**	.263(.148)*
Log of wealth	.123(.023)***	.030(.009)***	.027(.014)*	-.011(.010)	-.100(.027)***	.053(.017)***	-.007(.017)	-.069(.035)**	.025(.012)**	.108(.026)***	.152(.039)***
Log of income	-.011(.020)	.038(.010)***	-.040(.011)***	.019(.010)*	-.019(.019)	.015(.015)	.005(.013)	-.127(.029)***	.014(.010)	-.029(.025)	.019(.026)
Willing to take risks	.164(.056)***	.030(.010)***	.232(.031)***	.018(.016)	-.046(.049)	-.004(.033)	.111(.033)***	.061(.061)	-.001(.018)	.051(.057)	-.029(.046)
Own business	-.144(.051)***	.003(.012)	-.020(.027)	.044(.020)***	-.075(.035)**	.027(.033)	.070(.053)	.074(.054)	-.017(.024)	.123(.060)**	.072(.059)
Own other real estate	-.158(.033)***	-.033(.012)	-.017(.022)	.024(.019)	.113(.067)*	.046(.028)	.067(.040)*	.174(.041)***	.082(.020)***	.060(.043)	-.037(.050)
No mortgage debts	-.004(.040)	.041(.011)***	.088(.024)***	-.008(.013)	-.349(.062)***	.001(.020)	.010(.030)	.046(.063)	.009(.020)	.061(.049)	.176(.055)***
Age	-.006(.018)	-.015(.009)*	.084(.012)***	.007(.010)	-.051(.033)	.007(.022)	-.008(.012)	.037(.041)	-.023(.012)**	.007(.039)	.095(.054)*
Age squared	.000(.000)	.000(.000)**	.000(.000)***	.000(.000)	.000(.000)*	.000(.000)	.000(.000)	.000(.000)	.000(.000)**	.000(.000)	.000(.000)*
High school	-.133(.052)**	.005(.013)	-.037(.023)	.004(.035)	.070(.082)	-.004(.046)	.014(.026)	.020(.041)	-.022(.020)	.080(.080)	-.089(.054)*
College	.061(.041)	.006(.012)	.012(.021)	.008(.035)	-.141(.040)***	.080(.048)*	.050(.029)*	-.121(.047)***	.019(.022)	.174(.079)**	-.044(.051)
Family size	.036(.014)**	-.020(.008)**	-.002(.011)	.029(.014)**	.005(.018)	-.029(.009)***	-.008(.013)	-.018(.022)	-.025(.007)***	-.027(.020)	.032(.021)
Married	.112(.045)**	-.044(.016)***	-.053(.027)**	-.031(.024)	-.034(.068)	-.100(.041)**	.055(.028)**	.058(.076)	-.133(.020)**	-.069(.079)	-.257(.062)***
No of observation	111	487	236	242	52	139	189	55	361	48	54
R-squared	.1579	.0554	.1787	.0934	.4634	.1393	.0630	.3129	.1120	.3725	.1849

Note. Robust standard errors are in parentheses. Dependent variable is the share of financial wealth invested in stocks. The second stage regressions are adjusted for sample selection using the Heckman procedure. 1) Financially underdeveloped. 2) Switzerland. 3) Netherlands. 4) Denmark. 5) Germany.

"***" represents significant at the 1% level, "**" significant at the 5% level, and "*" significant at the 10% level.

References

Brueckner, J. K. (1997). Consumption and investment motives and the portfolio choices of homeowners. *Journal of Real Estate Finance and Economics*, *15*(2), 159-180. http://dx.doi.org/10.1023/A:1007777532293

Cardarelli, R., Igan, N., & Alessandro, R. (2008). The changing housing cycle and the implications for the monetary policy. In *World Economic Outlook: Housing and the Business Cycle*, International Monetary Fund.

Catte, P., Girouard, N., Price, R., & Andre, C. (2004). *Housing markets, wealth and the business cycle*. OECD Economics Department Working Papers No. 394. http://dx.doi.org/10.1787/534328100627

Chetty, R., & Szeidl, A. (2010). *The effect of housing on portfolio choice*. NBER Working Paper No. 15998. http://dx.doi.org/10.3386/w15998

Chiuri, M., & Jappelli, T. (2003). Financial market imperfections and home ownership: A comparative study. *European Economic Review*, *47*(5), 857-875. http://dx.doi.org/ 10.1016/S0014-2921(02)00273-8

Cocco, J. (2005). Portfolio choice in the presence of housing. *Review of Financial Studies*, *18*(2), 535-567. http://dx.doi.org/10.1093/rfs/hhi006

Demirguc-Kunt, A., & Levine, R. (1999). *Bank-based and market-based financial systems: Cross-country comparison*. World Bank Publications.

European Mortgage Federation. (2010). *Study on the Cost of Housing in Europe*. European Mortgage Federation.

Flavin, M., & Yamashita, T. (2002). Owner-occupied housing and the composition of the household portfolio. *American Economic Review*, *92*(1), 345-362. http://www.jstor.org/stable/3083338

Fratantoni, M. C. (1998). Homeownership and investment in risky assets. *Journal of Urban Economics*, *44*(1), 27-42. http://dx.doi.org/10.1006/juec.1997.2058

Gollier, C. (2001). What does the Classical Theory have to say about household portfolios? In G. Luigi, M. Haliassos, & T. Jappelli (Eds.), *Household Portfolios*. Cambridge, Mass: MIT Press.

Grossman, S. J., & Laroque, G. (1990). Asset pricing and optimal portfolio choice in the presence of illiquid durable consumption goods. *Econometrica*, *58*(1), 25-51. http://www.jstor.org/stable/2938333

Guiso, L., Haliassos, M., & Jappelli, T. (2003). Household stockholding in Europe: Where do we stand and where do we go? *Economic Policy*, *18*(36), 123-170. http://dx.doi.org/10.1111/1468-0327.00104

Heaton, J., & Lucas, D. (2000). Portfolio choice in the presence of background risk. *Economic Journal*, *110*(460), 1-26. Retrieved from http://www.jstor.org/stable/2565645

Hess, A., & Holzhausen, A. (2008). The structure of European mortgage markets. *Special Focus: Economy & Markets 01/2008*.

La Porta, R., Lopez de Silanes, F., Shleifer, A., & Vishny, R. (1998). Law and finance. *Journal of Political Economy*, *106*(6), 1113-1155. http://dx.doi.org/ 10.1086/250042

Poterba, J., & Samwick, A. (1997). Household portfolio allocation over the life cycle. In J. Poterba, & A. Samwick (Eds.), *Aging Issues in the United States and Japan*. Ogura, Tachibanaki and Wise. http://dx.doi.org/ 10.3386/w6185

Yamashita, T. (2003). Owner-occupied housing and investment in stocks: An empirical test. *Journal of Urban Economics*, *53*(2), 220-237. http://dx.doi.org/ 10.1016/S0094-1190(02)00514-4

Notes

Note 1. Homeownership rates vary significantly across countries. For example, in Sweden, the owner occupancy rate reaches 60 percent for relatively younger households (people in their 30s) and slowly increases as households get older. In Belgium, France, Italy, and Spain, the owner occupancy rates among younger households are very low (10 percent or less), but the rates slowly rise and eventually exceed 60 percent for older households. On the other hand, in Austria, Germany, and the Netherlands, the overall homeownership rates are low and do not exceed 60 percent even among elderly households (Chiuri & Jappelli, 2003).

Note 2. A recent study showed that the (weighted) average cost of purchasing a house in 14 European countries was 5.3 percent of the property price in 2008. The study reported that, generally, the costs are higher in southern Europe and lower in northern Europe (European Mortgage Federation, 2010). Using estimates for the transaction costs of purchasing a house, Grossman and Laroque (1990) suggested that it takes an average of 20 to 30 years until another housing purchase occurs after a previous one.

Note 3. This study follows Demirguc-Kunt and Levine (1999) in their definition of market-based and bank-based economies. Appendix Table 1 provides more detail on the features of these two different financial market structures.

Note 4. Using data on typical loan-to-value ratios, availability of home equity withdrawal, size of early repayment fee for mortgages, and development of secondary markets for mortgage loans, Cardarelli et al. (2008) constructed a new mortgage market index expressed as a value between 0 and 1. A higher index value indicates easier access to mortgage credit. Appendix Table 2 reports the mortgage market index as well as the characteristics of mortgage markets of sample countries. According to this classification, market-based economies (Sweden, the Netherlands, and Denmark) are considered to have more complete mortgage markets. In other words, it is easier for households to borrow against housing wealth in these market-based economies.

Note 5. Homeownership may have a more significant impact on risky asset investments of younger households . However, the SHARE only surveys the household whose heads are aged 50 or above. Due to the limitation of the data set, this study only analyzes portfolio decisions of elderly households.

Note 6. The data from Belgium and France were collected in 2004 and 2005.

Note 7. This study excludes those households who have less than 500 euros of gross financial assets from the sample, in order to focus on the households who are expected to hold meaningful portfolio. As a sensitivity check, I ran all three specifications using the samples of households who have a larger amount of financial asset above 500 euros. All the estimates are effectively identical to the ones reported in this paper.

Note 8. To allow for the possibility of non-linearity in the effect of income and wealth, a set of income-quartile and wealth quartile dummies are used. The first quartiles of income and wealth distributions are excluded dummies.

Note 9. In Greece, there is no significant difference in the probability of stock market participation between homeowners and renters. This is probably because almost all households (89.3 percent) own a home.

Appendix A

Mortgage markets in bank-based vs. market-based economies

This study shows that the effects of housing investment on households' risky asset holdings decisions vary depending on countries' financial market structures and mortgage market completeness. This section describes the definitions used for financial market structure and mortgage market completeness.

In this study, all of the sample countries are categorized into three groups according to their financial market structures and degree of financial market development: market-based economies, bank-based economies, and financially underdeveloped economies. In market-based economies such as the U.K. and the U.S., stock markets play more important roles in financial transmission than banks. In bank-based economies such as Germany and Japan, banks play a leading role in mobilizing and allocating capital. This study follows Demirguc-Kunt and Levine (1999) in their definition of market-based and bank-based economies. Those authors constructed an aggregate index to measure the size, activity, and efficiency of stock markets relative to banking systems. When the aggregate measure of a country has a value of 0.3 or above, the country is defined as a market-based economy. In order to improve the country classification measure, they also defined a country's financial market as underdeveloped if the banking system and stock market of that country were underdeveloped by international standards. Countries with underdeveloped financial systems tend to have poor protection of shareholder and creditor rights, inefficient contract enforcement, poor accounting practices, higher levels of corruption, and restrictive banking regulations. Appendix Table 1 reports the financial market structure classification of selected countries. Among the 11 sample countries, Switzerland, Sweden, the Netherlands, and Denmark are categorized as market-based economies. Spain, Germany, France, Italy, Belgium, and Austria are classified as bank-based economies. Regardless of the relative importance of their stock markets or banks, Denmark and Greece are considered to have underdeveloped financial markets.

Mortgage market characteristics differ significantly between market-based and bank-based economies. Bank-based economies have smaller mortgage markets, higher liquidation costs associated with housing purchases, and tighter credit markets; also, lenders often require a higher down payment when purchasing a home. As a result, it is less easy for households to access mortgage credit. In this study, I follow Cardarelli et al. (2008) in their classification scheme for the degree of mortgage market development. Using data on typical loan-to-value ratios, the availability of home equity withdrawal, the size of early repayment fees for mortgages, and the development of secondary markets for mortgage loans, Cardarelli et al. (2008) constructed a new mortgage market index with values lying between 0 and 1. A higher index value indicates that it is easier to access mortgage credit. According to this index, market-based economies (Sweden, the Netherlands, and Denmark) are classified as countries with complete mortgage markets. Compared to those with less complete mortgage markets, it is easier and less costly for households in these countries to borrow against houses. A more flexible mortgage market increases the liquidity of housing wealth, which affects not only homeownership rates but also households' risky asset investment. Appendix Table 2 reports some institutional differences in the mortgage market index for selected countries.

Table A1. Country classification of financial structure

| Financially underdeveloped economies | | Financially developed economies | |
| Bank-based economies | | Bank-based economies | |
Country	Structure Index	Country	Structure Index
Greece	-.34	Portugal	-.75
Ireland	-.06	*Austria*	-.73
		Belgium	-.66
		Italy	-.57
		Finland	-.53
		Norway	-.33
		New Zealand	-.29
		Japan	-.19
		France	-.17

		Germany	-.10
		Spain	.02

Market-based economies		**Market-based economies**	
Country	Structure Index	Country	Structure Index
Denmark	.15	*Netherlands*	.11
		Canada	.41
		Australia	.50
		Sweden	.91
		United Kingdom	.92
		United States	1.96
		Switzerland	2.03

Note. A country is classified as a market-based economy when the structure index is 0.3 or above (Demirguc-Kunt & Levin, 1999). The sample countries are in Italic.

Source: Demirguc-Kunt & Levine (1999), Table 12.

Table A2. Comparison of the characteristics of mortgage markets

	Market-based economies					Bank-based economies					
	Financially developed			Under [1]		Financially developed					Under [1]
	U.K. [2]	Sweden	NLD [3]	DNK [4]	Spain	DEU [5]	France	Italy	BEL [6]	Austria	Greece
Mortgage debt in % of GDP (2002)[7]	64.3	40.4	78.8	74.3	32.3	54.0	22.8	11.4	27.9	n.a.	13.9
Typical loan-to-value ratios (%)[7]	69	77	90	80	70	67	67	55	83	60	75
Maximum loan-to-value ratios (%)[7]	110	80	115	80	100	80	100	80	100	80	80
Typical loan term (years)[7]	25	<30	30	30	15	25-30	15	15	20	20-30	15
Share of owner-occupied housing (%, 2002)[7]	69	61	53	51	85	42	55	80	71	56	83
Degree of product availability [8]	Very high	n.a.	High	Medium	High	Medium	Low	Medium	Medium	Low	Low
Consumer protection [8]	Medium	n.a.	Low	Low	High	Medium	High	High	High	Medium	Medium
State subsidization [8]	Low	n.a.	Very high	Medium	Medium	Medium	Medium	Low	Medium	Low	Medium
Usual time to enforce collateral (in months) [8]	8-12	n.a.	6	6	7-9	3-6	15-25	60-84	18	6	>24
Mortgage equity withdrawal [9]	Yes	Yes	Yes	Yes	Limited	No	No	No	No	No	No
Refinancing (fee-free prepayment) [9]	Limited	Yes	Yes	Yes	No	No	No	No	No	No	No
Covered bond issues (% of residential loans outstanding) [9]	75	80	90	80	70	70	75	50	83	60	75
Mortgage-backed security issues (% of residential loans outstanding) [9]	6.4	0.9	4.6	0.1	5.7	0.2	1.0	4.7	1.9	n.a.	6.2
Mortgage market index [9]	.58	.66	.71	.82	.40	.28	.23	.26	.34	.31	.35

Note. The mortgage market data for Switzerland is not available. 1) Financially underdeveloped. 2) The data for the United Kingdom is provided as a reference. According to Demirguc-Kunt & Levine (1999)'s definition, the United Kingdom is classified as a market-based economy. 3) Netherlands. 4) Denmark. 5) Germany. 6) Belgium.

Sources: 7) Catte et al. (2004). 7) Hess & Holzhausen (2008). 9) Cardarelli et al. (2008)

"***" represents significant at the 1% level, "**" significant at the 5% level, and "*" significant at the 10% level.

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