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**The impact of low-income home owners
on the volatility of housing markets**

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Abstract

Our paper analyses the relationship between homeownership rates and the volatility of housing prices. There might be a destabilizing impact because income risks of low income households might be higher, financial resources tend to be scarcer and houses are probably financed with a higher leverage. Lower mobility and sticky wages of low income homeowners might on the other hand have a stabilizing impact on housing prices. Our results point to a positive impact of home ownership rates on house price volatility. Besides that house price volatility is influenced by the growth rate of house prices, GDP volatility and the level of interest rates. A VAR analysis suggests that the higher volatility in countries with high home ownership rates is caused by a greater sensitivity of house prices to changes in GDP growth rates.

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1 Motivation

The subprime crisis has shown that mortgage lending to low income households (more general: households with a high ratio of house prices to disposable income) bears considerable risks for the stability of housing and mortgage markets. In the scientific as well as in the political discussion most of the stability problems have been attributed to shifts in the allocation of risks from original mortgage lenders to third parties (“originate and distribute”) and resulting adverse incentives to sell mortgages to people who are obviously cannot afford them. Less has been written about potential destabilizing effects in the behavior of the mortgage taking private households.

Main subject of our paper therefore is the relationship between the distribution of home ownership and the price stability of housing markets. In particular we are interested in the question whether (and if: in which circumstances) *a high degree of homeownership among low income households* is connected with *higher price volatility* in the housing markets.

There a number of reasons why this might be the case:

- The leverage of low income households might – within the same institutional settings and corrected for tax induced distortions – be higher than that for higher income households.
- Total financial wealth relative to committed mortgage expenditures might be smaller for low income households, i.e. they tend to have a lower buffer stock to compensate for unforeseeable income fluctuations than higher income households.
- Financial bailouts by relatives (e.g., parents) in the case of financial problems might be less likely for low income households than for higher income households (assumed that the degree of intergenerational income mobility is low and households stick over generations to their relative income class)
- Breadwinners of low income households might face a higher risk of unemployment than higher income households. Therefore they might more frequently be urged to sell their homes in economic downturns than higher income households.
- Financial literacy of low income (and usually less educated) households might be lower than that of higher income households: They might be more likely to overpay their houses and finance it riskier than higher income households.

In sum, due to these arguments it seems reasonable that the risk for low income (and low wealth) households to default in their mortgages might be higher than for households with higher incomes. Therefore one might argue that the volatility of housing markets is be positively correlated to the share of low-income home owners.

There are, however, competing arguments in favor of a *stabilizing impact* of low-income home-ownership:

- Low-income homeowners might be less mobile (with respect to their relative income position and their regional location) and therefore are likely to stick to their homes in periods of economic upturns while higher income households are more likely to change into higher paid jobs and move into better houses. (This however is also an argument in favor of increased volatility in regional housing markets where housing demand is rising but supply is restricted (cf. Ortal Magné/Rady 2002)).
- Wages might be less variable and capital incomes might be less important for low income households: Therefore income variability of (employed) low income homeowners might be smaller than that of higher income households, smoothing their housing demand as well.

The net impact of these potential effects is uncertain. Moreover: it probably varies with the amplitude of economic fluctuations and might be different in economic upturns and downturns.

It seems worthwhile to analyze these questions not only from an academic but also from a political point of view. In many countries the increase of the homeownership rate is one important target of social welfare policy. Broad distribution of private home ownership is regarded as a support to social stability, and it is propagated as a favorite instrument of private retirement provision. For policy makers therefore it would be helpful to know if – and if: under what conditions – there is a tradeoff between these targets and the stability of the housing market.

2 Related Literature

Determinants of house prices

Many recent empirical studies have been devoted to the development of house prices. However, due to the lack of available data there is not much previous work on the relation between socio-demographic structures of home owners and the stability of housing markets. The literature has so far most frequently analyzed the dynamics of prices and the overall economic effects of housing price inflation (see for recent work.: Helbling/Terrones (2003), Ludwig/Sløk (2004), Filardo (2004), Catte et al. (2004), ECB (2006), Demary (2008)), the determinants of house prices and the detection of bubbles (Terrones (2004), Terrones (2005), Black/Fraser/Hoesli (2006), Girouard et al. (2006), Himmelberg/Mayer, Sinai (2005), Kholodilin/Menz/Siliverstov (2007), Hott/Monnin (2008)), and the implications for monetary policy (ECB (2005)). These papers highlight fundamental factors that

explain the development of housing prices, in particular the role of demand factors (income, population growth, interest rates), supply factors (land availability, construction) and structural/institutional factors (tax regimes, mortgage market characteristics). Catte et al (2004, p. 6) mention briefly that the volatility of house prices in OECD differs between countries. They assume a positive correlation between average growth rates of house prices and the volatility of growth rates.

Mortgage markets, price dynamics and housing market stability

A more specialised strand of papers focuses on the impact of different mortgage market characteristics on the access to and the stability of housing markets:

The importance of access to mortgage markets for the probability to become a homeowner is highlighted in a recent micro econometric study (Bicacova/Siermienska (2007)), based on the newly available Luxembourg Wealth Study database (LWS). The authors focus on differences in the access to credit markets and home ownership rates in a comparison of five countries: Finland, Germany, Italy, the UK and the US. Their paper highlights some important differences in the homeownership rates and mortgage take-up rates by age, in mean and median home values, in the ratio of home value to income in income quintiles, and in the distribution of homeownership and mortgage take-up rates across income deciles. The authors conclude that countries with more mature mortgage markets (i.e. UK) have – other things being equal - higher homeownership rates than countries with less developed markets. This complements the findings of Chiuri/Jappelli (2003) who present – based on a broad dataset of the Luxembourg Income Study (LIS) – evidence that the availability of mortgage finance affects the age-profile of home ownership, particularly the ownership ratio of young households.

Tsatsaronis/Zhu (2004) find in a cross country comparison that the prevalence of variable mortgage rates and market based property valuation is correlated with a higher risk of mutually reinforcing imbalances between the real estate market and the financial sector, leading to higher instability in both sectors. Lamont/Stein (1999) analyze the sensitivity of house prices to income shocks in a comparison of US cities with different average leverage of homeowners. They conclude that the price reaction to income changes in cities with low leverage on average is much more gradual than in cities with a high leverage. Similar results for the UK housing market are reported by Benito (2006).

Ortalo-Magné/Rady (2005) highlight in a theoretical model the role of income changes and down payment constraints of young households for the volatility of housing markets. In an older paper (Ortalo-Magné/Rady (2002)) the authors model the impact of the low mobility of (low income) homeowners on the volatility of housing markets. They state that the low

mobility of home owners (who do not expect their income to follow housing costs) increases housing market volatility: The reason is that these home owners do not react as elastically to price changes as renters or higher income households do.

Distribution of income volatility and their impact on housing markets

Also related to our subject are papers which focus on differences in the volatility of income over the income distribution. There is some evidence that income volatility is correlated to income: Dynan/Elmendorf/Sichel (2005) find that volatility of income is higher for heads without a high school degree than with a degree. Jensen/Shore (2008) report for the US that high income and highly educated individuals are less likely to have volatile incomes, However they also note that risk aversion and professional status (self employment) correlate to higher income volatility; while having children or to be married lowers the volatility of income.

Diaz-Serrano (2004) analyses the impact of income volatility on residential mortgage delinquency in 12 EU countries. He finds a negative correlation between level of income and income volatility in some countries (UK, Italy, Spain, and Portugal), a positive correlation in the others. He also detects a significant effect of income volatility on probability of mortgage default but also a lower probability of home ownership with higher volatility of income.

Van den Noord 2005 argues that differences in the volatility of house prices in the Euro area can partly be explained by different tax regimes. Based on a simple model of the housing market, he demonstrates that demand shocks in generous tax system produce higher house price volatility than in other, less generous systems. He also finds some empirical support for his hypothesis, albeit only in a simple correlation of country specific tax wedges to house price volatility.

Taken together, the literature review provides some support for a transmission from higher home ownership among lower income households to *increased* housing market instability. Though – with exception of Rady/Ortalo-Magné's (2002) paper – there seems to be no direct and no empirical investigation of this question.

3 Our approach

Empirical work that directly explains house price volatility (instead of identifying drivers of house price changes) seems – contrary to the literature on financial market volatility – to be scarce. The reason is very likely the usual low frequency of house price data and the lack of internationally comparable data. Similar to the paper of van den Noord, we intend to directly explain the volatility of house prices, however not by focusing on tax wedges

but on home ownership rates, and applying a multivariate framework. We try to directly control for GDP growth volatility, interest rate changes, changes in interest rates and credit market conditions.

Our main research questions are:

- In general: Is there a measurable impact of homeownership in low income groups on the price dynamics of housing markets?
- In particular: Are markets with a high rate of homeownership (HHO markets) or with a rising home ownership rate (RHO markets) more or less volatile than markets with a lower rate of homeownership (LHO markets) or markets with a stagnating/decreasing rate (NRHO markets)?
- Are HHO/RHO markets more sensitive to external shocks (e.g. income or interest rate shocks) than LHO/NRHO markets?

Methodology:

The empirical analysis of these questions is severely limited by data restrictions. In principle, the analysis of panel data on the household level would be the best method to study the connection between house price developments and the distribution of home ownership in more detail. Unfortunately no internationally comparable panel data are currently available. The LWS database provides only cross sectional data for a rather small set of countries. The LIS database covers a broader sample of countries but contains many gaps in the time series dimension (for a survey of the waves see Chiuri/Japelli (2006), p. 21.) Therefore, as far as time series analysis is concerned, we are forced to rely on relatively rough and highly aggregated indicators that reflect the distribution of homeownership and the characteristics of low-income homeowners. Additionally, we can use the LWS data to obtain some descriptive evidence on the distribution of home ownership, and also on financing behavior and resources of low vs. high income households in a number of countries.¹

We use a fixed effects panel regression model to explain the development of house price volatility. Additionally we analyze the sensitivity of house prices to shocks from macroeconomic variables for different groups of countries in a VAR. Our empirical analysis is limited by available data on house price developments and distributional indicators: We therefore confine our econometric analysis to 13 OECD countries: Canada, Germany, Finland, France, Ireland, Italy, Netherlands, Japan, Spain, Sweden, Switzerland, UK and US.

¹ Differences in financing behavior are not yet discussed in the current preliminary version of the in this paper: .

4 Data

4.1 Home Ownership Ratio as a Proxy for the Share of Low Income Home Owners

To the best of our knowledge, comparable data on the distribution of home ownership among different quantiles of the income distribution are not available for long time periods in a cross section of countries. We therefore have to proxy for the share of low income home owners by using the home ownership ratio. We assume that a high home ownership ratio indicates a high share of low income home owners, while a low ownership ratio predominantly refers to a low share of low income homeowners and to a much lesser extent to higher income households. In other words: We assume that – other things being equal – a lower homeownership ratio is correlated to a higher concentration of home ownership in high income classes.

Our assumption seems to be rather plausible: In the presence of down payment constraints and/or restricted access to credit markets the probability that well-off households own their home should be higher than for low income households. Anecdotal empirical evidence seems to confirm our assumption. Data for Germany – which has in international comparison an exceptionally low rate of home ownership – show that home ownership is very unevenly distributed over income deciles: While in the highest income deciles more than 70 per cent of all households own their house or apartment, the lower part of the income distribution is clearly dominated by renters (cf. Fig. 12 in Appendix). Moreover, owners in low income deciles have higher relative interest and repayment burdens than owners in higher income deciles (cf. Fig. 15 in appendix).

In contrast to that, empirical evidence for countries with a high rate of home ownership points to a rather even distribution of home owners in their population: Spain, with an average rate of home ownership exceeding 80 per cent in the 1990s, has a rather flat distribution of home ownership among different social classes, as Pla/Cabrerizo (2004, p. 239) report. Another example is Belgium with an average rate of home ownership of more than 70 per cent in the late 1990s and nearly 60 per cent home owners in the lowest standardized income quintile (cf. Goertz/Goossens 2004, p. 87). A cross country comparison of home ownership rates for 5 countries (Germany, UK, US, Ireland and Italy), based on the Luxembourg Wealth Study dataset, also shows a tight correlation between the average rate of home ownership and the ratio of home ownership rates in low and high income deciles (cf. Fig. 13, Fig. 14 in the appendix). Given this empirical evidence and the intuitive plausibility of the argument, we treat it as a stylized fact: that a higher rate of homeownership is a reasonable proxy for of a higher share of low income home owners among all private households (and a higher share of owner occupied dwellings in all dwellings, respectively).

Unfortunately, data on home ownership rates are not available on an annual basis for nearly all countries (except for US and UK). Most of the data originate from surveys that are conducted every 4 or 5 years. In a number of countries the periodicity is even lower. To generate annual data we therefore have to estimate long term trends for national ownership ratios, based on as many data points as are available for each country. This was done pragmatically by graphical inspection of the data points and estimating a linear, loglinear or exponential trend that best fits the data. Fig. 19 and Fig. 20 display the estimated ownership ratios for all countries.

4.2 Other data

Long series of house prices were obtained from the OECD. We use the series that were compiled by the OECD for the OECD Economic surveys and have also been analysed in a number of other OECD publications (for sources and methodology see OECD Economics Department working paper No 475, p. 34).² Data for long term interest rates and GDP per capita were basically obtained from the OECD Economic Survey database; remaining gaps were filled by interpolation based on data from national sources.

5 Descriptive Evidence

We define house price volatility as the annual standard deviation of annual house price changes, calculated in percent. Therefore, steadily increasing or decreasing prices will imply low volatilities, while deviations from this growth path will cause increases in volatility.³

$$\text{Volatility of house prices} = \sqrt{\frac{\sum_{t=1}^n (\Delta P_t - \overline{\Delta p})^2}{n-1}}$$

Fig. 1 shows the volatilities of nominal and real house prices for the whole period 1970 to 2006 in comparison. Obviously volatilities are very different between countries, and volatilities of nominal house prices tend to be higher than those of real house prices (house price inflation minus CPI inflation).

Descriptive statistics for the 13 countries under consideration provide first evidence of a relationship between the volatility of house prices and the ownership ratio. Fig. 2, Fig. 3

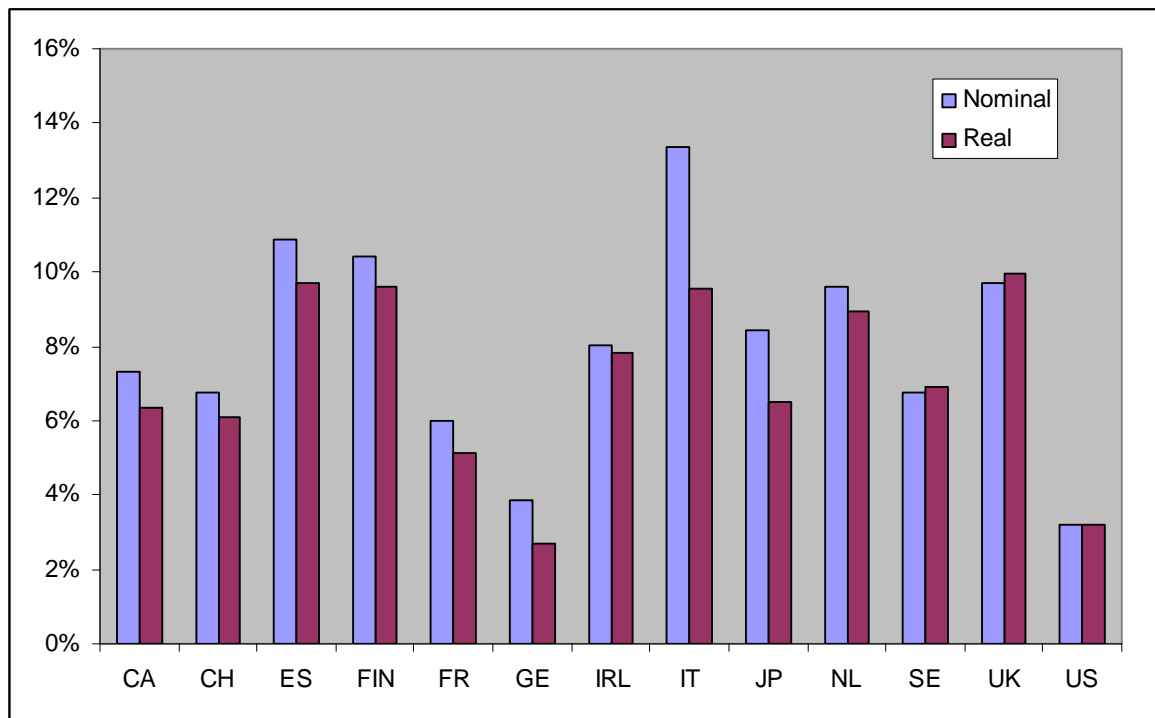
² We thank Christophe Andre and Nathalie Girouard for kindly providing their data.

³ We follow here e.g. Catte et al. (2004.) This measure yields similar results as the root mean squared deviation from trend which is used by van den Noord 2005, p. 42, but is easier to handle because we do not have to estimate trends.

and Fig. 4 show a positive correlation between the levels of the home ownership rates and their increases, respectively, and the volatility of the housing markets. The correlation with volatility seems to be particularly strong with regard to the absolute increase of the ownership rates over the whole period 1970 to 2006 (see also Tab. 1).⁴

On the other hand there is no obvious relationship between credit market characteristics and the volatility of housing prices. Tab. 2 summarizes several indicators of the national mortgage markets: We can observe high volatilities of housing prices in conservative markets like Italy or Spain, while volatilities are rather low in “more ‘aggressive’ markets”⁵, e.g., in the U.S. or in Sweden.

Fig. 1: Volatility of Nominal and Real House Prices in the period 1970 - 2006



Source: OECD, own calculations.

⁴ For nominal values see Fig. 16 to Fig. 18 in appendix.

⁵ Tsatsaronis/Zhu, p. 70., also in quotation marks in the source.

Tab. 1: Correlations between ownership rate and house price volatility

	Standard deviation of house prices changes	
	Real	nominal
Increase of OR (%points)	0.62	0.59
Average annual increase of OR in % (geometric mean)	0.46	0.43
Average OR	0.43	0.39

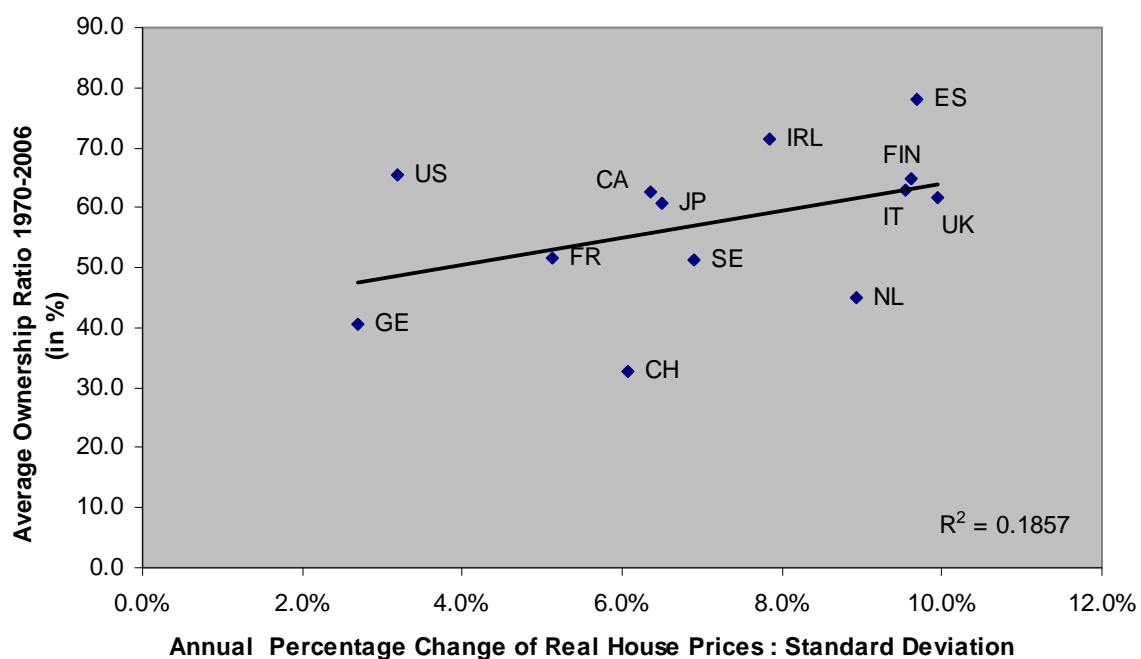
Fig. 2: Volatility of Real House Prices and Average Ownership Ratio 1970-2006

Fig. 3: Volatility of Real House Prices and Average Annual Increase of Ownership Ratio 1970-2006

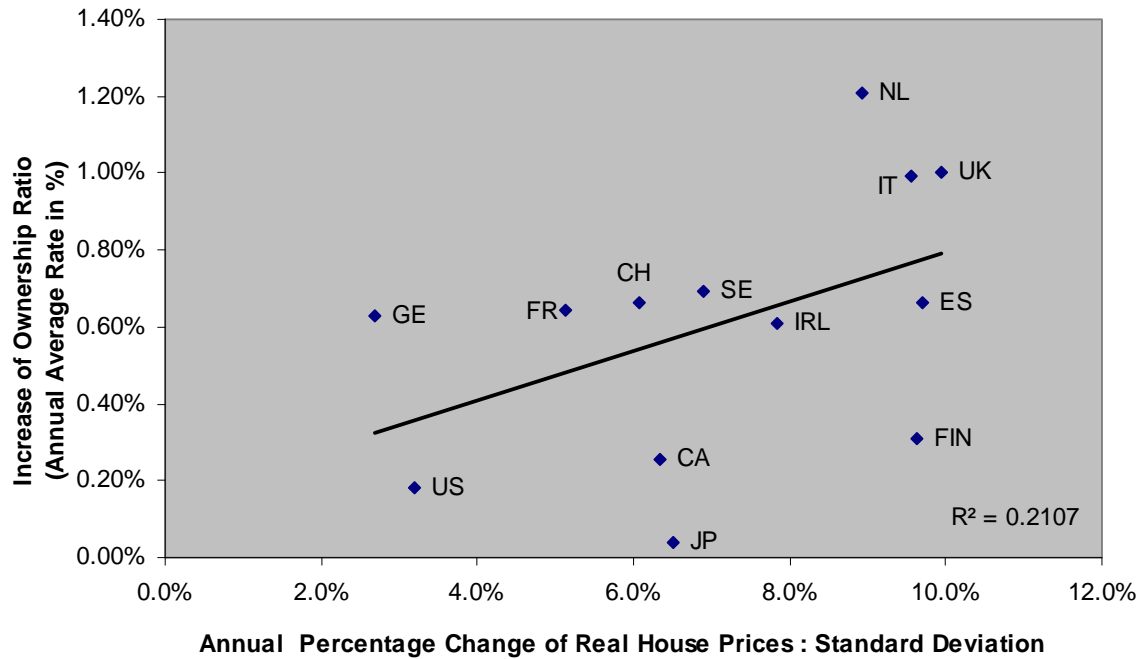
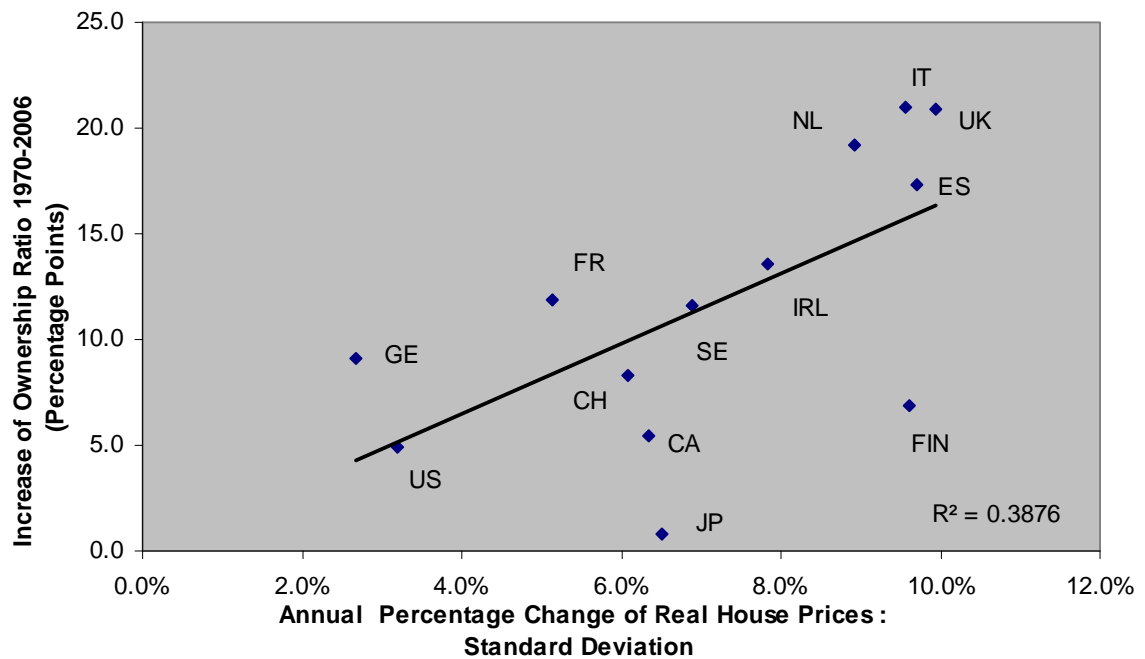


Fig. 4: Volatility of Real House Prices and Increase of Ownership Ratio in percentage points 1970-2006



Tab. 2: Characteristics of national mortgage markets and volatility of house prices

	Tax Relief on Mortgages	Max. LTV	Typ. LTV	Residential Mortgage in % of GDP			Completeness of mortgage markets*	Volatility of real house prices
				1992	2002	% increase		
CA	N	100	75	42.7	43.1	0.9%	1	6.3%
ES	Y	100	70	11.9	32.3	171.4%	1	9.7%
FIN	Y (up to a ceiling)	80	75	37.2	31.8	-14.5%	2	9.6%
FR	N	100	67	21	22.8	8.6%	1	5.1%
GE	N	80	67	38.7	54	39.5%	1	2.7%
IRL	Y	90	66	20.5	36.5	78.0%	3	7.8%
IT	Y (POOD)**	80	55	6.3	11.4	81.0%	1	9.6%
JP	Y	100	80	25.3	36.8	45.5%	2	6.5%
NL	Y	115	90	40	78.8	97.0%	2	8.9%
SE	Y	80	77	37.5	40.4	7.7%	3	6.9%
UK	N	110	69	55.5	64.3	15.9%	3	9.9%
US	Y (up to a ceiling)	100	78	45.3	58	28.0%	2	3.2%

Sources: Catte et al. 2004 p.a. 18, OECD 2007 (Ec. Survey Belgium, p. 120), OECD 2006 (Ec. Survey Finland, p. 129), classification by Tsatsaronis/Zhu (2004): 1 indicates conservative, 2 and 3 more flexible mortgage markets. **POOD: principal owner occupied dwellings.

6 Econometric Analysis

6.1 Impact of the Homeownership Ratio on the Volatility of House Prices: Estimates from a Panel Regression

We directly estimate the impact of the home-ownership ratio (as a proxy variable for the relative share of low income homeowners in each country under consideration) on the volatility of house prices. This is done in a panel regression for the 13 countries over the period 1970 to 2006. Unfortunately we have only annual data for the home ownership ratios, so we have only 36 data points for the calculation of house price volatility in each country at our disposal. Furthermore, as housing cycles tend to be long⁶, it seems recommendable to define rather long periods in our volatility calculations. Though this reduces the number of the remaining time periods in our panel regression further.

Having tested different specifications⁷, we decided in favour of a model with overlapping time periods of 7 years, starting in 1971 (one year is lost due to differencing of some vari-

⁶ Girouard et al. (2006, p. 4) quantify the length of an average real housing cycle by about 10 years.

⁷ We also tested versions with non-overlapping periods, but in these specifications either the number of time periods or the lengths of the periods were too small to yield any significant results.

ables). This results in 11 overlapping time periods: 1971-1977, 1974-1980, 1977-1983, 1980-1986, 1983-1989, 1986-1992, 1989-1995, 1992-1998, 1995-2001, 1998-2004, and 2001-2006.⁸ The overlap of the time frames leads is likely to lead to serial correlation in the time series for which we have to correct in the regressions.⁹

Our regression model is specified ad hoc and cannot be strictly deduced from a theoretical model. In particular it is questionable whether the relationship between our endogenous variable and the explaining regressors is linear. Nevertheless we use a linear panel regression here as a first approximation and follow similar approaches in the literature (see for a similar approach to explain financial market volatility Gerlach, Ramaswamy, Scatigna (2006), p. 86).

We analyse the impact of the following regressors on the volatility of nominal and real house prices (measured as the standard deviation of annual changes in growth rates):

- GDP volatility, measured as the standard deviation of annual changes in growth rates of GDP per capita,
- CPI volatility, measured as the standard deviation of annual changes in CPI growth rates,
- average growth of house prices in each period (in percentage points)
- the unemployment ratio (in percentage points)
- private debt in percent of GDP (in percentage points)
- long term interest rates, nominal and real (long term interest rates minus current change of CPI, in percentage points)
- homeownership ratio (in percentage points)
- interaction variables
 - homeownership ratio \times unemployment rate
 - homeownership ratio \times unemployment rate
 - homeownership ratio \times interest rate

Although unit root tests indicate stationarity of all variables in levels, some regressors are highly correlated. Therefore estimates in levels are potentially biased by multicollinearity.

⁸ The last period covers – due to data restrictions – only 6 years.

⁹ We used the XTREGAR command in STATA, that corrects the estimates for first order serial correlation.

Indeed, the coefficients in first specifications of the model in levels prove to be very sensitive to the exclusion of different regressors. Therefore we decided – in spite of the already low number of time periods in the sample – to conduct our analysis in first differences (i.e. estimating the changes between the overlapping periods).

In this regression the multicollinearity problem is strongly reduced: We find – as we have expected – in a first regression for nominal house prices a significant positive effect for the volatility of real GDP growth per capita, which serves as a proxy for individual income (see Tab. 3 for the results). We also find a significant impact of the growth rate of house prices: This confirms the observation, already described by Catte et al. (2004), that house price volatility might be correlated with house price growth. The coefficients of the nominal interest rate and the home ownership rate are also significant.

The specification in first differences is robust to the exclusion of the insignificant regressors, indicating that multicollinearity of the variables seems to pose no major problem here. We estimated the same model with the volatility of real house prices as endogenous variable, using real interest rates instead of nominal interest rates and the growth rate of real house prices as regressors. The results (see Tab. 4) are similar to the outcome of the nominal regressions. We observe again a clear significance for the volatility of GDP, the real price growth and also a significant impact of the ownership rate. The debt to GDP ratio is now significant with a positive sign, while the real interest rate is not.

The inclusion of interaction variables in both models does not improve the results.

The specifications described above suffer potentially from an endogeneity problem because GDP volatility as well as CPI volatility might be influenced by house price volatility. We therefore excluded the CPI – which anyway proved to be insignificant – and carried out a sensitivity test with the growth rate of GDP, which is less likely to be endogenous. In this specification (not reported) the GDP variable is not significant, while the other variables show the same signs and significances.

In another specification of the basic model (results not reported), we include instead of levels of the variables their change within each of the periods under consideration. The results broadly confirm the influence of GDP growth volatility and nominal interest rates. However, the specifications with within-period changes do not yield clear results for the unemployment rate and the home ownership ratio. The inclusion of interaction variables in this specification shows a significant coefficient for the interaction between changes of the unemployment rates and the home ownership ratios when explaining nominal price volatilities. This is not the case for the volatility of real prices: While the within-period change of the unemployment rate is significant for the volatility of real house prices, the ownership ratio and also the interaction between both variables are not.

Tab. 3: Results of Regression for Nominal House Price Volatility

Dependent Variable Δ Volatility of Nominal House Prices						
	Coeff.	Std. Error	t-value	P> t	95 % confidence interval	
Δ Volatility of CPI	-0,026	0,214	-0,12	0,904	-0,450	0,398
Δ Volatility of GDP	1,460	0,364	4,01	0,000	0,737	2,184
Δ Interest Rate	0,007	0,003	2,29	0,024	0,001	0,013
Δ Unemployment Rate	-0,003	0,002	-1,34	0,183	-0,008	0,002
Δ Ownership ratio	0,008	0,003	2,27	0,025	0,001	0,015
Δ Debt to GDP Ratio	0,000	0,000	1,20	0,234	0,000	0,001
Δ Growth Rate of Nominal House Prices	0,261	0,081	3,20	0,002	0,099	0,422
Const.	-0,005	0,005	-1,02	0,311	-0,016	0,005
R ² = 0,366						
117 Observations (9 periods/13 countries)						

Fixed effects regression, adjusted for serial correlation.

Tab. 4: Results of Regression for Real House Price Volatility

Dependent Variable Δ Volatility of Real House Prices						
	Coeff.	Std. Error	t-value	P> t	95 % confidence interval	
Δ Volatility of CPI	-0,079	0,181	-0,44	0,663	-0,439	0,280
Δ Volatility of GDP	1,896	0,321	5,91	0,000	1,259	2,532
Δ Real Interest Rate	0,001	0,002	0,63	0,530	-0,003	0,005
Δ Unemployment Rate	-0,002	0,002	-0,9	0,372	-0,006	0,002
Δ Ownership ratio	0,005	0,003	1,82	0,072	0,000	0,011
Δ Debt to GDP Ratio	0,001	0,000	1,93	0,057	0,000	0,001
Δ Growth of Real House Prices	0,174	0,067	2,62	0,010	0,042	0,306
Const.	-0,013	0,004	-3,28	0,001	-0,020	-0,005
R ² = 0,332						
117 Observations (9 periods/13 countries)						

Fixed effects regression, adjusted for serial correlation.

6.2 Impact of External Shocks on House Prices in a VAR

The results of our panel regressions point to a positive impact of the home ownership ratio on the volatility of nominal and real house prices. To confirm our results we conducted an additional analysis based on a vector autoregressive (VAR) model.

We estimated a simple unrestricted VAR with two lags¹⁰ in first differences, including real house prices, real interest rates, real GDP per capital and ownership ratio with annual values for the period 1970 – 2006. We divided the sample in four different groups, defined by two different dummy variables (see Tab. 5). One dummy separated countries that had owner occupier ratios of less than 60 per cent in 2006 (Switzerland, Germany, France, Netherlands and Sweden) from all other countries. The other dummy countries marked countries where the ownership ratio has increased more than 25 percent over the period 1970 – 2006: these are Switzerland, Spain, France, Germany, Netherlands, Sweden and UK.

We are mainly interested in the relative responses of house prices to shocks from other variables in the system for the different groups of countries. Our panel regressions above point in general to a higher volatility of house prices in countries with higher home ownership rates. Therefore we expect a higher responsiveness to external shocks (or to changes in the prices itself) in countries with high or strongly increasing ownership rates than in countries with low or less increasing ownership rates.

For the impulse response functions we used the Choleski-ordering GDP, interest rate, house prices, home ownership ratio, implying that all common shocks in the system are to be assigned to variations in GDP.

Our results are mixed: When we look at first at the differences between countries with low and high ownership rates in 2006 (the OR60 dummy), the sensitivity of real house prices in reaction to a one percent increase in GDP growth rates is indeed higher for countries with high ownership rates (HHO countries) than for countries with lower ownership rates (LHO countries) (see Fig. 5.) The sensitivity to interest rate and house price changes seems to be a bit lower (see Fig. 6 and Fig. 7). The latter result, however, is to be interpreted against the background of higher price volatility in the HHO-countries: While in Fig. 5 - Fig. 7 the impulses are standardized by the standard deviation of the respective equation, Fig. 8 shows the sensitivity to impulses of one standard deviation of house price changes. In this

¹⁰ In order to avoid distortions through different time periods and lag structures we used this uniform lag specification for all estimations, although lag length criteria indicated in some cases other optimal lag lengths. Robustness checks with different uniform lag lengths showed no qualitatively different results.

graph the responses of house prices in HHO and LHO countries to changes in the own series seem to be quite similar.

Looking at the different responses of countries with strongly rising ownership rates (RHO) versus countries where ownership rates are less dynamic (NRHO), we find much smaller differences (see Fig. 9 - Fig. 11). While GDP growth and own price sensitivity seem to be a bit higher, the reaction to interest rate changes is a bit smaller for RHO countries.

Tab. 5: Assignment of dummies to countries

	Growth of ownership rate 1970-2006 > 25 %	Ownership rate 2006 > 60 %
	ORdelta25	OR60
CA	0	1
CH	1	0
ES	1	1
FIN	0	1
FR	1	0
GE	1	0
IRL	0	1
IT	1	1
JP	0	1
NL	1	0
SE	1	0
UK	1	1
US	0	1

Fig. 5: Response of Real House Price Growth to a One Percentage Point Increase in GDP growth per capita, HHO vs. LHO countries

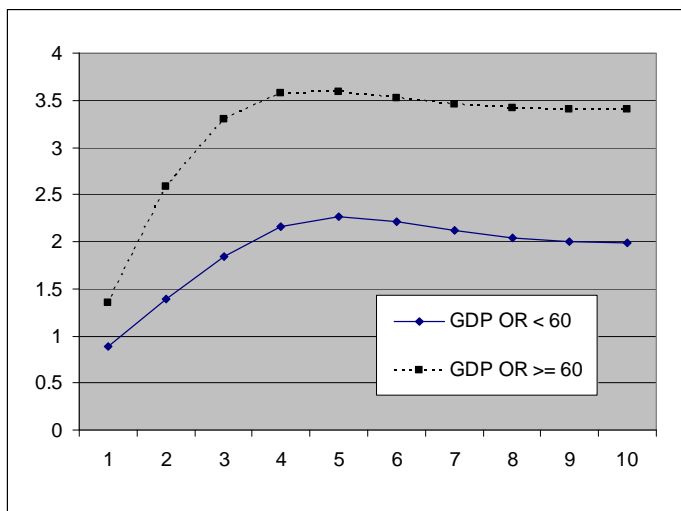


Fig. 6: Response of Real House Prices to a One Percentage Point Change in Long Term Interest Rates, HHO vs. LHO countries

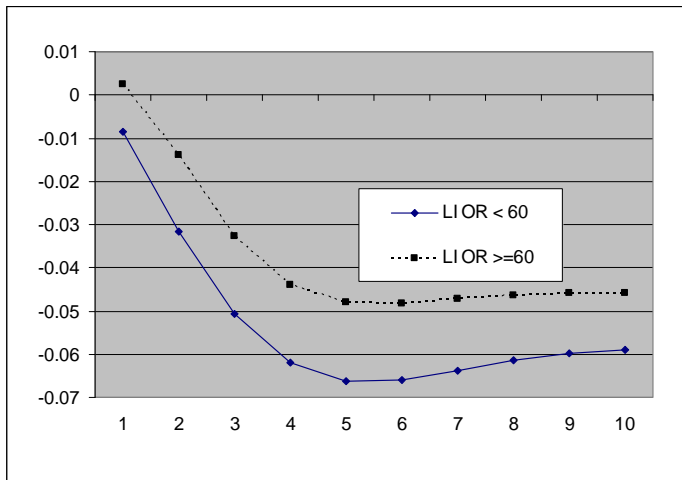


Fig. 7: Response of Real House Price Growth to a One Percentage Point Change in Real House Price Growth, HHO vs. LHO countries

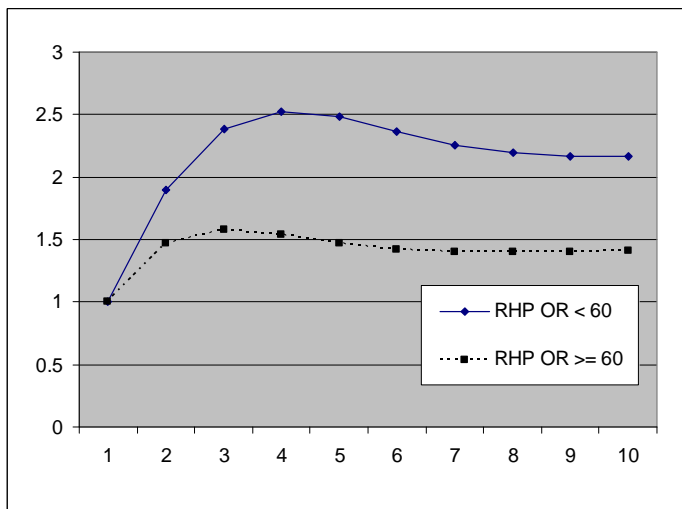


Fig. 8: Response of Real House Price Growth to a one Standard Deviation Impulse in Real House Price Growth, HHO vs. LHO countries

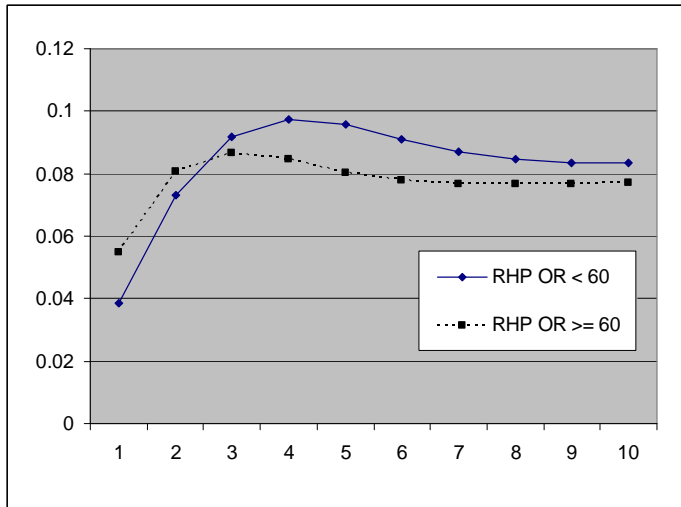


Fig. 9: Response of Real House Price Growth to a One Percentage Point Change in GDP growth per capita, RHO vs. NRHO countries

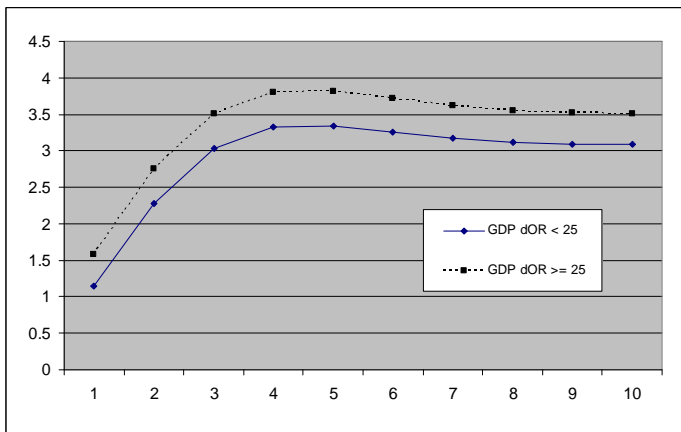


Fig. 10: Response of Real House Price Growth to a One Percentage Point Change in Long Term Interest Rates, RHO vs. NRHO countries

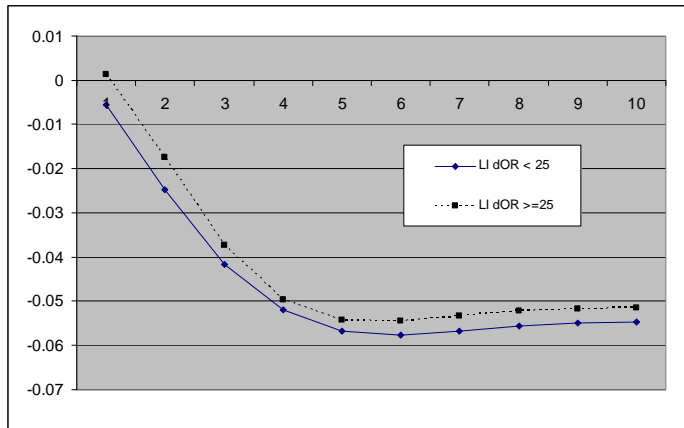
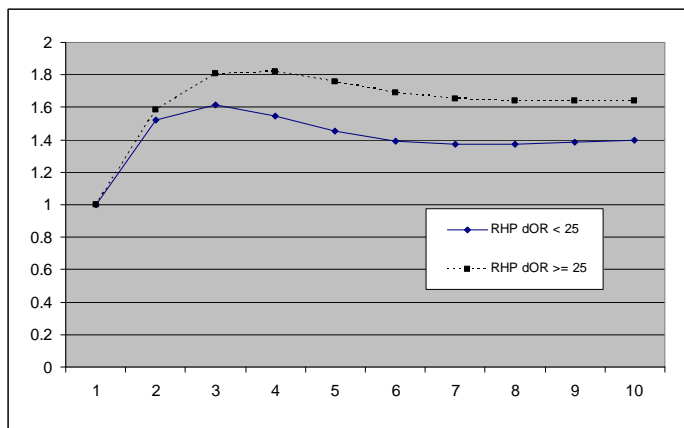


Fig. 11: Response of Real House Price Growth to a One Percentage Point Change in Real House Price Growth, RHO vs. NRHO countries



7 Conclusion

Our main research target was to measure the impact of the share of low income home owners on the volatility of housing prices. Since we have not sufficient data on the distribution of home ownership at our disposal, we had to proxy for the share of low income homeowner by using the owner occupier ratio, which was partly estimated to obtain annual data. With this admittedly crude measure we were in fact able to find some evidence for a destabilizing effect of high home ownership rates, showing up in a positive correlation between homeownership ratio and price volatility in a multivariate framework.

These results were confirmed in a VAR analysis which indicated that this higher volatility might be rooted mainly to a higher sensitivity of house prices to changes in real GDP per capita. Because we have not really identified exogenous GDP impulses in our unrestricted VAR, we cannot draw any conclusions on the causal relationship between GDP changes and changes of house prices. As recent results with structured VARs show, there is probably a very high impact of house price changes on GDP, so it might be that in HHO countries a feedback of house price volatility to GDP growth plays a more important role than in LHO countries.¹¹

Our results confirm the theoretical predictions by Ortalo-Magné/Rady (2002) on the role of homeowners for the price volatility of housing markets. However, in contrast to other studies we could not find a clear impact of mortgage market characteristics, which is probably due to an inadequate specification of our credit market variable. Furthermore we were not able to control for tax induced volatility effects as they have been described by van den Noord (2005). The latter might be correlated with home ownership ratios insofar as tax incentives effectively reduce credit market constraints for prospective home owners.

¹¹ See Demary 2008.

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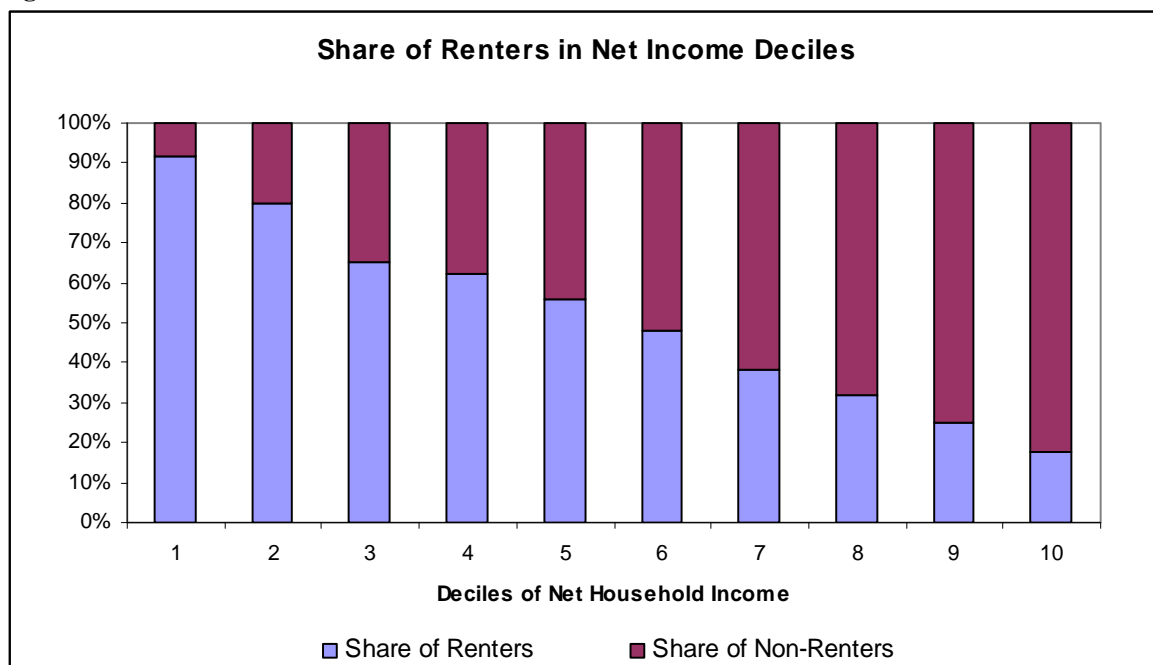
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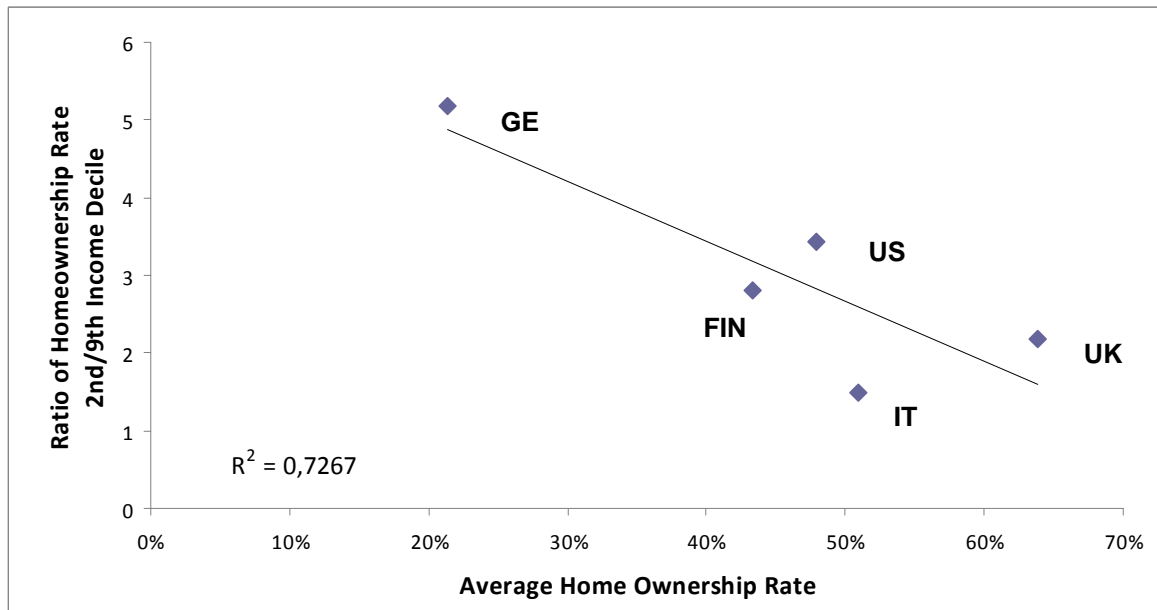
9 Appendix

Fig. 12



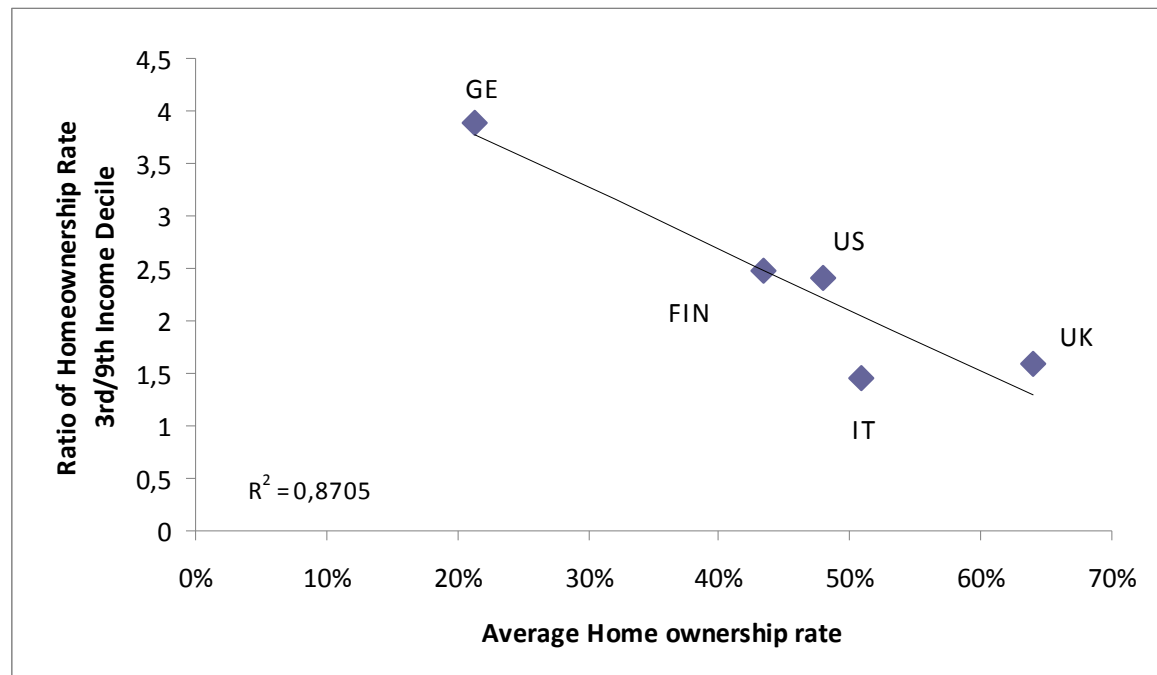
Source: Own calculations based on German income and expenditure survey 2003. Non-Renter include owner occupiers and others living rent-free.

Fig. 13 Ratio of home ownership 2nd/9th income decile dependent on average home ownership rate



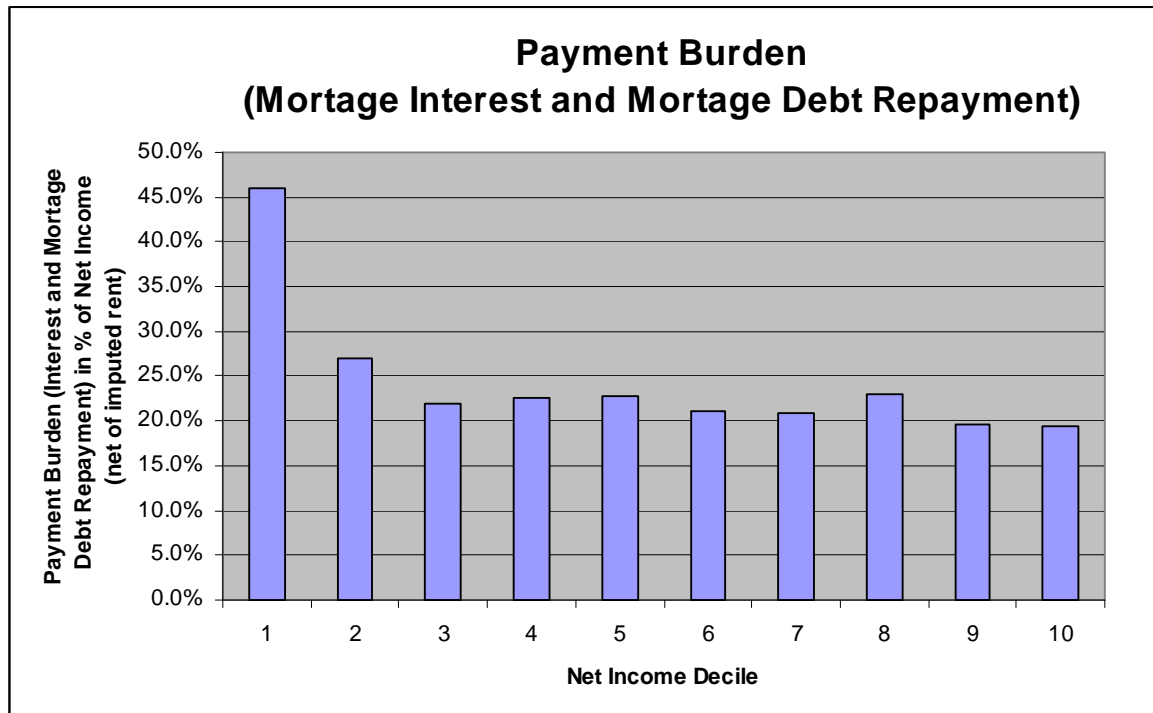
Datasource: Bicacova /Siermienska (2007), based on LWS-data. Sample: head and spouse 18-40 years old, extremely rich individuals excluded.

Fig. 14 Ratio of home ownership 3rd/9th income decile dependent on average home ownership rate



Source: Bicacova /Siermienska (2007), based on LWS-data. Sample: head and spouse 18-40 years old, extremely rich individuals excluded. Graph ZEW.

Fig. 15 Relative Payment Burden of Homeowners in Different Income Deciles



Source: Own calculations based on German income and expenditure survey 2003. Income decile calculated including imputed rent.

Fig. 16: Volatility of Nominal House Prices and Average Ownership Ratio 1970-2006

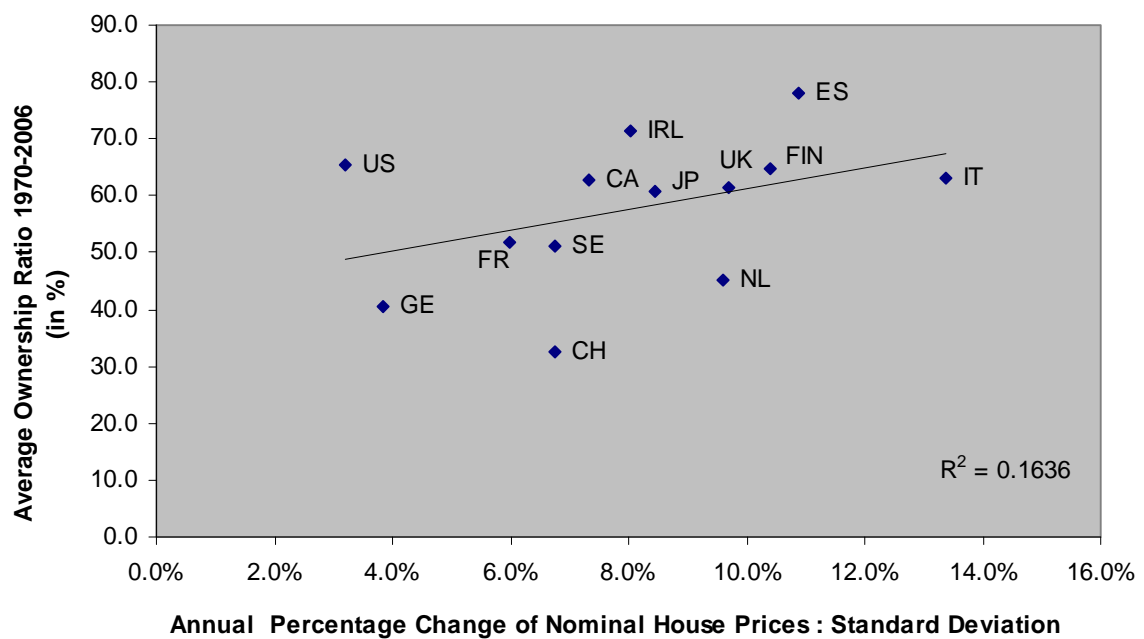


Fig. 17: Volatility of Nominal House Prices and Average Annual increase of Ownership Ratio 1970-2006

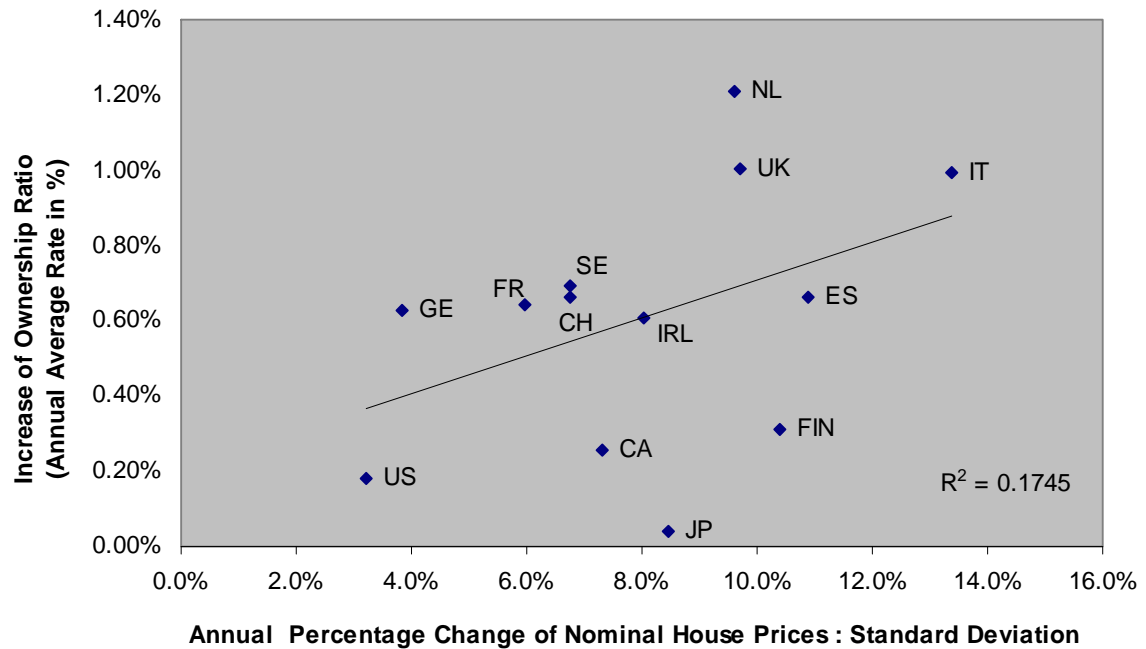


Fig. 18: Volatility of Nominal House Prices and Increase of Ownership Ratio in percentage points 1970-2006

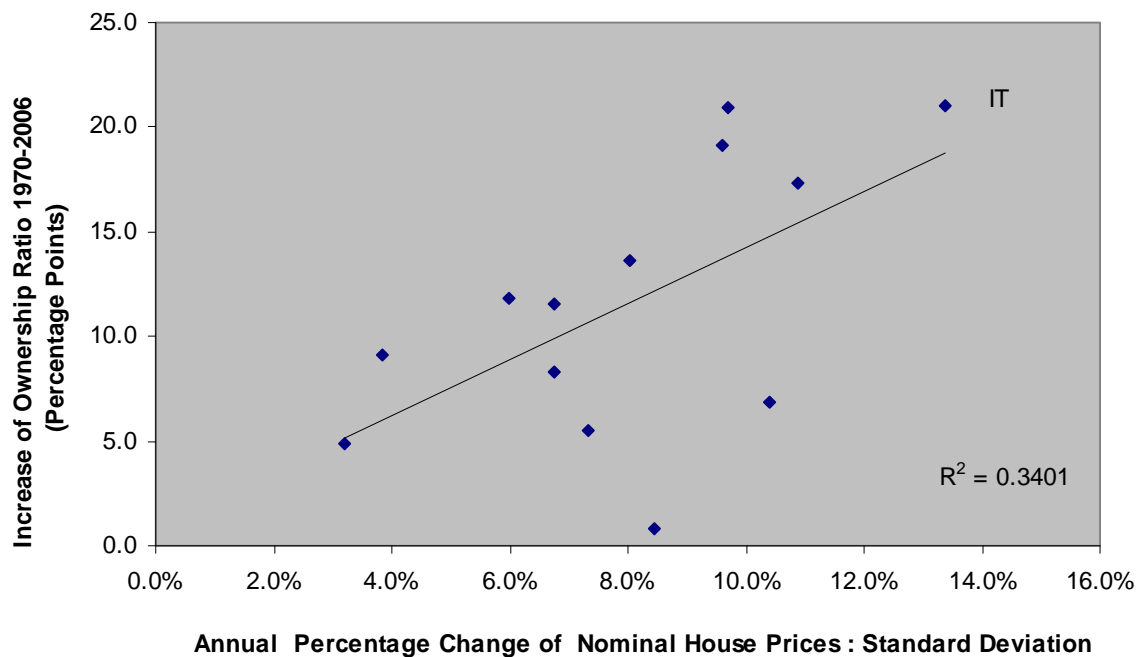
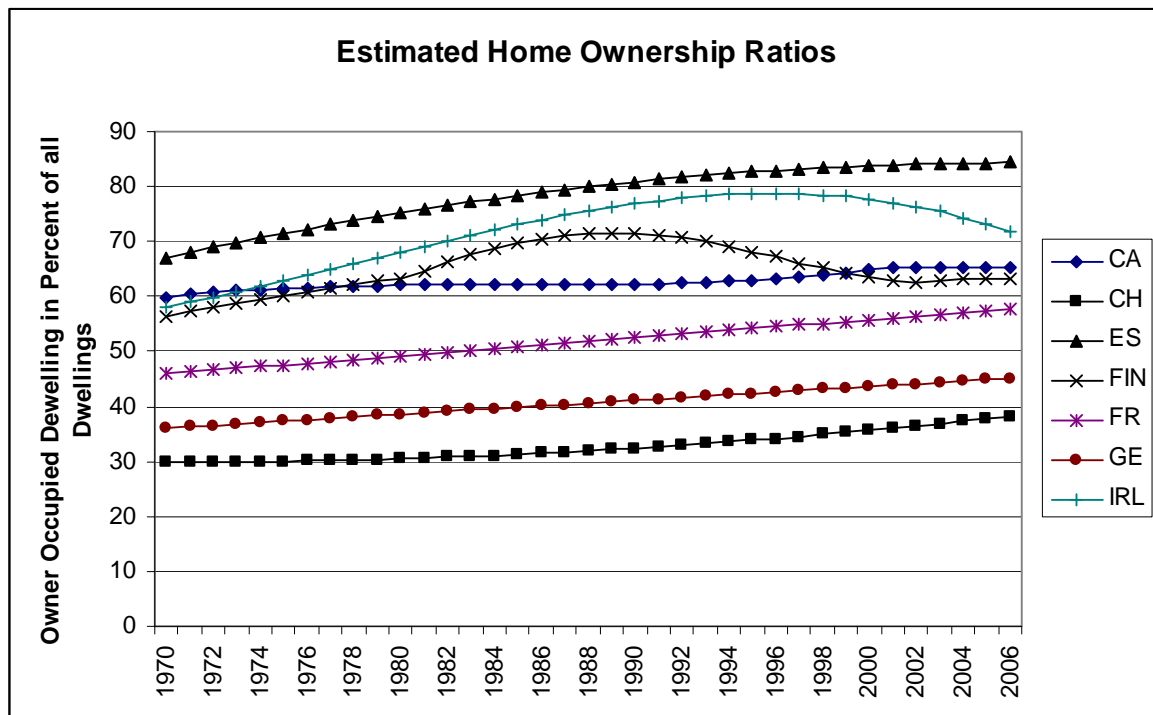
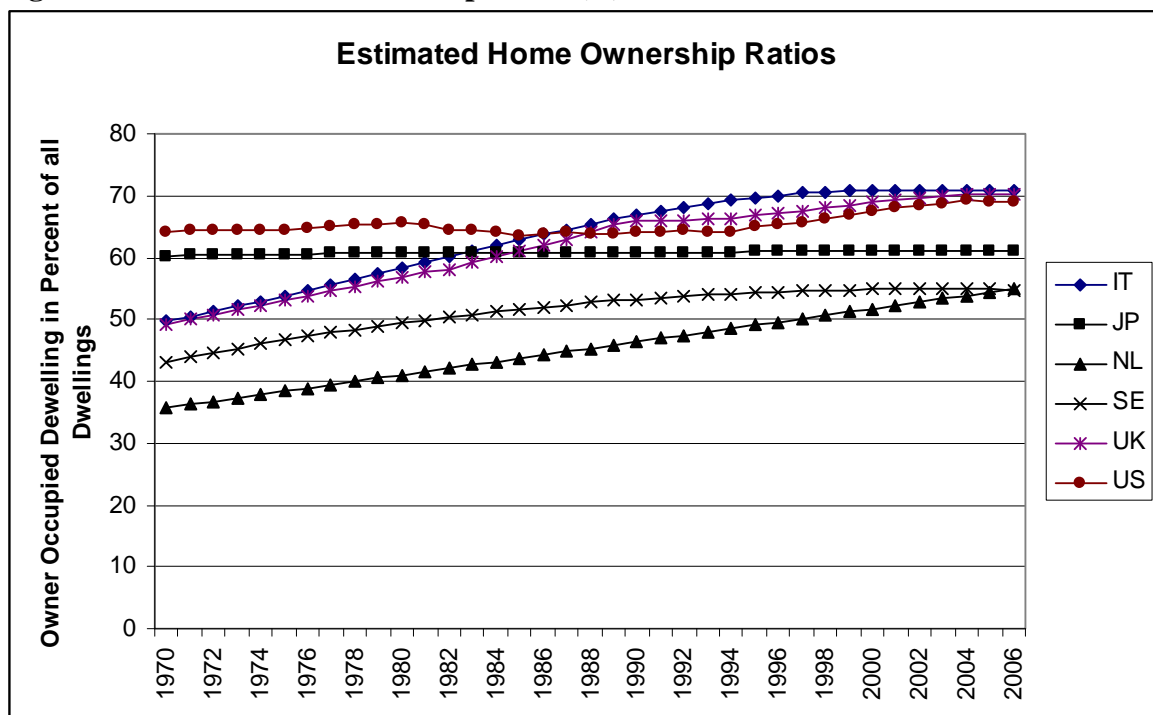


Fig. 19: Estimated home ownership ratios (I)

Sources: National Surveys, Kurz/Blossfeld 2004, own calculations.

Fig. 20: Estimated home ownership ratios (II)

Sources: National Surveys, Kurz/Blossfeld 2004, own calculations.