Saving Rates and House Price Dynamics in Europe: Structural Modeling and Implications for the Future

Report*

November 2008

Contents

* This report, edited by Elsa Fornero (University of Turin and CeRP) and Maria Cristina Rossi (University of Rome, Tor Vergata and CeRP), has been realized for the Observatoire de l'Épargne Européenne, whose financial support is gratefully acknowledged. It is the joint result of separate contributions by Fabio Bagliano (University of Turin and CeRP), Riccardo Calcagno (VU University Amsterdam and CeRP), Elsa Fornero, Claudio Morana (University of Eastern Piedmont, ICER and CeRP) and Maria Cristina Rossi. We are grateful to Massimo Guidolin for his help both in designing and in implementing the research project; to Giovanni Gili, Emilia Soldani and Serena Trucchi for research assistance and to Silvia Maero for editing support.

Executive Summary

Population ageing is one of the major challenges of our times. Unless structural reforms are undertaken not only in the welfare systems but also in the labour and financial markets, ageing will negatively affect both growth rates and public budgets, particularly in Europe. Without reforms, the rising needs of an increasingly elderly population will in any case put a stress on growth supporting policies.

The typical policy answer has been to increase labour market participation of both women and the elderly. Retirement ages have been increased and the implicit taxes on the continuation of work after reaching pension eligibility have been reduced or eliminated by resorting to a stronger correlation between contributions, age of retirement and benefits.

Less emphasis has been put on creating the conditions for a more direct participation of the elderly in financing their needs. Yet, a substantial contribution could come from their more substantial asset, i.e. housing wealth. In recent years, house prices have been steadily growing, with some exceptions, such as Germany and Japan (in 2000-6 real house prices in the OECD area increased at an average yearly rate of 6.6 per cent). Although the present financial crisis casts a gloomy uncertainty on future developments, with the possibility that past gains with be more than offset by prospective losses, the question remains as to how much and how far should the elderly be asked to participate directly in the financing of their increasing longevity. Not all the elderly are poor and the possibility to concentrate public resources on those more in need will help increasing the effectiveness of the expenditure.

Why concentrate on housing wealth? There are four main reasons:

- the weight of housing wealth in households' total assets;
- for homeowners an increase in house prices is likely to generate capital gains, i.e. additional wealth that might be spent in both housing and non-housing goods;
- the elderly are the main beneficiaries of the increase both because of higher homeownership rates and because their shorter lifetime horizon makes the increase in housing value less likely to be compensated by the PV of increased future rents;
- compared to other assets, house value stands out for its greater illiquidity which, combined with the greater needs of the elderly, could lead to financial innovations directed at increasing liquidity.

The transformation of the (greater) house value into a (higher) consumption flow (for example of LTC services) is however very difficult, unless the house is sold and the proceeds are transformed into an annuity: moving into a different (smaller or cheaper) house usually involves great psychological costs; as for annuities, irrespective of their theoretical dominance relative to other assets, they are rarely bought in any case, even when households have more liquid financial assets. The (increased) house value thus tends to represent a "hidden" wealth, which the owner can hardly dispose of for consumption. It thus ends up being bequeathed, even if not out of a genuine "joy of giving", but rather as a necessity. Still, all this should not be an obstacle to a more active role of housing equity towards the strengthening of the retirement nest-egg.

Financial instruments facilitating to turn housing wealth into consumption have been devised and used in the UK and the US for a long period. One of these instruments, called *reverse mortgage*, is a loan granted to house owners and guaranteed by the value of the house (the name comes from the fact that the contract is the opposite of the mortgage stipulated to purchase a house). Reverse mortgages are flexible products: the loan can be paid out either as a lump sum or as an annuity, and can be repaid by the owner or by his/her heirs. Although similar products have been introduced in different European countries in more recent years, the number of transactions remains very limited, hardly making a market. Through the annuity earned on a reverse mortgage, elderly people could cover at least a share of they old age needs, while at the same time remaining in their own house, which usually contributes to lower living costs; these formulae should therefore be promoted, for example through appropriate tax advantages, and also by reducing their complexity and by making the instruments compatible with a bequest motive (covering only part of the house value).

Despite the complexity of the products, instruments like the reverse mortgage could allow households to better allocate their consumption over time; their effects would not be limited to elderly needs; indeed, by enabling a higher consumption by a growing population group, they could play a role in increasing general consumption. Local authorities could play a significant role by endorsing reverse mortgage schemes and thus helping overcome the elderlies' diffidence towards them.

This is the general setting of the present report. We present, first, an overview of households' saving rates, house and wealth dynamics in Europe, in recent years. We document recent trends and stylized facts concerning saving rates, financial and non-financial wealth stock (with particular emphasis on housing wealth), house prices, the potential role and recent expansion of innovative financial products, such as reverse mortgages, and population ageing. We then use both a macro and a micro perspective to analyze the effects of house price variations on consumption and savings for a set of key European countries: France, Germany, Italy, Spain and the UK. Under the former perspective, we estimate the permanent and transitory components of house price fluctuations and explore the dynamic interactions between consumption expenditure, output, and real house prices.

Turning to a micro-perspective, we sketch a simple life-cycle model with households living for two periods, extending Skinner (1993). Even in such a simple framework, an unexpected shock to house prices will produce different wealth effects on households with different age. Our estimation analysis confirms that the impact of real estate appreciation on dissaving is very weak, households decreasing their savings by €50 to €100 corresponding to a €10,000 increase in housing capital gains.

The study does not allow to draw firm policy conclusions and this is by itself an important result, meaning that simple recipes and improvisation by politicians have no place here. Much more is to be understood as to why elderly people do not tap their housing wealth to finance their needs in old age. They are typically unwilling to contemplate moving to a smaller house. This is due to a precautionary motive against future uncertain (particularly health) contingencies, or to other factors.

Even in countries (such as those we have studied) where health expenditure is normally covered by public insurance, fear of future catastrophic health contingencies could persuade households to view the housing equity as the best hedge against these risks and possibly as a wealth to be (informally) exchanged within the family to obtain assistance and care in case of necessity.

1. Introduction

Recent trends in traditional statistical indices that capture the general economic notion of savings have spurred a vivid debate among economists, policy makers, and practitioners. The personal saving rate – which directly measures the ratio between savings and personal disposable income for households and non-for-profit institutions – has been steadily declining in most countries at least since the mid-1980s. In particular, between 2004 and 2006, the official personal saving rate statistics turned negative (or essentially zero) in the US, the UK, Canada, and Australia (see Guidolin and La Jeunesse, 2007). On the contrary, this pattern seems to have left a few other countries, such as Japan, France, Germany, and Italy, unscathed. As a result, average saving rates are now quite heterogeneous in their levels across developed countries, ranging from almost zero to about twenty percent.

The standard commentary is that Americans (and at least to some extent, Canada and Australia) cashed in their once skyrocketing house valuations (up to mid-2006) and raised their living standards; Continental Europeans, on the other hand, have not, and may have perceived more expensive housing as a hindrance rather than an advantage to their well-being. Indeed it is remarkable that the first set of countries we have listed pertains to the Anglo-Saxon culture, while the second is essentially a EU sub-aggregate (plus Japan). Additionally, all available statistical measures confirm that both business cycles (hence, disposable personal incomes) and asset prices (including housing prices) are increasingly co-moving across countries. This means that it would be futile to try and explain these differences in saving rates using factors idiosyncratic to each country[1].

Leaving aside measurement issues which are unlikely to explain the huge international differences in levels and trends of saving rates, at least two questions are triggered by these stylized facts, each conditional to the response given to the other.

First, is there any structural difference between the two sets of countries that we ought to understand and model? Second, if the answer is negative, is Europe destined to follow the steps of US and Canada witnessing a steep decline in savings rates? If the answer is positive, can it be that wealth shocks in the two sets of countries are somehow different or at least simply cause different reactions in terms of consumption/saving behavior?

The effects on consumption and savings of fluctuations in house prices seem to be increasingly at the heart of our understanding of worldwide savings patterns: both in Europe and in the US, a substantial and increasing fraction of household wealth is represented by real estate (in particular, housing) investments. For instance, in countries such as France, Germany, and Italy housing wealth constitutes at least 40% of the total assets accumulated by households, with an extraordinary peak of 51% of total wealth in Germany (2000 data, see Babeau and Sbano, 2005). After economists and policy makers have grown accustomed to consider financial prices as unstable and subject to wide

[1] After the inception of this report, it has become obvious that the trend in house prices has changed, especially in the US and the UK. However, it is too early to observe whether this will cause an inversion in the trend of the personal saving rate.

fluctuations and have found that these generally have modest effects on saving rates, house prices have become increasingly unstable too. Therefore, given its massive importance and the existence of rich temporal dynamics in house prices, housing wealth has acquired a capability of also generating volatility in the total market value of households' assets, i.e. in the overall amount of resources available during a household's life-cycle. Therefore the common perception that housing would only be just one portion – albeit sizeable, and possibly still less volatile – of total household wealth has been recently shaken by an increasing awareness that real estate assets may be somewhat special and that volatile house prices may affect consumption and savings in non-trivial ways. For instance, while a change in the price of an already traded security only affects the portfolio of the households who have invested in it, volatile house prices directly impact non-housing consumption of both homeowners and renters. For renters an increase in the price of houses generates additional costs for housing services, whose prices – at least in efficient markets, where the rental costs as a fraction of the total value of the residence should equal the interest rate plus the depreciation rate – should rise accordingly. On the other hand, for homeowners an increase in the price of their home(s) generates capital gains, i.e., additional wealth that might be spent in both housing and non-housing goods.

The traditional approach in the literature to estimating wealth effects has simply regressed consumption over changes in wealth so as to calculate the marginal propensity to consume out of a wealth increase and, as an implication, the marginal propensity to save off wealth shocks. For instance, Catte et al. (2004) estimate the marginal propensity to save (MPS) from shocks to both housing and financial wealth using OECD data. They find that the MPS out of housing wealth falls in the narrow range 0.92-0.95 for Australia, Canada, the Netherlands, the UK and the US, while it climbs to a stunning 0.98-0.99 for Italy, Japan, and Spain; finally the MPS would even fail to be significantly different from one for France and Germany. This means that for most of Europe (the exception is the UK), a one euro shock to housing wealth translates almost integrally into higher savings and in zero additional consumption. Moreover, Catte et al. report that for most countries housing wealth effects on savings are smaller than the effects from shocks to financial markets.

Until early 2007, if someone had taken these estimates as good and based a prediction on extrapolations of recent trends in real estate values in Europe, she would have concluded that an age of abundant savings and cheap capital awaits Europe: if house valuations had kept growing at the pace of the period 1995-2005 and – for whatever reasons – French, German, and Italian households were to save between 98 and 100% of such capital gains, we should have witnessed saving rates as a percentage of disposable income remaining positive and rather high in Europe, differently from the United States and the UK.[2]

However, estimates based on aggregate data are likely to suffer from massive endogeneity problems, which are easy to summarize: at the macroeconomic level, where consumption and savings decisions are a major determinant of equilibrium asset prices, it is virtually impossible to use price shocks to understand savings behavior, since the initial shock may have been generated in the first place by a change in saving attitudes. A number of subsequent studies examined the same issues using panel-like, microeconomic data sets concerning the behavior of individual households. For instance, Disney et al. (2002) use the information contained in the BHPS on spending patterns of British households along with county-level indicators of house prices to estimate the British MPS. They report a MPS for housing wealth shocks of approximately 0.98 during the house price boom of the 1990s, i.e. a coefficient significantly higher than aggregate studies. Grant and Peltonen (2005) use the panel section of the Italian SHIW to estimate the impact of changes in housing wealth on non-durable consumption. Their estimated housing wealth effects are small and not significant in general, i.e. their MPS is approximately 1.

In our study, we bring together a number of elements and factors – such as the dynamics of the demographic structure of house-owners, the process of financial innovation that involves the ability to transform changes in house valuations into consumption flows, and the differential impact on savings and consumption decisions of the degree of persistence of housing wealth shocks – in order to explain the apparently different effects of the recent appreciation in real estate assets that has taken place at the turn of the millennium on consumption and savings behavior. We exploit structural differences across time and especially across countries in the degree of financial sophistication, in the age and composition of households, as well as differences in the degrees of persistence and variability of the shocks to house prices, and finally in the transaction costs and frictions characterizing real estate markets, to reach two objectives: first, a deeper understanding of the differences in averages as well as recent dynamics of saving rates across developed countries, *in primis* among Anglo-Saxon and continental European countries; second, a range of well-founded predictions on how saving behavior is likely to evolve.

In particular, our study implements a research strategy based on three different steps.

1. In a first step, on the basis of a conjecture that different reactions of saving behavior across different countries may depend on the different role played by the transitory vs. permanent nature of the shocks to housing wealth, we separate and measure the two

[2] On the contrary, recent months (2007-2008) have witnessed declining house prices in Europe as well as in the US; taken at face value, the above estimates would imply that consumption will not suffer from the effects of such a downturn, the flow of savings acting as a buffer stock and absorbing the impact.

components of housing wealth variations and use time series methods to investigate the reaction of consumption to permanent shocks to house prices.

2. In the second step, we develop a micro-founded, optimizing model of the consumption and savings choices at the household level. We refer to a simple, deterministic framework to obtain a simple intuition of the major factors at play behind optimizing saving decisions.

3. In the third stage, we collect and analyze micro (when possible, panel) data from five European countries (France, Germany, Italy, Spain, and the United Kingdom) and proceed to estimate empirical models that allow us to test whether the implications of the theoretical frameworks are supported (when, and why) in each of the countries under investigation.

This report is structured as follows. Section 2 gives an overview of saving rates, house and wealth dynamics in Europe, in recent years. This Section provides a number of institutional details and familiarizes a reader with the basic stylized facts, useful to understand our research design. In particular, we document recent trends and stylized facts concerning saving rates, financial and non-financial wealth stock (with particular emphasis on housing wealth), house prices, the potential role and recent expansion of innovative financial products, such as reverse mortgages, and population ageing.

Section 3 adopts a small-scale multivariate modeling strategy to disentangle the permanent and transitory components of house price fluctuations and explore the dynamic interactions between consumption expenditure, output, and real house prices.

Section 4 sketches a simple life-cycle model with households living for two periods, extending Skinner (1993). Even in such a simple framework, an unexpected shock to house prices will produce different wealth effects on households with different age. The section describes specific results obtained on microeconomic data for France, Germany, Italy, Spain, and the United Kingdom.

Section 5 concludes and presents a few final thoughts concerning the comparative aspects of the results obtained in our investigation, as well as directions for future research.

2. An Overview of Saving Rates, Wealth, House Prices and Ageing in Europe

2.1. Saving Rates

Figure 1 and Figure 2 illustrate the evolution of gross and net saving rate, respectively, for the five selected European countries between 1996 and 2005. Table 1 reports the corresponding numbers in the two figures. In 1996, the Italian saving rate was approximately 20%, the highest among European countries. The saving rates of the other countries were at a much lower level, around 10% in France and Germany, and at 5% in the UK. Since 1996, Italy has witnessed the sharpest decline in its saving rate, which fell to below 10% in 2000 but slightly recovered after then. In 2005 the Italian saving rate was no longer different from that of other countries, with a saving rate of about 10%. France, Germany and Italy had shown similar saving rates between 2000 and 2005, with Germany and France showing a constant, smooth pattern in their saving propensity. Since 1999, French households are exhibiting the highest propensity to save, with a peak in their saving rate (equal to 13%) in 2002.

The UK households have constantly saved a lower proportion of their income during the decade. Moreover, the UK saving rate had further declined from its starting level during the decade. In 2005 the UK saving rate was approximately zero. Between the two extremes, on one end France, Germany and Italy have double digit saving rates. On the other hand the UK has no savings, Spain lies in the middle with a saving rate fluctuating around 5%.

Figure 1– Household Gross Saving Rates

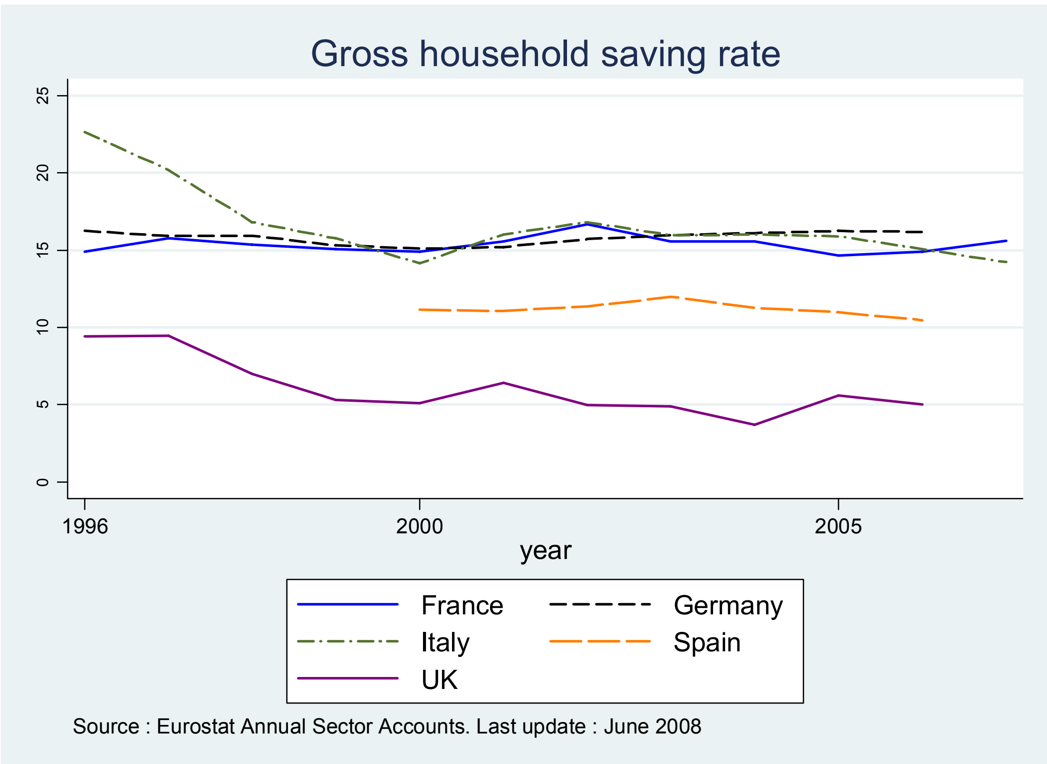


Figure 2– Household Net Saving Rates

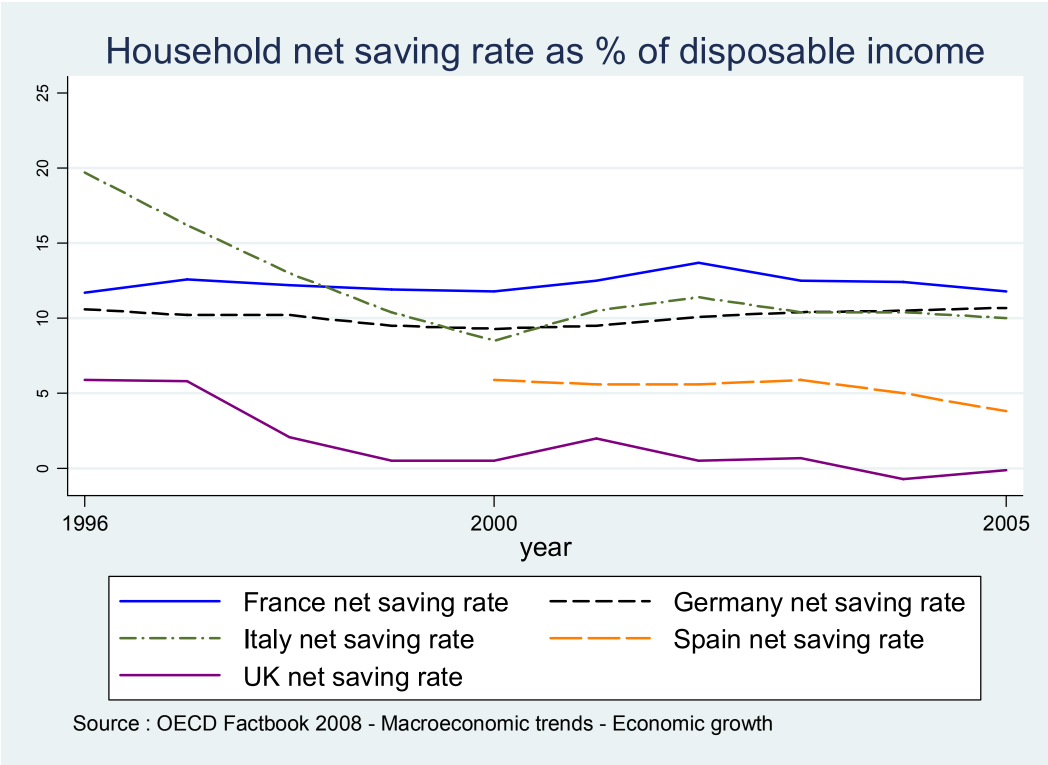


Table 1 – Gross and net Saving Rates

Year	France	Germany	Italy	Spain	UK
1996	14.9	16.26	22.66		10.44
1997	15.79	15.93	20.19		10.46
1998	15.35	15.94	16.82		8.01
1999	15.06	15.31	15.77		6.32
2000	14.9	15.1	14.16	11.14	6.11
2001	15.58	15.21	16.03	11.08	7.43
2002	16.67	15.71	16.82	11.36	5.99
2003	15.57	15.98	15.97	11.98	5.91
2004	15.56	16.11	16.01	11.28	4.71
2005	14.65	16.25	15.91	10.98	6.57
2006	14.89	16.19	15.07	10.46	6.03
2007	15.62		14.23		
Household Net Saving Rate					
1996	11.7	10.6	19.7		5.9
1997	12.6	10.2	16.2		5.8
1998	12.2	10.2	13		2.1
1999	11.9	9.5	10.4		0.5
2000	11.8	9.3	8.5	5.9	0.5
2001	12.5	9.5	10.5	5.6	2
2002	13.7	10.1	11.4	5.6	0.5
2003	12.5	10.4	10.4	5.9	0.7
2004	12.4	10.5	10.4	5	-0.7
2005	11.8	10.7	10	3.8	-0.1

Source: net saving rate OECD Factbook 2008; gross saving rate, Eurostat Annual Sector Accounts. Last update: June 2008.

2.2. Housing Wealth

As a next point in our investigation, we present a few summary statistics illustrating total net wealth (to be interpreted as the cumulated value of past savings net of outstanding debt) and its main components, as well as the distribution of net wealth (both financial and non-financial) by age groups. Table 2 presents the ratio between total net wealth and disposable income for the five European countries under investigation.

Table 2 clearly shows that Italy and the UK are characterized by a very high ratio of net wealth over income, and that this ratio has been increasing over recent years (e.g., according to Eurostat data, the ratio increased from about 6 to almost 8 between 1995 and 2005). In France and Germany lower ratios are found, ranging between 5 for the latter and 7 for France.[3] The reasons for these international differences can be numerous and difficult to disentangle: net wealth is in fact influenced not only by the progressive accumulation of past savings and movements in the price of securities, but also by institutional features (such as the structure of financial and banking markets), the conditions of the public pension schemes, and by demographic trends. Table 2 also reveals that Italy and France display a huge and increasing percentage of total wealth represented by housing (the most important component of non-financial assets, and corresponding to an explicit entry in the second group of data columns), although the recent trend has been similar in the UK.

Table 2 – Net Wealth and Housing Wealth as a Ratio of Disposable Income

Household wealth with respect to disposable income								
Data from Eurostat, annual financial accounts db (November 2007)[1]					Data from national statistical institutes, OCSE, Bundesbank			
	Financial assets (FA)	Financial liabilities (FL)	Non financial assets (NFA)	Net worth (FA+NFA-FL)	Financial acivities (FA)	Financial liabilities (FL)	Housing wealth	Net wealth (in millions of €)
Italy								
1995	2.56	0.38	3.95	6.14	-	-	-	4,504,843
…	…	…	…	…	…	…	…	
2000	3.63	0.51	4.11	7.24	3.8	0.53	3.4	6,336,532
2001					3.6	0.52	3.4	6,533,631
2002					3.5	0.54	3.6	6,929,581
2003	3.35	0.55	4.61	7.41	3.5	0.57	3.8	737,568
2004					3.7	0.61	4	7,867,593
2005	3.57	0.63	4.99	7.94	3.8	0.66	4.2	8,426,063
2006								
France								
1995	2.12	0.63	2.87	4.35	-	-	-	

[3] Unfortunately, data for recent years are not available for Spain. Notice that the last columns of Table 2 present evidence derived from Bundesbank, OECD, and other national statistical agencies' data, and gives similar indication; the only exception is that the net wealth-disposable income ratio of France turns out to be comparable to the ones recorded for Italy and the UK.

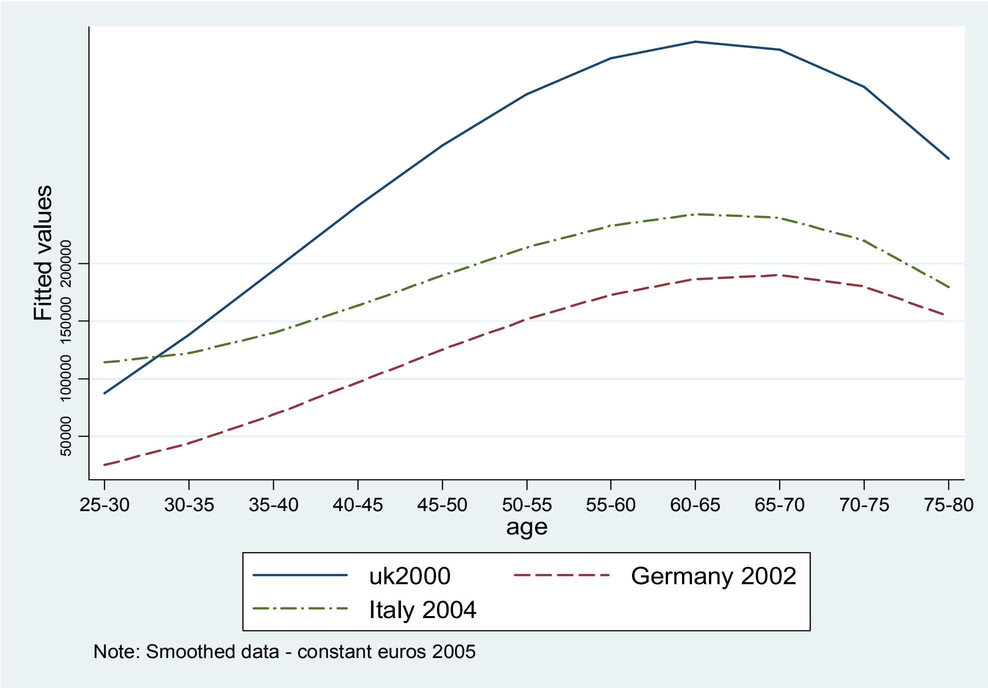
…	…	…	…	…	…	…	…
2000	2.67	0.72	3.2	5.15	2.8	0.77	2.9
2001					2.7	0.78	3.1
2002					2.6	0.76	3.3
2003	2.54	0.75	4.08	5.87	2.7	0.8	3.7
2004					2.8	0.84	4.3
2005	2.8	0.82	5.13	7.12	3	0.87	4.9
Germany							
1995	2.08	0.9	3.11	4.29	-	-	-
…	…	…	…	…	…	…	…
2000	2.55	1.07	3.24	4.72	2.7	1.14	2.9
2001					2.7	1.11	2.8
2002					2.7	1.12	2.9
2003	2.59	1.04	3.16	4.71	2.8	1.11	2.9
2004	2.76	1.01	3.06	4.82	2.8	1.09	2.8
2005					2.9	1.08	-
Spain							
1995	2.17	0.62	n.a.	n.a.	-	-	-
…	…	…	…	…	…	…	…
2000	2.49	0.81	n.a.	n.a.	n.a.	n.a.	n.a.
2001					n.a.	n.a.	n.a.
2002					n.a.	n.a.	n.a.
2003	2.49	0.99	n.a.	n.a.	n.a.	n.a.	n.a.
2004					n.a.	n.a.	n.a.
2005	2.65	1.2	n.a.	n.a.	n.a.	n.a.	n.a.
United	Kingdom						
1995	3.95	1.06	2.8	5.69	-	-	-
…	…	…	…	…	…	…	…
2000	4.86	1.14	3.78	7.5	4.9	1.14	3.1
2001					4.3	1.18	3.1
2002					3.8	1.3	3.6
2003	3.97	1.41	4.72	7.27	4	1.41	3.9
2004					4.1	1.53	4.2
2005	4.41	1.55	5.02	7.89	4.4	1.55	4.2

Note: [1]The disposable income in the denominator is referred to households plus non profit organizations because the latter cannot be disentangled from the former in most of the countries. We also use gross rather than net disposable income as a scale factor. The same approach is followed by Bier (2007). Net wealth cannot be calculated for Spain because the country does not publish data on household real wealth.

Figure 3 shows the characteristic shape of "net wealth by age" function for Germany, Italy and the UK[4]. Interestingly, the differences across country profiles can be noticed more in the levels than in the shapes: in particular, the German and Italian functions are nearly parallel between the ages of 40 and 80; something similar happens to Germany and UK between ages 35 to 70.

[4] Unfortunately, our data sets fail to refer to identical years. See Section 4.3 for details.

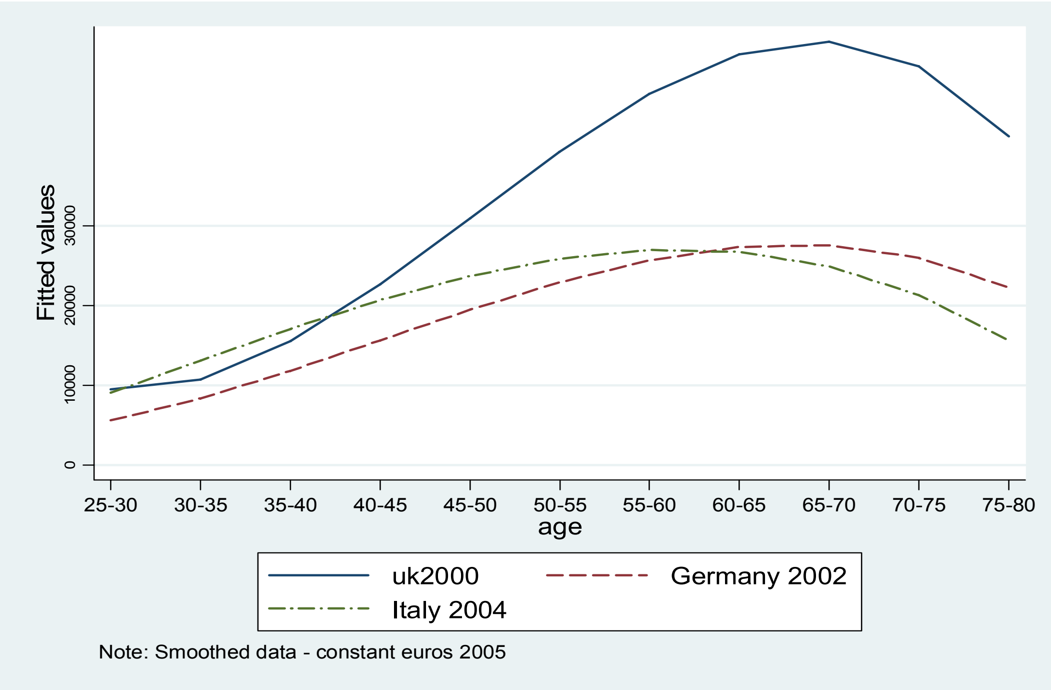
Figure 3 – Net Wealth by Age Group of Household's Head



Source: Luxembourg Wealth Study (LWS)

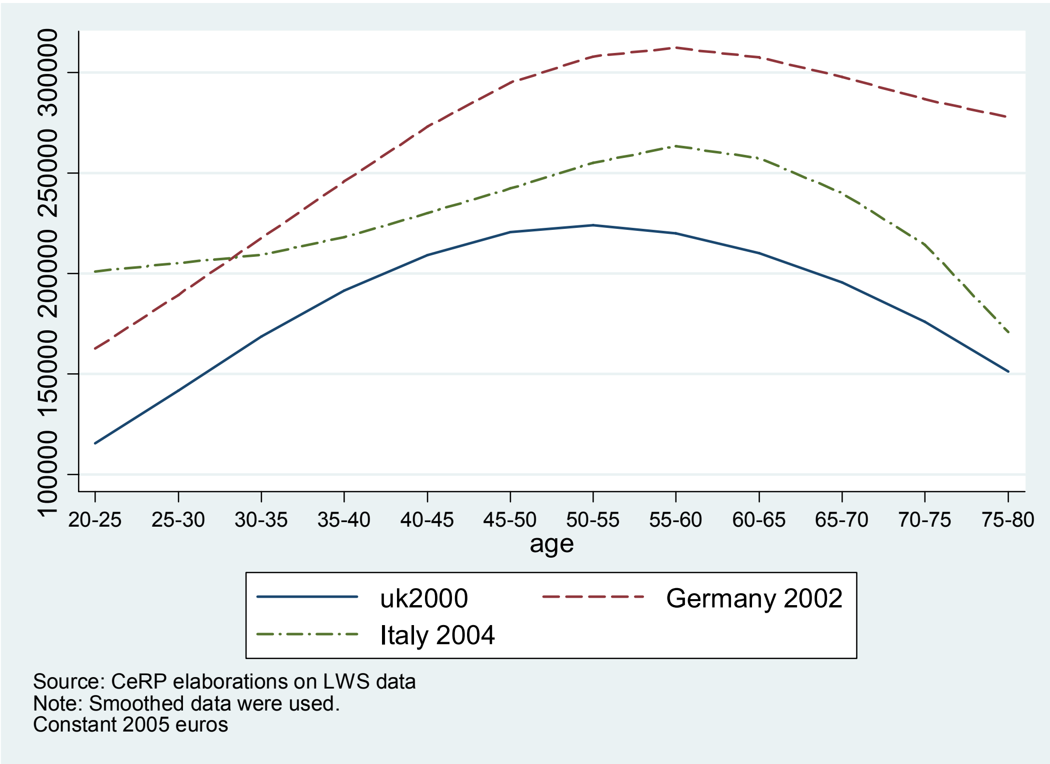
The same plots have been replicated twice to describe the evolution of both financial and non-financial wealth in isolation, as a function of the age of the head of household. Crucially, when looking at these figures we must keep in mind that these data refer to aggregate quantities, with the additional caveat that we are dealing with estimates based on sampling methods, in contrast to Table 2 which reported official, aggregate statistics. In Figure 4 it is clear that the function shapes are similar across countries, although financial wealth peaks relatively early in Italy (between 55 and 60 years of age) in comparison to Germany or the UK. On the contrary, as shown in Figure 5, the estimated functions are rather different when non-financial assets are considered, with the UK peak coming relatively early in life (between 50 and 55 years) old, which may have to do with many types of career paths (like banking or insurance) more typical of Anglo-Saxon countries. More importantly, Britain seems the only country where the ownership of housing services tracks closely the different needs in the life-cycle. Typically, housing service needs change in accordance with demographic changes, thus they should follow an inverse U-shape, increasing with household dimension.

Figure 4 – Total Gross Financial Assets by Age Group of the Household's Head



Source: LWS

Figure 5 – Total Gross Non-Financial Assets by Age Group of the Household's Head

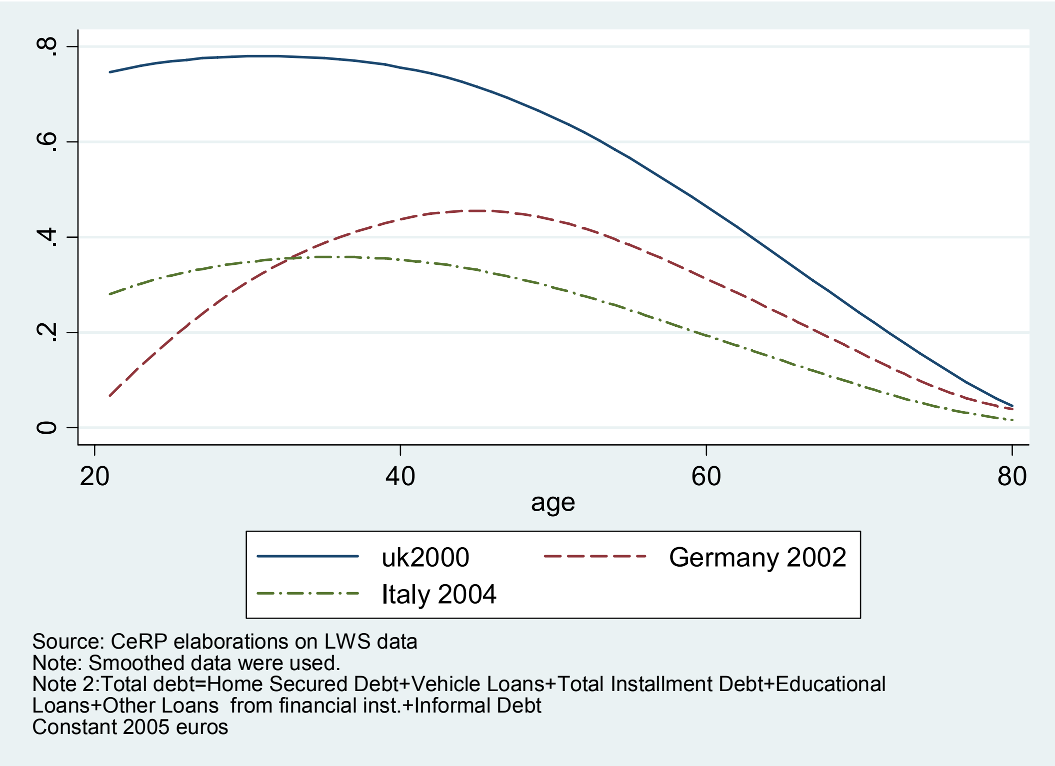


Source: LWS

Figure 6 and Figure 7 illustrate the ratio of households holding any debt and the amount of debt for the indebted households, respectively. The percentage of indebted people and the magnitude of debt has a similar pattern within countries and age group. The UK shows the highest percentage of indebted people at any age, while Italy has the lowest percentage, with the exception of the category of young households.

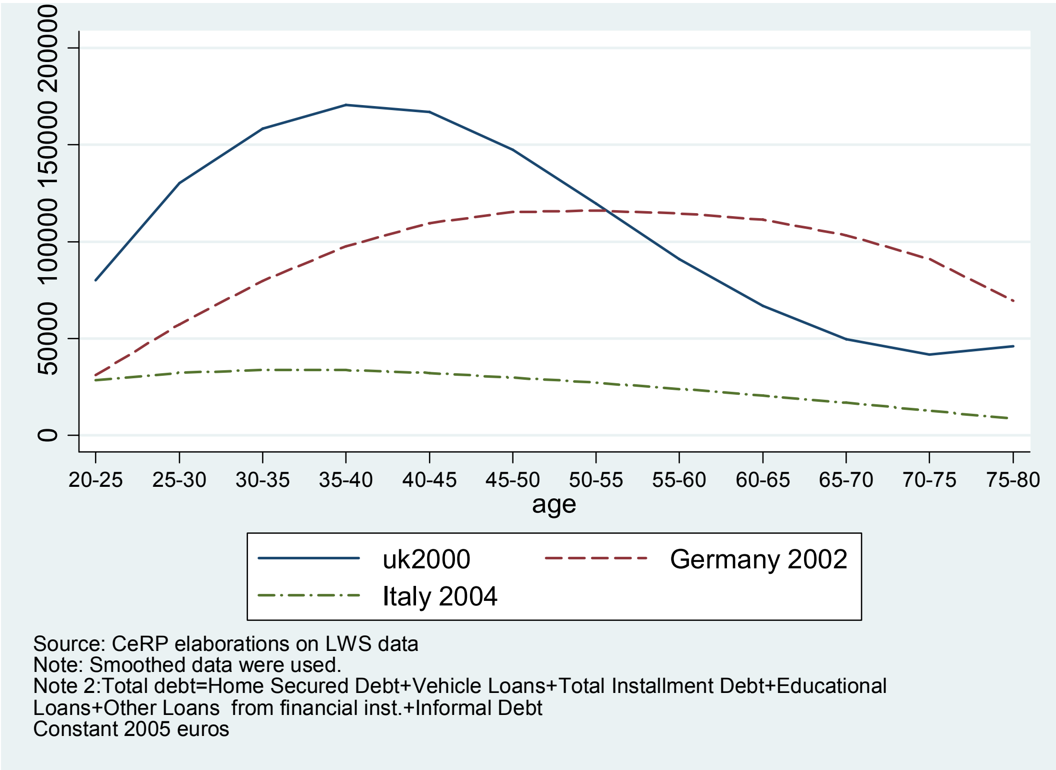
At the age of 30, almost 80% of British households is indebted, while this percentage drops to less than 40% for Germany and Italy. This evidence reveals that resort to borrowing to accomplish consumption smoothing over the life time is not a common practice with the exception of the UK, probably due to more flexible capital markets than in other European markets. Turning to the actual amount of debt, British households are the most indebted until the age of 50-55, reaching the debt peak at around Euro 170,000 at age 35-40. For older age groups, German households are the most indebted, with the peak of debt around Euro 100,000. Italian households are very little indebted, with an average debt never above Euro 50,000, this revealing the thinness of the financial market in this country.

Figure 6. Fraction of households with debt, by Age Group of the Household's Head



Source: LWS

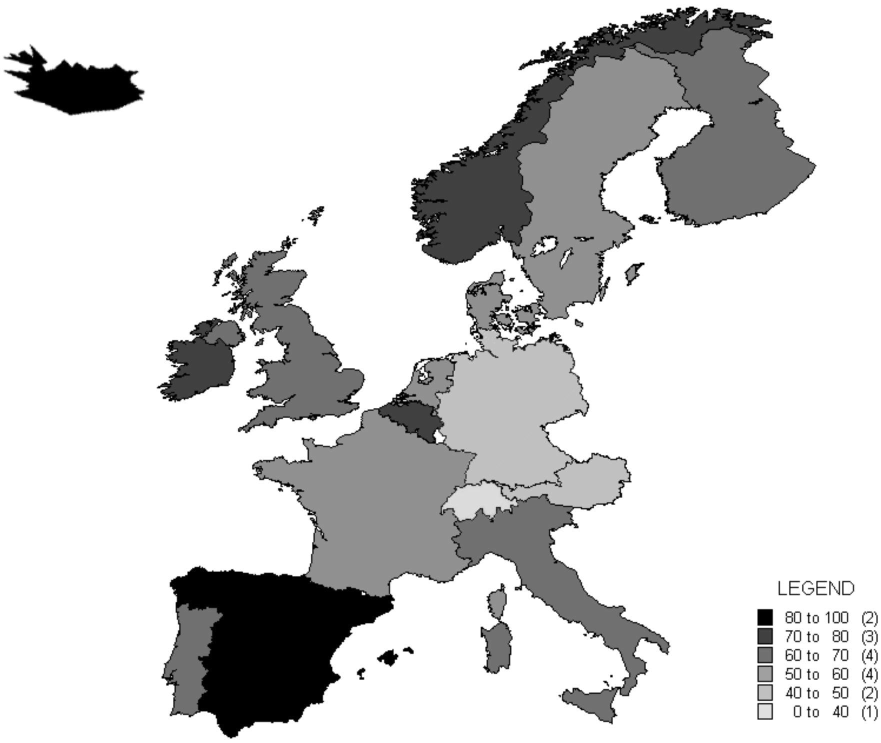
Figure 7. Household Debt, by Age Groups of Household's Head



Source: LWS

Figure 8, taken from Atterhög (2005, p.4), reports the home-ownership rates in various European countries.

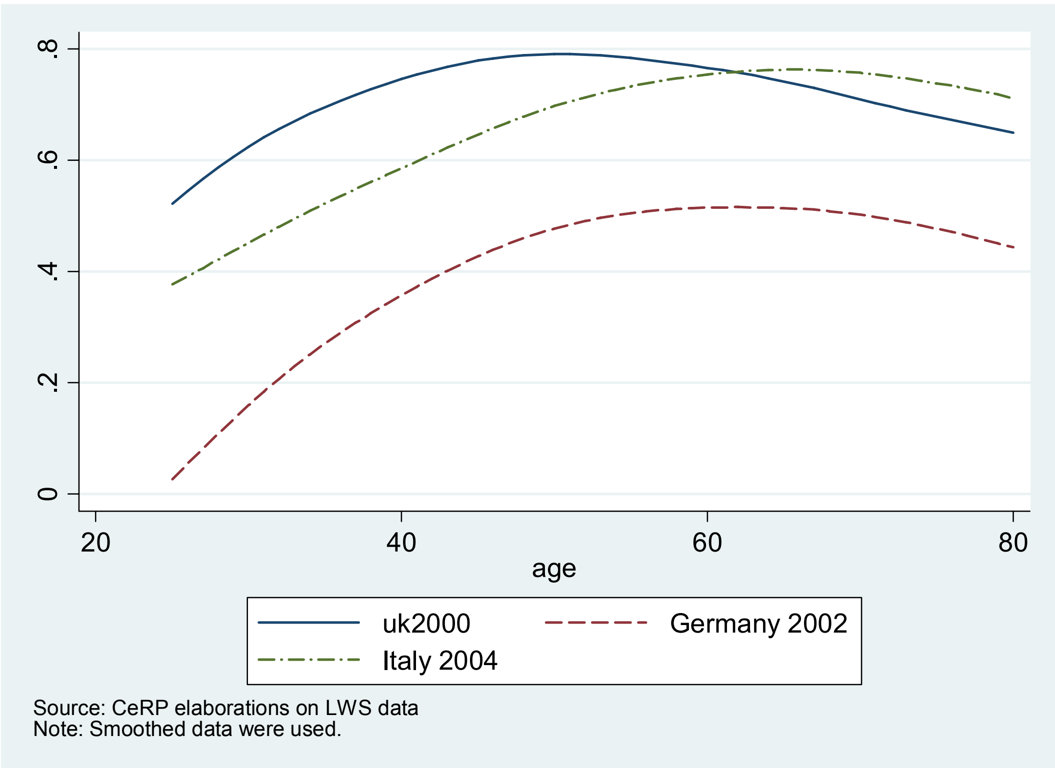
Figure 8 – Home ownership rates for selected European countries



The figure shows that Spain tends to have an extremely high average rate (in excess of 80%), while the country where the lowest levels (40-50%) are to be found is Germany (lower rates are only found in Switzerland and Luxembourg). France, Italy, and the UK show intermediate levels, between 50 and 70 percent.

Of particular interest is the comparison between the home ownership rates by age, illustrated in Figure 9. The data come from the LWS (Luxembourg Wealth Study) database but unfortunately they are only available for three countries: Italy, United Kingdom and Germany. In the figure, the age variable has been categorized in 5 classes of five years each and data have been smoothed by means of a third-order age polynomial regression to simplify the analysis. Consistently with the evidence in Figure 9, Germany has the lowest ownership rates at all ages, while the highest home ownership among the people younger than 60 years old occurs in the UK; the highest rate for the elderly occurs in Italy, where the natural decrease in homeownership in old ages is slower. While in UK, as in many other countries, the ages at which the home ownership rate reaches its peak is between 40 and 55 years, in Italy and Germany the maximum is reached later (60-70 years).[5]

Figure 9 – Home Ownership Rates by Age Group



Source: LWS

[5] Due to the low number of observations in the extreme age groups, caution must be taken in commenting upon the graph for very young and very old people.

2.3. *House Prices*

At least since 1970, European real house prices have fluctuated around a strong upward trend, which has become more and more evident after the mid-1990s. For instance, the Economist house-price index (The Economist, 2003) has increased by approximately 19% in real terms in the period 1195-2002. The reasons for this fundamental trend are generally considered to be the rising demand for housing space, due to increasing income; historically and persistently low real interest rates; the demographic developments to smaller (or even single-unit) households (Krainer, 2005); the increasing scarcity in land availability (often due to restrictive laws); the higher average quality of the new dwellings, and the lack of large productivity improvements in the technology used to produce and supply residential units. Girouard et al. (2006) have recently noticed that this booming trend in real house prices has no historical precedent, both in terms of the overall duration of the bullish trend (only recently interrupted for a majority of OECD countries) and in terms of high correlation observed between trends in house prices in most of the OECD countries and their clear disconnect from the standard (international) business cycle factors.

As a preliminary step in setting up our research design, we have proceeded to investigate the recent dynamics in house prices in the five European countries under investigation. Table 3[6] shows the sources of data employed in what follows. To estimate the duration and the turning points of the cycle we use the Bry-Boschan cycle-dating procedure (Bry and Boschan, 1971); in essence, this methodology introduces restrictions to ensure that periods of increasing and decreasing prices persist for at least six quarters before establishing a turning point. Table 4 shows that the last bullish cycle in housing markets[7] has already exceeded, both in terms of cumulative increase and duration, all the recent ones. Notice that this is not a purely European phenomenon: since the mid-1990s an impressive number of countries not covered by Tables 3 and 4 (e.g., Australia, New Zealand, and the United States) have experienced a similarly large surge in the real value of housing assets.

Figure 10 shows real prices (base year: 2000) in the five countries under investigation. One can easily detect the strong upward trend that has involved all the countries except Germany, where we notice a slow decrease in real prices. The plot also confirms the high correlation that seems to link the trends in the different countries, in particular Spain, France and UK. Faced with these strong and widespread trends in house prices, it becomes natural to investigate whether and how such changes in relative prices may affect future saving choices in Europe.

One problem with our research design is the existence of two different notions of house prices. The first comes from the index-construction activity of the agencies and institutions listed in Table 3 and produces time series of (real) prices for homogeneous

[6] We are grateful to Nathalie Girouard for providing us with the house price time series.

[7] It could be argued that such a long and steep cycle has actually ended during 2006, although our methodology does not allow us to formally draw this conclusion.

categories of dwelling units. The second comes from the micro-level data sets discussed in Section 4 of this report and consists of the subjectively perceived values for houses and dwelling units. One wonders whether the two notions of house prices give similar indication as the ongoing phenomenon of growth of real housing values. We have therefore devoted some time to investigating the relationship between the implications of the Italian SHIW data set for house prices (obtained as the household estimate of their dwellings' value) on one hand, and the data from house transactions, collected by Nomisma. We find (as in Cannari and Faella, 2007) that the two series tend to have similar patterns, with two phases of steep increase from 1987 to 1992 and from 2000 onward.

Table 3 – Sources of Data on House Prices in France, Germany, Italy, Spain and UK

Country	House price definition	Seasonal adjustement	Source
France	Indice de prix des logements anciens, France	No	INSEE, 1996Q1-2005Q1
Germany	Index for total Germany, total resales	--	Bundesbank, 1994-2004
Italy	Media 13 area urbane numeri indice dei prezzi medi di abitazioni, usate	No	Nomisma, 1991S1-2005S1
Spain	Precio medio del m2 de la vivienda, mas de un ano de antiguedad	No	Banco de Espana, 1987Q1-2004Q4
UK	Mix-adjusted house price index	No	ODPM, 1968Q2-2005Q2

Source: Girouard et al. (2006).

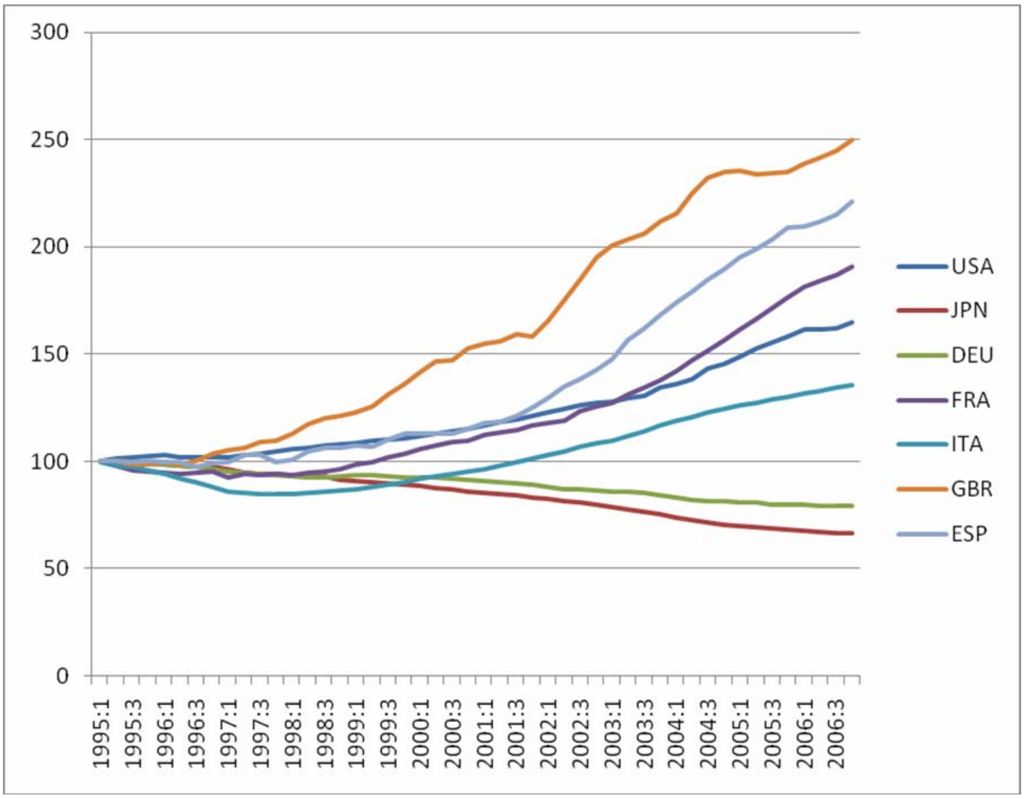
Table 4 – Real House Price Cycles

Summary statistics on real house price upturn cycles

	Major house price upturn 1970-2005						Current cycle 1995-2007	
	Number of upturns	Average duration (quarters)	Average price change %	Max duration (quarters)	Max price change %	Number of upturns > 15%	Duration (quarters)	Price change %
Germany	3	21.3	12.1	27	15.7	1	>40	-20.7
France	2	35.5	32.1	44	33	2	>40	94.0
Italy	2	34.5	81.9	44	98	2	>40	35.7
United Kingdom	3	18.3	64.2	30	99.6	3	>40	161.9
Spain	3	19.3	-21.6	31	-32.2	2	>40	118.4

Source: Girouard et al. (2006).

Figure 10 – Real House Price Cycles



Note: The graph shows the time series of real prices, base year 1995, quarterly data.

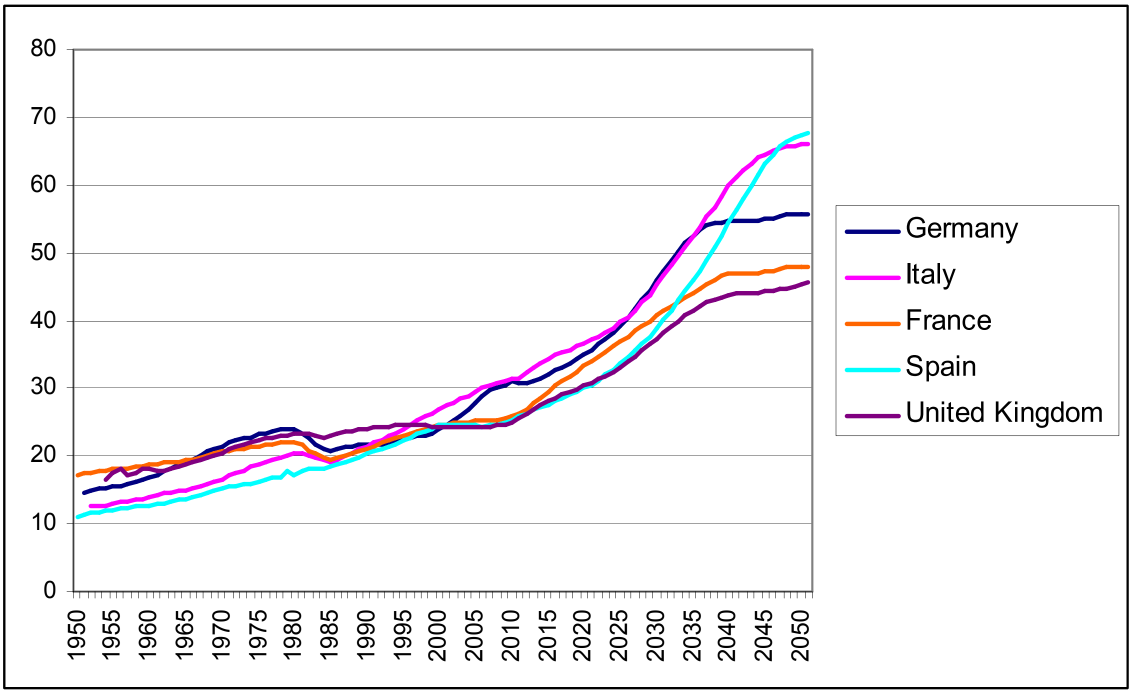
Source: CeRP calculations on OECD data.

2.4. Population Ageing

Naturally enough, a discussion of the future, predicted evolution of saving behaviors in Europe can hardly be disconnected from an assessment of the age profiles and demographic dynamics of the countries under consideration. Population ageing is one of the biggest challenges Europe will face in the coming decades, affecting not only the performance of economic systems and public finances, but also welfare systems, and society overall.

The European Commission forecasts that within less than a half century the European population will decrease and grew considerably older: fertility rates – despite a mild growth trend – will remain largely below their natural replacement rate. On the other hand, life expectancy at birth will grow – according to conservative forecasts – on average by 6 years and the working age population will decrease by about 16%, while the elderly population (aged 65 and older) will increase by roughly 75%. The dependency ratios (the ratio of population aged 65 and older over the population in the 15-64 bracket) for the countries considered in Figure 8 display a remarkable increase over the 1950-2050 horizon, with an extraordinarily high pace predicted in the future years.

Figure 11 – Evolution and Projections for (Percentage) Dependency Ratios in Europe



Source: National strategy reports on adequate and sustainable pension systems (2005).

2.5. The potential role of reverse mortgages

A reverse mortgage (called lifetime mortgage in the UK) is a loan scheme supported by collaterals represented by a house or other residential unit that allows a home-owner aged 62 or more (age depends by the financing institution) to convert a portion of the value of a house into consumption without any obligation of selling the house at the expiration of the loan or implications in terms of paying interests and capital on a regular basis. In fact, it is customary that both interest and financing expenses be capitalized into the overall debt, with (an obvious) maximum amount represented by the total market value of the house.

Reverse mortgages are flexible products: several alternative formulae may be employed to make cash resources available to the household by taking part of the reverse mortgage, such as a lump-sum initial payment, a revolving line of credit at a banking institution, or a sequence of payments over time over a fixed interval. Sometimes a combination of the three schemes is employed. The natural expiration of the contract coincides with the death of the home-owner, when any potential heir has the right to either extinguish the mortgage or to sell the unit and pay off the debt.

From the perspective of the financing institution, a reverse mortgage has a few peculiar profiles of risk (besides the interest rate risk and the risk of fluctuation in the value of the collateral) that make it quite special when compared to a standard mortgage. For instance, a lender in a mortgage faces the risk of death of the debtor, while in a reverse mortgage the risk is opposite – that the debtor may be unexpectedly long-lived. Additionally, while the risk of a mortgage declines over time as the capital is repaid, in a reverse mortgage interests cumulate over time and increase the risk of the contract. Apart from implying that special insurance clauses are generally added to reverse mortgages (like the no negative equity condition popular in the UK), these peculiarities explain why the implicit and explicit costs of reverse mortgages tend to exceed the ones for standard mortgages, by as much as nearly 2 percentage points. For simple actuarial reasons, an elevated cost of capital means that standard reverse mortgages make at best a small percentage of the current market value of real estate properties available, although such a percentage obviously increases with the age of the borrower.

To evaluate the effective cost of reverse mortgages we use an equation to compute the maximum fraction of a house's value that could be borrowed using a reverse mortgage from a risk-neutral lender (see Sinai and Souleles, 2007). Since the bank is risk-neutral, it will set the initial loan amount such that in expectation the sale value of the house will exactly equal the mortgage balance at the time of homeowner's death. In this case, the initial loan amount L is determined by:

$$L = \sum_{t=a}^{A} \left[(1+g)^{t-a} H \right] d(t \mid a)(1+m)^{-(t-a)},$$

where a is the current age of the homeowner, H is the current house value, and $d(t \mid a)$ is the probability of dying in year t conditional on being age a currently; m is the nominal mortgage interest rate and g is the nominal growth rate of house prices. The potential loan amount L is primarily a function of the expected remaining lifetime of the household.

Since reverse mortgages – more generally, the process of financial innovation that involves housing assets as collateral – may play a role in our five-country analysis, we have acquired specific information on how reverse mortgage contracts are implemented in each of the five countries under investigation. In Spain, a lifetime mortgage is called *pensión hypotecaria*; this type of contract has been available since the year 2003, mainly offered by small financial institutions. Interestingly, although the product is having some diffusion, in Spain reverse mortgages remain completely unregulated. Reverse mortgage contracts have been only recently introduced in Italy (2005) and France (2006). In Italy the product is called *prestito vitalizio ipotecario* and, at present, only three financial institutions seem to be active in this market, which remains very small (traditional contracts in which the naked property right on the real estate asset can be transferred fall outside the typical features of a reverse mortgage). Interest rates are quite high (they range between 7-8%) and the portion of the home value that can be converted into consumption is relatively low (for example 52% with Deutsche Bank). It is worth noticing, however, that Italy, with its high percentage of home owners (more than 70% of households own a house) and its big share of population aged more than 65, could represent a good potential market for reverse mortgage. As for the spread, as a consequence of the very recent introduction of this product in Italy, official data aren't available yet.

Similarly – in spite of the interest that this innovation has raised – in France only the *Credit Foncier* seems, at present, to be active in this market. However, the so-called "*vente en viager"* (which allows to sell property rights retaining possession of the home) has traditionally surrogated some of the economic functions that reverse mortgage contracts will play in the future. In Germany, reverse mortgages simply do not yet exist, although transferring only the "naked" property is of course possible.

As for other instances, there seems to be a diversity between continental Europe and Anglo-Saxon Countries, by which Italy, France and Germany appear more "traditional" or less prone to develop instruments that would allow households tap the (extra) equity of their homes.

In the United Kingdom, on the contrary, lifetime mortgages have long been in existence, having been introduced in 1965. In the course of the years they have undergone profound changes, and the market for those contracts is remarkably developed, with at least five distinct types of contract schemes that are actively traded. A roll-up mortgage allows a home-owner to choose whether to receive a monthly rent off the value of her home or a lump-sum payment at the signing of the contract. Usually, insurance contracts that guarantee a non-negative final equity value are appended to the main mortgage. In an interest-only mortgage the home owner receive a lump-sum loan and interests are actually paid every month, applying a fixed or variable interest rate. The fixed borrowed capital is refunded upon death of the home-owner. In a fixed repayment mortgage, the loan is opened in a single solution, but the interest gradually accrues to the overall debt over time. In a home income plan the proceeds from the reverse mortgage are immediately invested to produce a monthly cash flow sequence, used both to pay the interests on the mortgage and to finance additional consumption. Finally, a shared appreciation mortgage is like a fixed repayment contract, although the borrower has the right to benefit from a portion of the capital gain possibly realized at the time the dwelling unit is sold on the market, in exchange for a lower (or even nil) interest rate on the mortgage. This sophistication of the contracts offered witnesses of the size and vitality of the market for lifetime mortgages in the UK, which therefore is likely to represent the country in which changes in the values of housing assets are more likely to activate substantial modification in potential consumption choices. In any case, lifetime mortgages appear to be an expensive product in the UK as well, with an overall cost that can be of about 7% (Norwich Union). Differently from the other countries in our analysis, the UK has an official source for data about lifetime mortgages: statistics and key figures are indeed provided by the Council of Mortgage Lenders. Accordingly to these data, the market of lifetime mortgages, with about 24,000 lifetime mortgages newly advanced in 2006, appears to be growing, but still very small if compared to the total number of homeowners who are over 60 (4.5 million accordingly to the *General Household Survey* (2002)). In any event, even in the UK the market for reverse mortgages remains rather thin and under-developed.

3. Permanent vs. Transitory Effects of House Price Dynamics on Consumption: a Macroeconomic Perspective*

The quantitative relevance of fluctuations in household wealth in determining consumption spending and savings is a long-standing empirical issue at least since the contribution of Modigliani (1971), who provided a rough estimate of the marginal propensity to consume out of wealth of around 0.05 for the US economy. The results of subsequent econometric work using time-series data broadly supported that original estimate of a positive and significant wealth effect on consumption.

However, such commonly estimated marginal propensities capture only the long-run trend relationship between aggregate consumption and total wealth and may poorly summarize the consumption-wealth link for at least two reasons: (i) if transitory fluctuations in wealth are large, these measures yield a misleading estimate of the overall wealth effect on consumption, since they focus only on the trend component, due to permanent movements in the series; (ii) variations in the value of different components of total wealth (e.g. stock, bonds, real estate wealth) may have a different impact on consumption and savings. The importance of disentangling permanent ("trend") from transitory ("cyclical") changes in wealth is pointed out by Lettau and Ludvigson (2004), who empirically identify permanent and transitory elements in US household net worth, and investigate how they are related to consumer spending. Their main finding is that the bulk of fluctuations in household wealth are dominated by the transitory component, and therefore they are unrelated to aggregate consumer spending, since the latter reacts only to permanent wealth movements.

These issues are particularly relevant for housing wealth. In fact, due to the special nature of this component of wealth (entering both the resource side of the households' budget constraint as an asset stock, and the consumption side in the form of housing services), permanent and transitory fluctuations in house prices affect consumption and savings through different (and more complicated) channels than other wealth components. Moreover, the relative importance of permanent and transitory movements in housing wealth may be different from financial wealth, making the aggregate measure of the consumption effect even less meaningful.

On these grounds, the present section focuses on the decomposition of house price fluctuations into permanent and transitory components, estimating their impact on consumption expenditure in the European countries under study in the long-run and over short-to medium-term horizons.

3.1 Objective

The aim of this section is to characterize the dynamic interactions among house prices and consumption, separating permanent movements from transitory fluctuations. Starting from the Lettau-Ludvigson insight, we use the econometric framework of the common

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* This section is based on a paper (forthcoming in the CeRP working paper series) prepared by Fabio Bagliano and Claudio Morana.

trends model of King et al. (1991) and build country-specific empirical models of the interrelated dynamics among measures of total consumption expenditure, income and real house prices (since most of the quarterly fluctuations in housing wealth is attributable to house price movements, we can use the latter variable to capture housing wealth fluctuations in our sample). The focus on consumption rather than on saving allows a more direct comparison of our results with the existing macroeconomic literature on wealth effects. Our macroeconomic perspective also justifies the use of total consumption (including both non-durables and durables) as the variable of interest in exploring the wealth-consumption link, as in Mehra (2001) and Ludwig and Slok (2004).

For each country, permanent and transitory movements in house prices and consumption are estimated within a three-variable system including, beside real house prices and private final consumption expenditure, also output. In the common trends framework, the permanent component of the endogenous variables bears the meaningful economic interpretation of long-run forecast conditional on the information contained in the system. Moreover, by means of a minimal set of identifying assumptions, we are able to give economic content to the (two) permanent innovations driving the system and to study their individual dynamic effect on house prices and consumption at different horizons. Compared with simpler procedures, such as the Beveridge and Nelson (1981) univariate decomposition, the adopted strategy exploits more information, capturing the joint dynamics of house prices and the macroeconomic variables of interest, leading to a more accurate identification of shocks with a different degree of persistence, and a complete characterization of their dynamic effects on consumption.

In order to benchmark our results for the European countries covered by the project, the analysis has also been carried out for the US, over the 1979-2007 period.

3.2 Econometric Methodology

We study the interactions among house prices, output and consumption by means of three-variate country-specific models, aiming at capturing the main features of the joint dynamics of the macroeconomic variables of interest and providing an accurate identification of shocks with a different degree of persistence. To this aim, we apply the common trends methodology of King et al. (1991) and Mellander et al. (1992), exploiting the long-run (cointegration) properties of the data to disentangle the permanent and transitory components in the time-series behavior of house prices, consumption and output. In this context, the permanent component of each series bears the interpretation of a long-run forecast conditional on the information contained in the system. The rest of this sub-section outlines the econometric methodology in some detail.

3.2.1. The common trends model

Consider a vector $\mathbf{x}_t$ of n non-stationary $-I(1)-$ variables of interest. If there are $0 < r < n$ cointegrating relationships among the variables, the following cointegrated VAR representation for $\mathbf{x}_t$ holds (deterministic terms are omitted throughout for ease of exposition):

$$\Delta\mathbf{x}_t = \mathbf{\Pi}(L)\Delta\mathbf{x}_{t-1} + \boldsymbol{\alpha}\boldsymbol{\beta}'\mathbf{x}_{t-1} + \boldsymbol{\varepsilon}_t$$

where $\mathbf{\Pi}(L) = \mathbf{\Pi}_1 + \mathbf{\Pi}_2 L + ... + \mathbf{\Pi}_p L^{p-1}$ is a polynomial in the lag operator L, the $n \times r$ matrix $\boldsymbol{\beta}$ contains the cointegrating vectors (capturing long-run equilibrium relations), such that $\boldsymbol{\beta}'\mathbf{x}_t$ are stationary linear combinations of the variables, $\boldsymbol{\alpha}$ is the $n \times r$ matrix of loadings (capturing the adjustment of each variable in $\mathbf{x}$ to deviations from long-run equilibrium), and $\boldsymbol{\varepsilon}_t$ is a vector of serially uncorrelated reduced form disturbances. As shown in Mellander et al. (1992), this cointegrated VAR can be inverted to yield the following stationary Wold representation for $\Delta\mathbf{x}_t$:

$$\Delta\mathbf{x}_t = \mathbf{C}(L)\boldsymbol{\varepsilon}_t$$

where $\mathbf{C}(L) = \mathbf{I} + \mathbf{C}_1 L + \mathbf{C}_2 L^2 + ...$ with $\sum_{j=0}^{\infty} j \,|\, \mathbf{C}_j \,| < \infty$. It is then possible to derive the *stochastic trends* representation of $\mathbf{x}_t$, by decomposing the series into a permanent (non-stationary) and a transitory (stationary) components, whereby extending the Beveridge and Nelson (1981) univariate decomposition to a multivariate framework. By recursive substitution, we obtain the following expression for the levels of the variables:

$$\mathbf{x}_t = \mathbf{x}_0 + \mathbf{C}(1)\sum_{j=0}^{t-1}\boldsymbol{\varepsilon}_{t-j} + \mathbf{C}^*(L)\boldsymbol{\varepsilon}_t$$

where $\mathbf{x}_0$ is the vector of the initial values of the series, $\mathbf{C}^*(L) = \sum_{j=0}^{\infty}\mathbf{C}^*_j L^j$ with $\mathbf{C}^*_j = -\sum_{i=j+1}^{\infty}\mathbf{C}_i$, and $\mathbf{C}(1)$ captures the long-run effect of the reduced form disturbances in $\boldsymbol{\varepsilon}$ on the variables in $\mathbf{x}$.

The existence of cointegrating relationships linking the elements of $\mathbf{x}$ imposes restrictions on the $\mathbf{C}(1)$ matrix, constraining the long-run responses of the n endogenous variables. With r cointegrating vectors, the non-stationary component of $\mathbf{x}$ can be expressed in terms of a reduced number $k = n - r$ of *common stochastic trends* as follows:

$$\mathbf{x}_t = \mathbf{x}_0 + \underset{(n\times k)}{\mathbf{A}}\;\underset{(k\times 1)}{\boldsymbol{\tau}_t} + \mathbf{C}^*(L)\,\boldsymbol{\varepsilon}_t$$

with $\boldsymbol{\tau}_t = \boldsymbol{\tau}_{t-1} + \boldsymbol{\psi}_t$

where $\boldsymbol{\tau}_t$ is a k-element vector random walk and $\boldsymbol{\psi}_t$ contains the k innovations to the stochastic trends, i.e. the *permanent shocks*. The matrix $\mathbf{A}$ captures the impact of the (common) stochastic trends on each variable in $\mathbf{x}$. The common trends representation not only separates the permanent component of $\mathbf{x}$ from the transitory component but also attributes the permanent component to a limited number (k) of permanent disturbances that can possibly be separately identified and whose individual dynamic effects on $\mathbf{x}$ can be studied by means of impulse response analysis and forecast error variance decompositions.

3.2.2. Permanent vs. transitory components and dynamics

The *permanent component*, $\mathbf{x}^P_t$, can be easily obtained from the long-run forecast for $\mathbf{x}$, since in the long-run only the stochastic trends have an influence on the levels of the endogenous variables. Hence:

$$\mathbf{x}_t^P = \lim_{i\to\infty} E_t\,\mathbf{x}_{t+i} = \mathbf{x}_0 + \mathbf{A}\,\boldsymbol{\tau}_t$$

capturing the values to which the series are expected to converge once the effect of the transitory shocks have died out. Thus, no particular assumption on the correlation between permanent and transitory innovations and on the structural economic nature of the shocks are needed to estimate the permanent component of the series. However, if we are also interested in estimating the long-run effect of *each individual* structural permanent disturbance in $\boldsymbol{\psi}$ and the *dynamic response* of each variable in $\mathbf{x}$ to such shocks, then complete identification of the nk elements of $\mathbf{A}$ is necessary. In the presence of multiple common trends ($k > 1$), the decomposition of the stochastic permanent component ($\mathbf{A}\,\boldsymbol{\tau}_t$) into a matrix of loadings $\mathbf{A}$ and a vector of common stochastic trends $\boldsymbol{\tau}_t$ requires some economic assumptions.

To carry out this step, and obtain an economically meaningful interpretation of the dynamics of the variables of interest, the vector of reduced form disturbances $\boldsymbol{\varepsilon}$ must be transformed into a vector of underlying structural shocks, some of which with *permanent* effects on the level of $\mathbf{x}$ and some with only *transitory* effects. Let us denote this vector of i.i.d. structural disturbances as

$$\boldsymbol{\varphi}_t \equiv \begin{pmatrix} \boldsymbol{\psi}_t \\ \boldsymbol{\nu}_t \end{pmatrix}$$

where $\boldsymbol{\psi}$ and $\boldsymbol{\nu}$ are sub-vectors with k and r elements, respectively, and $k = n - r$. The structural form for the first difference of $\mathbf{x}_t$ is:

$$\Delta\mathbf{x}_t = \boldsymbol{\Gamma}(L)\boldsymbol{\varphi}_t$$

where $\boldsymbol{\Gamma}(L) = \boldsymbol{\Gamma}_0 + \boldsymbol{\Gamma}_1 L + \ldots$. Since the first element of $\mathbf{C}(L)$ is $\mathbf{I}$, we have:

$$\boldsymbol{\varepsilon}_t = \boldsymbol{\Gamma}_0\boldsymbol{\varphi}_t$$

where $\boldsymbol{\Gamma}_0$ is an invertible matrix. It follows that $\mathbf{C}(L)\boldsymbol{\Gamma}_0 = \boldsymbol{\Gamma}(L)$, implying that $\mathbf{C}(1)\boldsymbol{\Gamma}_0 = \boldsymbol{\Gamma}(1)$. In order to identify the elements of $\boldsymbol{\psi}_t$ as the permanent shocks and the elements of $\boldsymbol{\nu}_t$ as the transitory disturbances the following restriction on the long-run matrix $\boldsymbol{\Gamma}(1)$ must be imposed:

$$\boldsymbol{\Gamma}(1) = \begin{pmatrix} \mathbf{A} & \mathbf{0} \end{pmatrix}$$

The disturbances in $\boldsymbol{\psi}_t$ are then allowed to have long-run effects on (at least some of) the variables in $\mathbf{x}_t$, whereas the shocks in $\boldsymbol{\nu}_t$ are restricted to have only transitory effects.

Finally, the common trends representation of $\mathbf{x}_t$ in structural form is derived as

$$\begin{aligned} \mathbf{x}_t &= \mathbf{x}_0 + \boldsymbol{\Gamma}(1)\sum_{j=0}^{t-1}\boldsymbol{\varphi}_{t-j} + \boldsymbol{\Gamma}^*(L)\boldsymbol{\varphi}_t \\ &= \mathbf{x}_0 + \mathbf{A}\sum_{j=0}^{t-1}\boldsymbol{\psi}_{t-j} + \boldsymbol{\Gamma}^*(L)\boldsymbol{\varphi}_t \\ &= \mathbf{x}_0 + \mathbf{A}\,\boldsymbol{\tau}_t + \boldsymbol{\Gamma}^*(L)\boldsymbol{\varphi}_t \end{aligned}$$

where $\boldsymbol{\Gamma}^*(L)$ is defined analogously to $\mathbf{C}^*(L)$. As shown in detail by Stock and Watson (1988), King et al. (1991) and Warne (1993), the identification of separate permanent shocks requires a sufficient number of restrictions on the long-run impact matrix $\mathbf{A}$. Part of these restrictions (rk) are provided by the r cointegrating vectors, requiring that

$$\boldsymbol{\beta}'\mathbf{A} = \mathbf{0}$$

A second set of $k(k+1)/2$ restrictions on the elements of $\mathbf{A}$ is obtained by equating the two representations of $\mathbf{x}$ obtained above, yielding

$$\mathbf{C}(1)\boldsymbol{\varepsilon}_t = \mathbf{A}\boldsymbol{\psi}_t$$

(a restatement of the fact that the long-run impact of $\boldsymbol{\varepsilon}$ is only due to the permanent structural innovations $\boldsymbol{\psi}$). From this relation it follows that (imposing $E(\boldsymbol{\psi}_t\boldsymbol{\psi}_t') = \mathbf{I}$)

$$\mathbf{C}(1)\boldsymbol{\Sigma}\mathbf{C}(1)' = \mathbf{A}\mathbf{A}'$$

where $\boldsymbol{\Sigma}$ is the covariance matrix of the VAR innovations $\boldsymbol{\varepsilon}$. The remaining $k(k-1)/2$ restrictions needed for (exact) identification of $\mathbf{A}$ have then to be derived from economic theory and can take the form of zero restrictions on some of its elements (as in the case of long-run neutrality assumptions). Once identification of $\mathbf{A}$ is achieved, estimates of the structural permanent disturbances are derived as:

$$\boldsymbol{\psi}_t = (\mathbf{A}'\mathbf{A})^{-1}\mathbf{A}'\mathbf{C}(1)\boldsymbol{\varepsilon}_t$$

so that impulse responses and forecast error variance decompositions may be calculated to gauge the relative importance of each permanent innovation in determining fluctuations of the endogenous variables.

An important property of the permanent-transitory decomposition obtained above is that the transitory component $\mathbf{x}_t^{TR}$ is determined by both permanent ($\boldsymbol{\psi}_t$) and transitory shocks ($\boldsymbol{\nu}_t$):

$$\mathbf{x}_t^{TR} = \boldsymbol{\Gamma}^*(L)\boldsymbol{\varphi}_t = \boldsymbol{\Gamma}_{\psi}^*(L)\boldsymbol{\psi}_t + \boldsymbol{\Gamma}_{\nu}^*(L)\boldsymbol{\nu}_t$$

where the first component $\boldsymbol{\Gamma}_{\psi}^*(L)\boldsymbol{\psi}_t$ gives the contribution of permanent innovations to the overall transitory fluctuations (technically called the “dynamics along the attractor”), while the vector $\boldsymbol{\Gamma}_2^*(L)\boldsymbol{\upsilon}_t$ measures the contribution of the transitory disturbances, linked to the process of adjustment towards long-run equilibrium (“dynamics towards the attractor”). The two components have a fundamentally different economic interpretation. The adjustment dynamics have the error correction process as generator, and therefore are disequilibrium fluctuations. On the contrary, the dynamics along the attractor may be related to the overshooting of the variables to permanent innovations, capturing the transitional dynamics which take place after a shock to the common trends of the system; since along the attractor the cointegrating relationships are satisfied, the dynamics along the attractor are equilibrium fluctuations.Below, following Proietti (1997) and Cassola and Morana (2002), we disentangle the two components of transitory fluctuations in real house prices, to provide some insight into the nature of house price fluctuations

3.3. Empirical Results

For each country, we specify a three-variable system including real private final consumption expenditure (c), an index of real house prices (h) and real GDP (y), all sampled at a quarterly frequency and in logs. The countries studied are the five European countries under investigation in this report and – only as a benchmark – the US. The source of the data is OECD; in particular, house price data are extensively described and analyzed in Girouard et al. (2006). The sample period ranges from 1978:Q1 to 2007:Q4, with the only exceptions of Spain (for which the data start in 1980:Q1) and Italy (for which the data end in 2007:Q3).

Table 5 offers some descriptive statistics on the variables, displaying the means, standard deviations, and contemporaneous correlation coefficients of the yearly growth rates of *c*, *h*, and *y*.

Table 5 – Summary Statistics for Macroeconomic Series on Consumption, Real House Prices, and Real GDP

	France				Germany			
		$\Delta_4 c$	$\Delta_4 h$	$\Delta_4 y$		$\Delta_4 c$	$\Delta_4 h$	$\Delta_4 y$
Mean (%)		2.077	2.522	2.143		1.456	-0.858	1.755
	$\Delta_4 c$	1.237			$\Delta_4 c$	1.563		
St. dev (%)/Corr.	$\Delta_4 h$	0.396	5.417		$\Delta_4 h$	0.582	2.686	
	$\Delta_4 y$	0.728	0.254	1.253	$\Delta_4 y$	0.618	0.434	1.634
	Italy				Spain			
		$\Delta_4 c$	$\Delta_4 h$	$\Delta_4 y$		$\Delta_4 c$	$\Delta_4 h$	$\Delta_4 y$
Mean (%)		2.129	1.860	1.919		2.755	4.790	2.969
	$\Delta_4 c$	2.016			$\Delta_4 c$	2.048		
St. dev (%)/Corr.	$\Delta_4 h$	0.106	8.889		$\Delta_4 h$	0.719	8.928	
	$\Delta_4 y$	0.776	-0.016	1.622	$\Delta_4 y$	0.839	0.642	1.694
	UK				US			
		$\Delta_4 c$	$\Delta_4 h$	$\Delta_4 y$		$\Delta_4 c$	$\Delta_4 h$	$\Delta_4 y$
Mean (%)		2.894	4.782	2.368		3.168	1.335	2.883
	$\Delta_4 c$	2.168			$\Delta_4 c$	1.489		
St. dev (%)/Corr.	$\Delta_4 h$	0.712	8.059		$\Delta_4 h$	0.470	3.274	
	$\Delta_4 y$	0.816	0.567	1.859	$\Delta_4 y$	0.798	0.318	1.882

The behavior of real house prices shows remarkable differences across countries. In particular, wide fluctuations occurred in Italy, Spain and the UK (with standard deviations between 8% and 9%), whereas the other countries feature less pronounced fluctuations (5.4% for France, 3.3% for the USA, and 2.7% for Germany).[8] Also the contemporaneous correlations between house price growth and consumption and GDP growth display different patterns: high (positive) correlation in Spain and the UK (around 0.7 with consumption growth and 0.6 with GDP growth), no correlation in Italy, and intermediate results in the remaining countries. Such evidence points to possibly important cross-country differences in the dynamics linking house prices to consumption expenditure and output.

For each country the initial specification of a three-variable VAR system in levels has been set to five lags. Then, the specification has been progressively reduced, testing each step by means of a battery of specification tests. The final specifications of the

[8] In the case of Germany, the results must be taken with caution since they may be affected by the unification occurred in 1990. In the econometric analysis below we allowed for shifts in the variables after 1990; moreover, results on the shorter post-unification sample (1991-2007) are qualitatively similar to those obtained on the full sample.

unrestricted reduced form model in levels feature two lags for Spain, three for Germany and Italy, four for the UK and the US; only in the case of France five lags have been retained in the model.

3.3.1. Cointegration analysis

To test for the existence of long-term relationships, different criteria have been jointly employed. Johansen's (1988) trace test has been used to assess the number of valid cointegrating relationships, while the Johansen reduced rank regression approach has been employed to estimate the cointegrating vectors in the cointegrated VAR. Moreover, we also relied on the Granger representation theorem concerning the sufficient and necessary conditions for cointegration, whereby the presence of error correcting behavior within a set of nonstationary $I(1)$ variables is a sufficient condition for cointegration, while the presence of cointegration within a set of variables necessarily implies the existence of an error correction mechanism. Therefore, we looked also at the statistical significance of the elements of α as additional evidence of cointegration. Finally, standard information criteria have been used to further evaluate the estimated cointegrated vector error correction model against the unrestricted alternative.

The results of cointegration analysis are reported in Table 6. Overall, evidence of one cointegrating vector can be obtained for all countries, albeit clear-cut results can be attained only by inspecting the error-correcting properties of the variables and the information criteria computed with and without imposing cointegration rank and identification restrictions. Tests based on the trace statistic (as shown by the p-values reported in the upper part of the table) clearly support cointegration for France, Italy, the US, and, to a lesser extent, for Spain, whereas for Germany and the UK the evidence in favor of cointegration comes from the strongly significant estimates of the error-correcting coefficients. Moreover, in all cases both the AIC and BIC information criteria point to the cointegrated model as the preferred one.

Unrestricted estimates of the cointegrating vector (β) and the error-correction coefficients (α) are reported in the middle part of Table 6, whereas in the lower part of the table appropriate restrictions (in all cases supported by the reported likelihood ratio test, *LRT*) are imposed on the structure of β and α. Two groups of countries emerge from the results. On the one hand, Italy, Spain, and the UK are characterized by a long-run relationship which involves only consumption and output with no role for house prices. This finding points to the lack of long-term effects of real house price movements on consumption expenditure, though the possibility of short- to medium-term wealth effects on consumption stemming from house price dynamics is still allowed.

Table 6 – Cointegration Analysis

	France		Germany		Italy	
Eigenvalues						
	0.208		0.096		0.184	
	0.037		0.014		0.042	
	0.026		0.000		0.022	
H_0: rank $\leq$ (p-value)						
0	0.015		0.865		0.075	
1	0.548		0.998		0.515	
2	0.085		0.959		0.110	
	Unrestricted		Unrestricted		Unrestricted	
	$\boldsymbol{\beta}$	$\boldsymbol{\alpha}$	$\boldsymbol{\beta}$	$\boldsymbol{\alpha}$	$\boldsymbol{\beta}$	$\boldsymbol{\alpha}$
c	1	0.004	1	-0.025	1	-0.134
		(0.058)		(0.056)		(0.039)
h	-0.129	0.282	-0.312	0.025	0.012	0.347
	(0.016)	(0.080)	(0.078)	(0.031)	(0.023)	(0.154)
y	-0.837	0.098	-1.054	0.112	-1.005	-0.001
	(0.015)	(0.038)	(0.040)	(0.047)	(0.024)	(0.037)
BIC	-21.242		-20.421		-19.005	
AIC	-22.459		-21.201		-19.847	
	Restricted		Restricted		Restricted	
	$\boldsymbol{\beta}$	$\boldsymbol{\alpha}$	$\boldsymbol{\beta}$	$\boldsymbol{\alpha}$	$\boldsymbol{\beta}$	$\boldsymbol{\alpha}$
c	1	0	1	0	1	-0.129
						(0.037)
h	-0.129	0.283	-0.256	0	0	0.375
	(0.016)	(0.080)	(0.067)			(0.154)
y	-0.837	0.097	-1	0.122	-1	0
	(0.015)	(0.032)		(0.040)		
LRT (p-value)	0.946		0.468		0.970	
BIC	-21.452		-20.629		-19.233	
AIC	-22.527		-21.267		-19.882	

Table 6 (continued) – Cointegration Analysis

	Spain		UK		US	
Eigenvalues	0.173		0.102		0.189	
	0.044		0.056		0.042	
	0.002		0.023		0.022	
H_0: rank $\leq$ (p-value)						
0	0.128		0.306		0.010	
1	0.793		0.334		0.211	
2	0.661		0.102		0.105	
	Unrestricted		Unrestricted		Unrestricted	
	β	α	β	α	β	α
c	1	-0.150	1	-0.056	1	0.077
		(0.034)		(0.040)		(0.047)
h	-0.001	-0.227	-0.001	0.012	-0.161	0.264
	(0.020)	(0.134)	(0.049)	(0.069)	(0.029)	(0.064)
y	-0.981	-0.063	-1.127	0.043	-1.008	0.121
	(0.036)	(0.047)	(0.089)	(0.031)	(0.014)	(0.051)
BIC	-19.883		-18.538		-21.219	
AIC	-20.472		-19.535		-22.217	
	Restricted		Restricted		Restricted	
	β	α	β	α	β	α
c	1	-0.110	1	-0.087	1	0
		(0.028)		(0.027)		
h	0	0	0	0	-0.158	0.235
					(0.023)	(0.060)
y	-1	0	-1.120	0	-1	0.068
			(0.035)			(0.042)
LRT (p-value)	0.180		0.570		0.249	
BIC	-20.037		-18.709		-21.369	
AIC	-20.479		-19.564		-22.224	

On the other hand, in France, Germany and the US, also the house price variable enters the cointegration relationship together with consumption and output, pointing to long-term housing wealth effects. Finally, the estimated error-correction coefficients in α show that house prices strongly react to deviations from the equilibrium relations in France and the US, suggesting that house price dynamics contains a quantitatively important transitory component that dies out in the long-run.

3.3.2. Permanent and transitory components

The existence of one cointegrating relationship among three $I(1)$ non stationary variables implies the presence of two distinct sources of shocks having permanent effects on at least some of the variables, and one transitory shock.[9] In terms of the common stochastic trend representation, the permanent component of the series is driven by a bivariate random walk process of the form:

$$\begin{pmatrix} \tau_t^1 \\ \tau_t^2 \end{pmatrix} = \begin{pmatrix} \mu^1 \\ \mu^2 \end{pmatrix} + \begin{pmatrix} \tau_{t-1}^1 \\ \tau_{t-1}^2 \end{pmatrix} + \begin{pmatrix} \psi_t^1 \\ \psi_t^2 \end{pmatrix}$$

where $\boldsymbol{\mu}$ is a vector of constant drift terms, and the levels of the variables are decomposed into a permanent and a transitory component as follows:

$$\begin{pmatrix} c_t \\ h_t \\ y_t \end{pmatrix} = \begin{pmatrix} c_0 \\ h_0 \\ y_0 \end{pmatrix} + \begin{pmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \\ a_{31} & a_{32} \end{pmatrix} \begin{pmatrix} \tau_t^1 \\ \tau_t^2 \end{pmatrix} + \Gamma^*(L) \begin{pmatrix} \psi_t^1 \\ \psi_t^2 \\ \nu_t \end{pmatrix}$$

where ν_t is a purely transitory disturbance, and the elements of matrix $\mathbf{A}$, a_{ij}, capture the long-run effect of the two permanent disturbances (ψ_t^1 and ψ_t^2) on the endogenous variables. As mentioned earlier on, disentangling the permanent from the transitory components of consumption, house prices and output, does not call for any restriction on the elements of $\mathbf{A}$. However, in order to estimate the long-run effects of each individual disturbance and study the dynamic response of c, h and y to ψ_t^1 and ψ_t^2, we have to achieve the complete identification of the six elements a_{ij} .

To this aim, the first two sets of restrictions derived from the (restricted form of the) cointegrating vector and from the fact that the long-run impact of the reduced form innovations is entirely due to the permanent disturbances, provide five restrictions, leaving only one additional identifying assumption to be imposed. To achieve complete identification of $\mathbf{A}$ we impose a long-term output neutrality restriction, whereby one of the permanent disturbances, ψ_t^2, is assumed not to have a long-term effect on output y: this amounts to imposing $a_{32} = 0$. Of course, when the cointegrating vector includes only consumption and output, as it is the case for Italy, Spain and the UK, the neutrality restriction holds for consumption as well (i.e., also $a_{12} = 0$). This identifying assumption is consistent with the interpretation of the first permanent shock (ψ_t^1) as mainly a supply-side disturbance related to the engines of long-term economic growth (determining the long-run behavior of output, consumption, and possibly real house prices), whereas ψ_t^2 has only short- to medium-term effects on output but can permanently affect house prices and possibly consumption expenditure. Under this assumption, estimation of the common trends model is carried out, yielding the long-run effects of permanent shocks (i.e. the elements a_{ij}) reported in Table 7. Finally, for each variable, the permanent component can be constructed as, in the case of house prices:

$$\hat{h}_t^P = h_0 + \hat{a}_{21}\hat{\tau}_t^1 + \hat{a}_{22}\hat{\tau}_t^2$$

---

[9] In our system $n = 3$, $r = 1$, and the number of common stochastic trends $k = 2$.

capturing the long-run effects on h of the two identified permanent disturbances, and bearing the interpretation of the (conditional) forecast of house prices over a long-term (infinite) horizon, when all transitory fluctuations in house prices have vanished. The transitory component s then simply computed as $\hat{h}_t^{TR} = h_t - \hat{h}_t^P$.

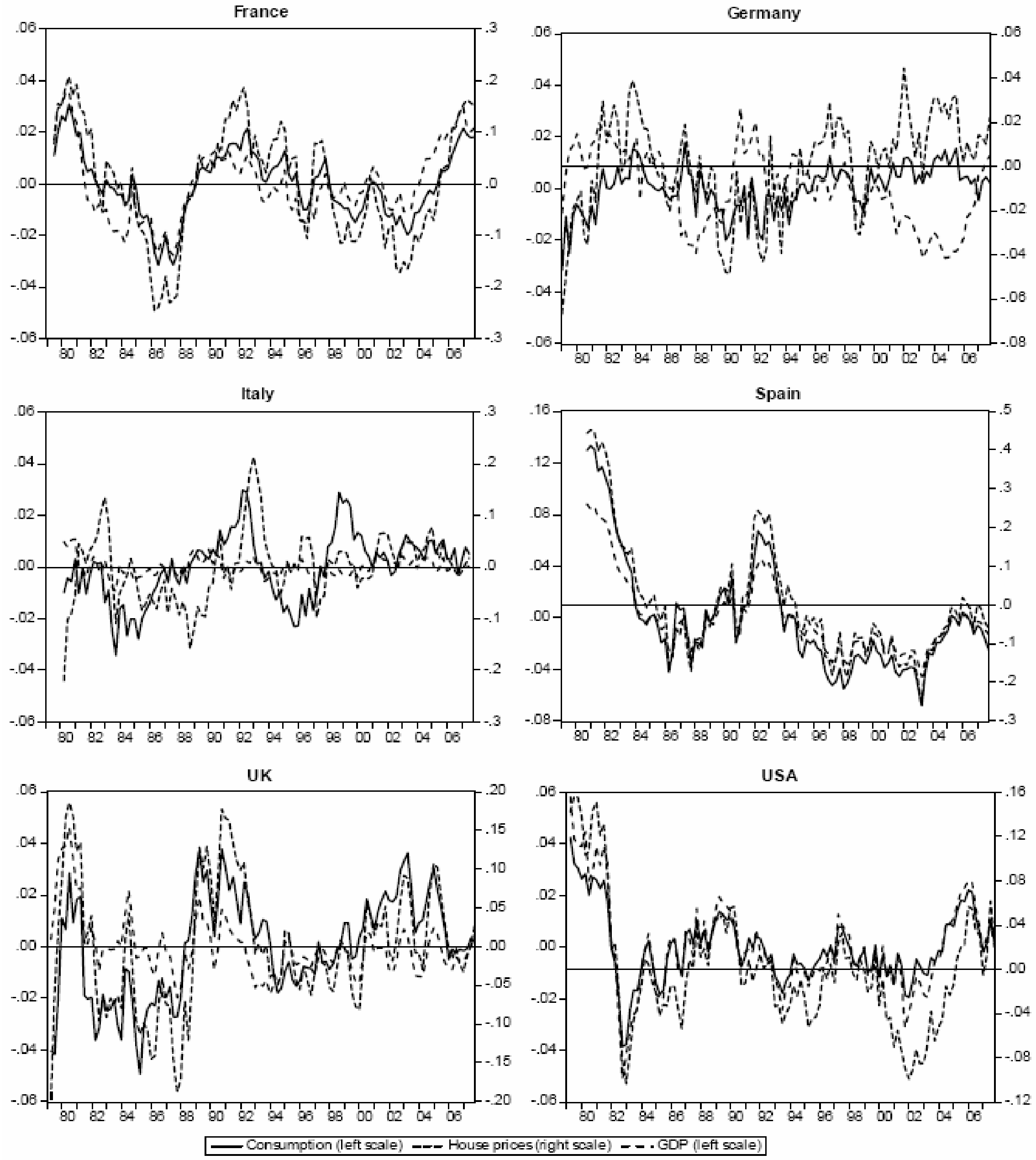
The results in Table 7 show that the permanent component of house prices, h_t^P, is determined almost entirely by the output-neutral permanent disturbance ψ_2 in France, Germany and the US (the estimates of the a_{21} element being not significant), whereas only a weak effect of ψ^1 can be detected for Italy. In Spain and the UK both permanent shocks have a strong long-run impact on house prices. A further common feature of France, Germany and the US (consistent with the presence of h in the cointegrating vector) is the significant long-run effect of ψ^2 (which basically drives house prices) on consumption.

Table 7 – Long-Run Effects of Permanent Shocks

	France		Germany		Italy	
Variable	ψ_1	ψ_2	ψ_1	ψ_2	ψ_1	ψ_2
c	0.673	0.538	0.714	0.424	0.711	0
	(0.318)	(0.187)	(0.229)	(0.135)	(0.152)	
h	0.976	4.173	0.709	1.658	2.190	4.138
	(1.876)	(1.452)	(0.655)	(0.528)	(1.450)	(0.859)
y	0.653	0	0.532	0	0.711	0
	(0.169)		(0.092)		(0.152)	
	Spain		**UK**		**US**	
Variable	ψ_1	ψ_2	ψ_1	ψ_2	ψ_1	ψ_2
c	1.126	0	1.326	0	0.853	0.367
	(0.284)		(0.368)		(0.263)	(0.113)
h	4.425	3.741	4.567	2.456	0.327	2.323
	(1.702)	(0.834)	(1.560)	(0.646)	(0.924)	(0.713)
y	1.126	0	1.184	0	0.802	0
	(0.284)		(0.328)		(0.198)	

Figure 12 displays the essential features of the estimated transitory components of consumption, house prices and output. House prices appear to be very strongly (contemporaneously) correlated with both consumption and output in Spain, the US, and France (with correlation coefficients greater than 0.8). In the UK and Germany a strong positive correlation is detected only with respect to consumption, whereas in the case of Italy both correlations are only around 0.3.

Figure 12 – Transitory Components of Consumption, House Prices, and GDP



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The permanent shock driving output in the long-run (ψ^1) accounts for a large fraction of output fluctuations also over short-and medium-term horizons (the remaining fraction being accounted for mainly by the transitory shock, ν), with the only notable exception of the US.[10] The output-neutral shock ψ^2 accounts for the bulk of house price fluctuations over long- and medium-term (business cycle) horizons in France, Germany, Italy and the US, whereas in Spain and in the UK a large fraction of long-run house prices fluctuations is explained by the permanent driving force of output.

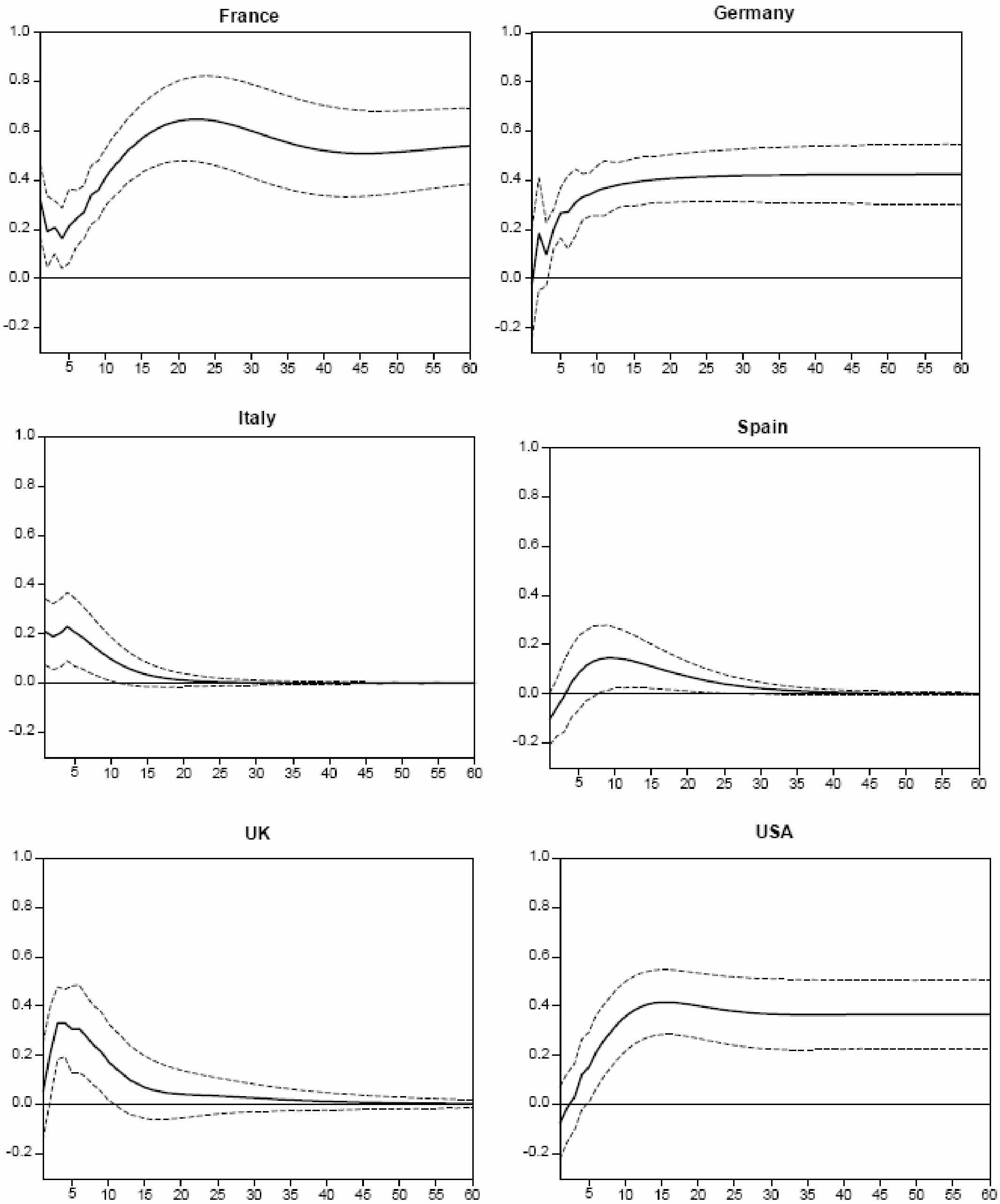
As far as consumption fluctuations are concerned, in the countries where no long-run effect of house prices on expenditure is detected, the output-neutral permanent

[10] In the US, at the one-quarter horizon, as much as 71% of output fluctuations are attributable to ψ^2; this still accounts for 40% of output movements at the one-year horizon.

disturbance ψ^2 accounts for a non negligible fraction at a long horizon (39% in France, 26% in Germany, and only 16% in the US). Figure 13 shows the impulse response function of consumption expenditure to a unitary shock in ψ^2 (with one-standard deviation error bands) and confirms this finding. In particular, the effects of the ψ^2 shock build up gradually over time for France, Germany and the US, being already statistically significant after five quarters for Germany and the US, while for France the impact is significant already at the outset. Differently, since the impact of the shock is only transitory, the estimated dynamic response for Italy, Spain and the UK builds up for about five quarters for Italy and the UK and then fades away within three years, while a longer building up time is found for Spain (ten quarters).

Overall, two main conclusions can be drawn. First, though two mainly separate driving forces determine the long-term evolution of output and house prices, some non negligible interactions can be detected at business cycle frequencies, with the output driving force having a strong impact on house prices in some countries. Only for the US a relevant role of house price fluctuations for the determination of business cycle output fluctuations is found. Yet, some more long-term interrelations can be detected for Spain and the UK, for which the contribution of the permanent output shock is dominant. Second, consumption and house prices do seem to be related at various frequencies, ranging from the very short-term to the long-term. In general, when countries show a long-term impact of house prices on consumption (France, Germany and the US), the latter linkage is already evident in the medium-term. Differently, when a long-term impact is absent (Italy, Spain and the UK), evidence of a linkage between consumption and house prices can however be found in the short-term.

Figure 13 – Consumption Response to a Permanent Shock ψ^2



3.3.4 Transitory dynamics in house prices

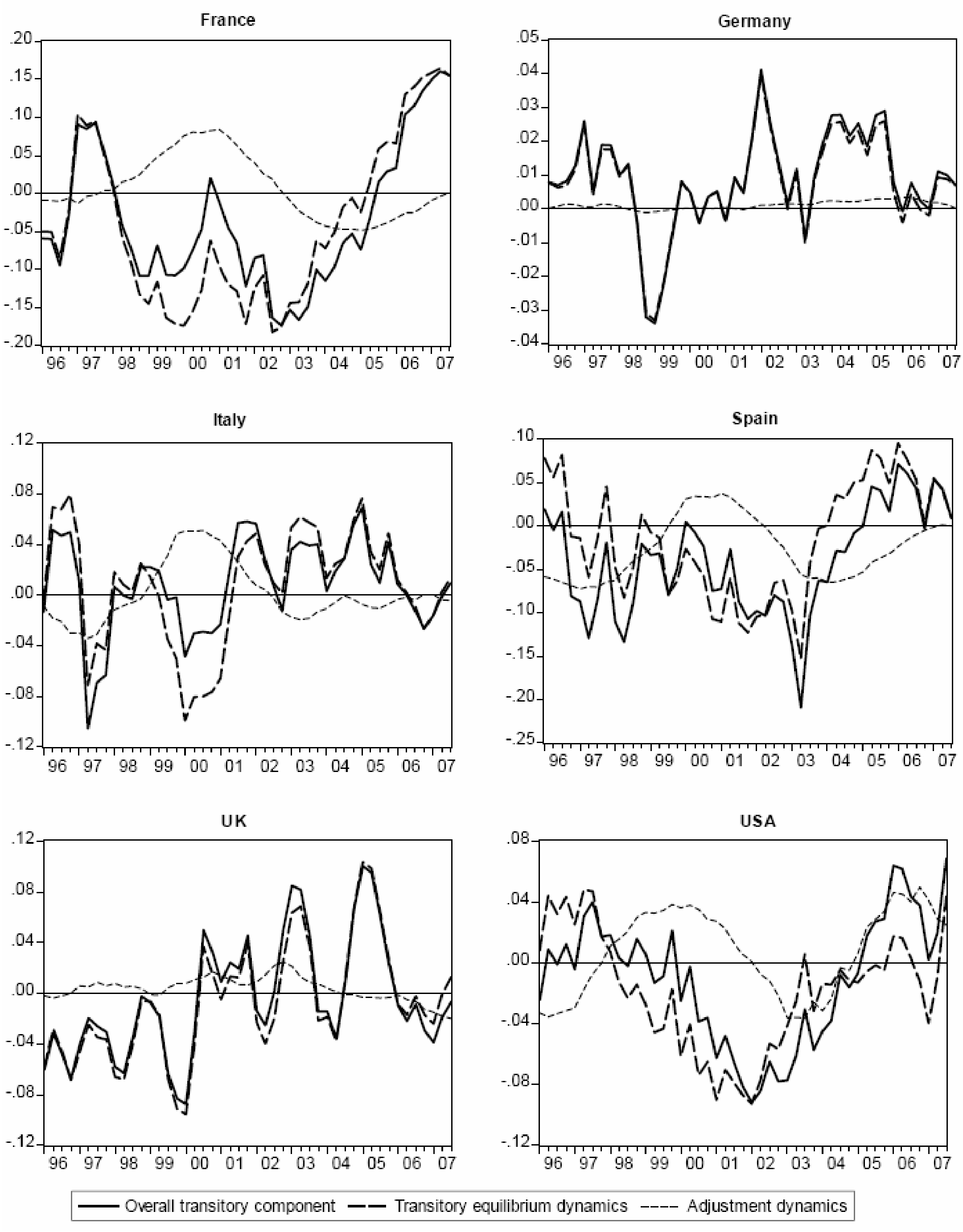
The permanent-transitory decomposition obtained from the common trends model yields transitory components which are determined by both permanent and transitory shocks. The contribution of the two types of disturbances can be disentangled, allowing for further economic insights into the nature of transitory fluctuations in the endogenous variables. Focusing on house prices, the transitory component can be written as

$$h_t^{TR} = \Gamma_{21}^*(L)\psi_t^1 + \Gamma_{22}^*(L)\psi_t^2 + \Gamma_{23}^*(L)\nu_t$$

where $\Gamma_{2j}^*(L)$ ($j = 1,2,3$) are the elements of the second row of matrix $\Gamma^*(L)$. The first two terms are driven by the permanent shocks and capture transitory house price fluctuations *along* the equilibrium relationship (e.g. overshooting effects in the house price equilibrium dynamics). The last term captures the contribution of the purely transitory disturbance ν_t to cyclical movements in house prices, capturing transitional dynamics *towards* the equilibrium relationship determined by the error-correcting properties of the data. The assessment of the relative contribution of the two components may be particularly relevant in order to establish the nature of the potential misalignment in current house prices with respect to their permanent value.

Figure 14 presents, for each country over the most recent decade (1996-2007), the overall transitory series of house prices h_t^{TR}, and the two components described above, named transitory *equilibrium* dynamics (capturing temporary fluctuations along the equilibrium), and *adjustment* dynamics (measuring the correction towards equilibrium). In all countries there is evidence of a positive misalignment of house prices with respect to their trend values in the final part of the period (the overall transitory component being positive on average), though the starting date for this process differs across countries (around 2001 in Italy and the UK, 2003 in Germany, and 2005 in France, Spain and the US). However, the most recent observations (2007) show that sizeable misalignments are still present only in France and the US. Looking at the relative role of the transitory equilibrium and the adjustment dynamics, a sharp difference can be observed between cyclical fluctuations in house prices in the US and in the European countries for the most recent period. While for the latter countries the origin of the recent house price misalignment is related to equilibrium fluctuations, i.e. to overshooting effects along the equilibrium path, for the US current fluctuations are essentially disequilibrium dynamics induced by the error-correcting behaviour of the system.

Figure 14– Transitory House Price Component: 1996-2007



4. The Effects of House Prices on Household Savings: a Cross-Country Perspective*

4.1. A (Simple) Theoretical Model

In this section we analyze a simple life-cycle two period model that follows closely Skinner (1993). As in the latter and in other papers (Campbell and Cocco (2005), Iacoviello (2004)), we include the consumption of housing services in the household's utility function. Then, according to the standard life-cycle model, households increase their consumption in both housing services and other commodities (through a "substitution effect") by some fraction of the increase in their total wealth. However, the same fluctuations in house prices produce different wealth effects on households with different characteristics (Dreyer-Morris (2005), Bover (2006)), such as the age of the household: older homeowners should react more to an increase in the value of their housing property since they will have to spend less in terms of future housing services. The objective of this section is to solve for the consumption choices of households in a two periods[11] dynamic partial equilibrium framework as a function of their age and their initial endowments in real estate. In the following paragraphs we sketch out the structure of the model and derive a number of testable empirical implications.

Households derive utility in each period t of their life by consuming both housing services h_t and other consumption goods c_t. The utility function is supposed to be time-separable and iso-elastic, i.e.:

$$U(c_t, h_t) = \frac{c_t^{1-\gamma}}{1-\gamma} + \mu \frac{h_t^{1-\gamma}}{1-\gamma}$$

Households discount their future utility at a subjective rate δ so that their lifetime expected utility is:

$$U(c_t, c_{t+1}, h_t, h_{t+1}) = \frac{c_t^{1-\gamma}}{1-\gamma} + \mu \frac{h_t^{1-\gamma}}{1-\gamma} + \frac{1}{1+\delta}\left(\frac{c_{t+1}^{1-\gamma}}{1-\gamma} + \mu \frac{h_{t+1}^{1-\gamma}}{1-\gamma}\right).$$

The interest rate r paid on savings equals the loan rate charged on debts in a riskless world without financial imperfections. The price of the non-housing commodity is normalized to one, while the price of the housing service (i.e. the rent per period t) is denoted by ρ_t. At each period of his lifetime the household receives a (certain) income Y.

At the end of the first period, each household chooses his optimal level of real estate holdings, h_{t+1}^* where $h_{t+1}^* > \overline{h}_t$ indicates an investment in housing. Finally, in the second period a household can liquidate its real estate holdings[12].

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* This section is based on the paper "The Effect of House Prices on Household Saving: The Case of Italy" by Riccardo Calcagno, Elsa Fornero and Mariacristina Rossi (CeRP working paper 76/08).

[11] The simplest possible model capturing the heterogeneity in the reaction of consumption to housing wealth between young and old needs households living at least two periods.

[12] This is possible, for example, through a reverse mortgage.

The budget constraints in each period are then:

$$t: \quad A_t + c_t + \rho_t h_t \leq Y_t + \rho_t \overline{h}_t$$

$$t+1: \quad c_{t+1} + \rho_{t+1} h_{t+1} \leq Y_{t+1} + A_{t+1}(1+r) + \left(\overline{h}_t - h_{t+1}^*\right)P_t + \rho_{t+1} h_{t+1}^* + \tfrac{P_{t+1} h_{t+1}^*}{1+r}$$

where A_t indicates the net financial wealth of the household at the end of the first period of life, $\overline{h}_t$ is its initial endowment of housing assets. Thus $\left(\overline{h}_t - h_{t+1}^*\right)P_t$ is the revenue the household obtains by selling part of its initial real estate endowment[13] $\left(\overline{h}_t - h_{t+1}^*\right)$ at the beginning of period $t+1$ at price P_t;[14] finally, $\rho_{t+1} h_{t+1}^*$ is the rent of the new real estate holding and $\frac{P_{t+1} h_{t+1}^*}{1+r}$ is the revenue from the disinvestment of the housing equity.

Clearly, the model accommodates very little uncertainty, indeed, we assume households know at the beginning of their life cycle future realizations of most of the parameters/variables in their budget constraints; the exception we allow consists of the possibility of unexpected shocks hitting house rents at a period $\tau \geq t$ (and hence the house prices P_t and P_{t+1}). We make such a strong assumption because, as shown by many papers (e.g., Campbell and Cocco, 2005), in the presence of many sources of uncertainty an investment in real estate when future house prices (and rents) are random and possibly correlated with future uncertain incomes, interest rates, and non-housing asset returns, real estate holdings become a key hedging tool for risk-averse households, with the result of confounding (i.e., making them much more complicated, possibly non-linear) many of the effects that we are trying to track in this project.[15] In particular, because we want to focus on observable household characteristics that we can precisely quantify from our survey data, such as demographic variables, the household initial endowments in real estate, and their access to the capital markets, leaving out the hedging motive for real estate investment seems justifiable.

The model can be solved by using standard methods. The assumption of no uncertainty simplifies the analysis of the life-cycle model in a crucial way: with no borrowing constraints the amount invested in real estate is irrelevant for the optimal consumption profile. Indeed, markets are complete, and households can transfer wealth intertemporally simply by saving (or borrowing) cash (at rate r). As a result, the equilibrium price of housing equity is equal to the present value of future rents, net of the transaction costs. If a household is not restricted in his access to the capital market at t, A_t can be negative and combining the two budget constraints we obtain the intertemporal constraint:

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[13] Of course we assume that nobody can go short in housing, $h_{t+1} \geq 0$. Also, $h_{t+1}^* \geq \overline{h}_t$ the household is actually increasing his real estate owning buying at price P_t.

[14] We assume that the house prices are "ex-rent", that is houses are evaluated at the end of the period. Hence, if you sell the house at the end of period t (that coincides with the beginning of period $t+1$), you earn P_t.

[15] For instance, if a household expects higher housing needs in the future, as well as higher rents (so that housing services are expected to become more expensive), it will hedge this risk increasing its net housing equity position. The amount of his additional investment in real estate depends on the risk-aversion of the household and on his expectations about future house prices. In a model with optimal portfolio allocation that includes investment in real estate such characteristics drive the demand and supply of houses.

$$c_t + \rho_t h_t + \frac{c_{t+1} + \rho_{t+1} h_{t+1}}{1+r} = Y_t + \frac{Y_{t+1}}{1+r} + \rho_t \bar{h}_t + \frac{P_t \bar{h}_t}{1+r},$$

where we have also used the relationship $(P_t = \frac{P_{t+1}}{1+r} + \rho_{t+1}$ for equilibrium in the reverse mortgage market. We can now solve the household maximization problem with respect to $\{c_t, c_{t+1}, h_t, h_{t+1}\}$ under the intertemporal constraint. The first-order conditions are then:

$$\frac{c_{t+1}}{c_t} = \left(\frac{1+r}{1+\delta}\right)^{\frac{1}{\gamma}}$$

$$h_t = \left(\frac{\mu}{\rho_t}\right)^{\frac{1}{\gamma}} c_t$$

$$h_{t+1} = \left(\frac{1+r}{1+\delta}\right)^{\frac{1}{\gamma}} \left(\frac{\mu}{\rho_{t+1}}\right)^{\frac{1}{\gamma}} c_t$$

where – after substituting for c_{t+1}, h_t and h_{t+1} in terms of c_t in the budget constraint – one can show that:

$$c_t = \frac{Y_t + \frac{Y_{t+1}}{1+r} + \bar{h}_t \left[\rho_t + \frac{P_t}{1+r}\right]}{1 + \rho_t \left(\frac{\mu}{\rho_t}\right)^{\frac{1}{\gamma}} + \left(\frac{1+r}{1+\delta}\right)^{\frac{1}{\gamma}} (1+r)^{-1} + \left(\frac{1+r}{1+\delta}\right)^{\frac{1}{\gamma}} (1+r)^{-1} \rho_{t+1} \left(\frac{\rho_t}{\rho_{t+1}}\right)^{\frac{1}{\gamma}} \left(\frac{\mu}{\rho_t}\right)^{\frac{1}{\gamma}}}.$$

4.2. Empirical implications

Our empirical analysis takes steps from testing some comparative static implications of the model. First, take the household born at t, and consider an increase in P_{t+1} due to unexpectedly high rents ρ_τ at some future time $\tau > t+1$, i.e., after his lifetime is over.[16] Our model predicts that the response of current (when young) consumption (c_t^y) to such a shock is positive only for households with positive real estate endowment:

$$\frac{\partial c_t^y}{\partial \rho_\tau} = \frac{\partial c_t^y}{\partial P_{t+1}} = \frac{\frac{\bar{h}_t}{1+r} \frac{1}{1+r}}{1 + \rho_t \left(\frac{\mu}{\rho_t}\right)^{\frac{1}{\gamma}} + \left(\frac{1+r}{1+\delta}\right)^{\frac{1}{\gamma}} (1+r)^{-1} + \left(\frac{1+r}{1+\delta}\right)^{\frac{1}{\gamma}} (1+r)^{-1} \rho_{t+1} \left(\frac{\rho_t}{\rho_{t+1}}\right)^{\frac{1}{\gamma}} \left(\frac{\mu}{\rho_t}\right)^{\frac{1}{\gamma}}} > 0.$$

Furthermore, young households (with a positive endowment in real estate at the beginning of their life) increase their current consumption more than their future consumption if $\gamma > 1$ after such a shock:

$$\frac{\partial c_{t+1}^y}{\partial \rho_\tau} = \left(\frac{1+r}{1+\delta}\right)^{\frac{1}{\gamma}} \frac{\partial c_t^y}{\partial P_{t+1}}.$$

Alternatively, consider a shock in the house prices due to an increase in the rent ρ_{t+1}: this will result in a direct increase in P_t and

$$\frac{\partial c_t^y}{\partial \rho_{t+1}} = \frac{\bar{h}_t K - W\left(\frac{\mu}{\rho_t}\right)^{\frac{1}{\gamma}} \left(\left(1 - \frac{1}{\gamma}\right) \frac{1}{(1+r)} \left(\frac{\rho_t}{\rho_{t+1}}\right)^{\frac{1}{\gamma}} \left(\frac{\mu}{\rho_t}\right)^{\frac{1}{\gamma}} \left(\frac{r+1}{\delta+1}\right)^{\frac{1}{\gamma}}\right)}{\left[1 + \rho_t \left(\frac{\mu}{\rho_t}\right)^{\frac{1}{\gamma}} + \left(\frac{1+r}{1+\delta}\right)^{\frac{1}{\gamma}} (1+r)^{-1} + \left(\frac{1+r}{1+\delta}\right)^{\frac{1}{\gamma}} (1+r)^{-1} \rho_{t+1} \left(\frac{\rho_t}{\rho_{t+1}}\right)^{\frac{1}{\gamma}} \left(\frac{\mu}{\rho_t}\right)^{\frac{1}{\gamma}}\right]^2}$$

where the first term at the numerator is the wealth effect and the second term is a

[16]Announced at the beginning of period t. Remember that we consider consumption choices in condition of certainty, so the household knows the realized value of rents.

substitution effect (negative for $\gamma > 1$).[17] We predict that the response of consumption to shocks in rents occurring during the lifetime of the household is lower than the one due to shocks occurring in a more distant future. Let us now analyze the consumption reaction of a household born at $t-1$ to a shock in ρ_{t+1} (hence in P_t) or in later rents. Their current consumption c_t^o reacts more to a shock in P_t than the consumption of young households. This is because of two reasons: first, they entirely consume in their last lifetime period the unexpected total wealth gain $\overline{h}_{t-1} \frac{\partial P_t}{1+r}$ (recall we are assuming bequest motives away); secondly, elder households do not suffer any substitution effect, since they will not have to pay during their lifetime the cost of a higher rent ρ_{t+1}. The same argument holds of course for an increase in later rents (captured by an increase in P_{t+1}). Thus, our model predicts that – absent moving costs and bequests motives – the consumption of the elderly should be more reactive to shocks in rents and/or house prices. All the effects are stronger for households with higher initial real estate endowments.

Iacoviello (2004) has recently suggested that financially constrained households may show a higher sensitivity of consumption to house prices. We can sketch this effect using our simple model. For instance, consider a positive (unexpected) shock on P_t (due to an increase in future rents), and consider the household i (born at t) endowed with $\overline{h}_{i,t}$ units of housing (which he currently inhabits), against which it can borrow to finance additional consumption at time $t+1$. If the amount the household can borrow depends on the value of his real estate endowment at the market price then his borrowing capacity increases. Additionally to the effects showed above, this constrained household also experiences an increase in the total resources available for consumption in the first period: if his degree of impatience was so high to make the borrowing constraint binding, such a shock in the house price will undoubtedly increase his current consumption c_t^y. So for financially constrained households, $\frac{\partial c_t^y}{\partial P_{t+1}}$ is higher than for unconstrained (patient) households.

4.3. The Data

We use micro-panel data for five European countries: France, Germany, Italy, Spain, and the United Kingdom.

For France, we make use of four rounds of surveys collected by INSEE (*Institut National de la Statistique et des Études Économiques*). These are the "*Enquête Patrimoine*", specifically collected with a focus on household assets and their compositions in 1996, 1998, 2000, 2003-2004. The surveys are designed on the determinants of the evolution and composition of French household assets over time. Each dataset contains socio-demographic variables (age, occupation, family size), income level, and asset information. Out of the four rounds, two of them (1996 and 2000) are defined as "légères" as they contain less detailed information than the 1998 and 2003-

[17] $W(Y_t, Y_{t+1}; \rho_t, P_{t+1;} \overline{h}_t)$ is defined as $Y_t + \frac{Y_{t+1}}{1+r} + \overline{h}_t \left\lfloor \rho_t + \frac{P_t}{1+r} \right\rfloor$, while:

$$K(\mu, \gamma, \delta; r, \rho_t, \rho_{t+1}) = \left[1 + \rho_t \left(\frac{\mu}{\rho_t}\right)^{\frac{1}{\gamma}} + \left(\frac{1+r}{1+\delta}\right)^{\frac{1}{\gamma}} (1+r)^{-1} + \left(\frac{1+r}{1+\delta}\right)^{\frac{1}{\gamma}} (1+r)^{-1} \rho_{t+1} \left(\frac{\rho_t}{\rho_{t+1}}\right)^{\frac{1}{\gamma}} \left(\frac{\mu}{\rho_t}\right)^{\frac{1}{\gamma}} \right].$$

2004 surveys. For example, l'"*Enquête Patrimoine*" 1998 (2003) contains 10500(15223) households and 1000 variables. The surveys do not have a panel dimension; as a consequence, the same household cannot be tracked over time. However, their sizes allow to construct a pseudo-panel. The "*légères*" surveys contain about half the size of interviewed households and variables of the detailed ones.

For Germany, we use panel data from SAVE by the Mannheim Research Institute for the Economic of Aging (MEA). This is an annual data set that spans the period 2001-2006 (although 2002 data are unavailable). The number of households covered grows from approximately 2,500 in 2001 to 3,500 in 2006 (because of the high drop-out rate in the early years, in 2005 and 2006 new households were included). The data set contains rich information concerning saving behavior (including amounts, sign, reasons for savings expressed as categorical variables, and amounts saved for precautionary motives) and structure and level of housing wealth, extended to stock and flow information on loans (of all kinds) and mortgages.

In the case of Italy, we provide detailed information in Section 4.5.3, collecting a few preliminary results for the Italian case that we have been using to calibrate our empirical methodologies and to fine tune our research questions. Italian data shall come from the Bank of Italy's Survey of Household Income and Wealth (SHIW).

In the case of the United Kingdom, we use the British Household Panel Survey (BHPS) data set. The BHPS was designed as a survey of a nationally representative sample of 10,000 adult members of approximately 5,500 households who were interviewed in 1991. The same individuals, together with their co-residents were then followed and re-interviewed in successive waves. Ten waves are currently available, covering the years 1991–2000. The survey focuses, in particular, on household and individual characteristics such as their participation in the labour market, their income and wealth, their health, their education, and, more generally, their socio-economic status. Financial and non financial asset value, along with indebtedness, at individual level, are recorded every five years. Similarly to SAVE and EFF, the data set reports the (subjective) values of housing assets and of the outstanding mortgages, along with standard measures of financial wealth.

Finally, the data used for Spain come from the first wave of a new survey of household finances "*Encuesta Financiera de las Familias*" conducted in 2002 by the Bank of Spain, in which 5143 households are interviewed. Based on the wealth tax, there is over-sampling of wealthy households. Eight wealth strata are defined which are progressively over-sampled at higher rates. Around 40% of the sample corresponds to households liable to the wealth tax (5% of the population). The EFF contains rich information on assets, debts, incomes, spending, and socioeconomic variables relating to the households and their members. In case of a recorded increase in housing value, the survey asks whether the increase has led to a new loan and what the household has done with this windfall gain. The EFF is the only statistical source in Spain that allows the linking of incomes, assets, debts, and consumption at the household level.

4.4. Descriptive Statistics

As a way to familiarize with the data set used in this report, we compute a few basic summary statistics that illustrate the structure and composition of the samples/panels under investigation. The following tables focus on two key aspects: the percentage of households covered by each sample who declare to save; the percentage of households who are house-owners. When a choice was possible, calculations have been performed for the last wave of data or for pooled data, both to simplify the task and to provide an average impression, simple "picture" of the data at hand.

It is comforting to notice that our micro/panel data have implications for home-ownership rates which are qualitatively consistent with those already noticed in Section 2 and Figure 9: the rates for Germany are low and approximately two-thirds of the rates computed for Italy and the UK. The differences between male and female home-ownership rates favor everywhere males, although the differences are initially large (but then declining) in the case of Germany and Italy, and – on the opposite – smaller but persistent in the case of the UK.

The columns of Tables 8-12 concerning the percentage of respondents with positive savings are also interesting. In terms of levels, Italy is different from Germany and the UK, since in the case of Italy it appears that almost 80% of the respondents are saving, while in Germany and the UK such a percentage is between 35 and 40 percent only. However Italy is different in another sense as well (and here, Italian data are qualitatively homogeneous with UK data, although at a different average level): while Italian and UK positive saving rate data are rather stable and persistent over time (in the case of Italy, around 75-80%, for the UK at approximately 35-40%), the German data imply a dramatic drop in 5 years only, from an initial fraction of respondents with positive savings of 72% to 40% at the end of 2006. One last striking feature that makes Italy and the UK similar, and both of these data sets substantially different from German data, is the fact that while in Italy and the UK the differences between male and female positive saving rates are small, in the German case females had initially reported a much lower frequency of positive savings than males did, although the difference disappears over time. This seems to imply that the quick decline in the frequency of saving rate for Germany is almost entirely imputable to male behavior.

Table 8 – Summary Statistics. France

Year	**Percentage of home owners**			**Percentage of households with savings>0**		
	Males	Females	Total	Males	Females	Total
1998	67.55	43.49	62.13	51.76	39.92	49.09
2004	65.82	41.70	59.79	17.21	11.88	15.88

Source: Enquete Patrimoine, 1998 and 2004.

Table 9 – Summary Statistics. Germany

Year	Percentage of home owners			Percentage of households with saving>0		
	Males	Females	Total	Males	Females	Total
2003	50.4232	40.5564	45.9603	62.4547	57.1010	60.0331
2005	54.0491	49.4614	51.7397	61.4195	55.9246	58.6534
2006	56.1853	50.4684	53.2696	59.9634	52.1077	55.9570

Source: SAVE dataset.

Table 10 – Summary Statistics. Italy

Year	Percentage of home owners			Percentage of households with saving>0		
	Males	Females	Total	Males	Females	Total
1998	68.93	57.72	65.86	79.09	78.29	78.87
2000	70.73	63.76	68.29	79.60	79.95	79.72
2002	70.72	65.01	68.62	79.12	79.57	79.29
2004	69.67	64.37	67.62	78.37	77.91	78.19

Source: SHIW dataset.

Table 11 – Summary Statistics. Spain

Year	Percentage of home owners			Percentage of households with saving>0		
	Males	Females	Total	Males	Females	Total
2002	89.36	85.30	87.99	97.19	95.80	96.72
2003	87.16	83.92	85.99	97.14	95.70	96.62

Source: Spanish Survey of Households and Finances (EFF).

Table 12 – Summary Statistics. UK

	Percentage of homeowners			Percentage of households with saving>0		
Year	Males	Females	Total	Males	Females	Total
1997-1998	75.23	62.25	69.25	43.96	40.54	42.08
1998-1999	76.32	61.62	69.43	45.14	41.21	42.99
1999-2000	76.03	63.28	70.03	42.09	38.70	40.22
2000-2001	76.20	64.07	70.44	43.98	41.53	42.63
2001-2002	75.92	63.76	70.07	44.39	40.73	42.37
2002-2003	76.09	63.88	70.21	44.16	40.58	42.20
2003-2004	75.95	65.85	71.15	43.29	40.55	41.79
2004-2005	73.90	64.15	69.16	43.37	40.44	41.76
2005-2006	78.86	66.92	73.00	44.01	40.03	41.80

Source: BHPS.

4.5. Empirical analysis

4.5.1 France

The *Enquête Patrimoine* has the specific purpose to investigate in detail the composition and dynamics of the wealth of French families. It is carried out periodically, every five years since 1986, by the *INSEE*, the national French institute of statistics. The sample, which consists of approximately 10,000 households, is representative at national level. The survey contains detailed information on the socio-economic characteristics of the household members (education, occupational groups, marital status, etc). What makes this data set particularly useful for our analysis is that it contains a detailed section on asset composition, including the values of housing (for a description and analysis of portfolio structures, see Arrondel and Calvo, 2002 and Arrondel and Masson 2002).

Two waves of the *Enquête Patrimoine*, respectively 1998 and 2004, are available for the year range 1995-2005 and were used for the purpose of our research. Our final sample consists of 9053 household-observations in 1998 and 8753 in 2004.

The data set contains information as to whether the household has saved in the past; however, this type of information does not extend itself to cover the magnitude of the money set aside for saving purposes. The dependent variable in our analysis is thus a dichotomous variable taking the value of one if the household answered yes to the following question:

"En définitive, avez-vous au cours des 12 derniers mois "mis de l'argent de côté", c'es tà-dire augmenté vos placements financiers par rapport à il y a un an?".

Given the dichotomous nature of the dependent variable, we used a probit model for our empirical analysis. The estimates for 1998 and 2004 differ slightly in the set of regressors used. House mortgage values were not present in the 2004 wave, while we could find this information in 1998. Thus net house value has been used for our estimations referring to 1998, while the gross house value has been used with reference to 2004[18].

Table 13 and Table 14 provide summary statistics for the waves used in our empirical analysis.

Table 13 – Summary Statistics: France, 1998

Variable	Mean	Std. Dev.	Variable	Mean	Std. Dev.
Savings	.49	.50	Household income 19,819-27,414 euro	.20	.40
Net House Value * (age<40)	7369.09	31885.95	Household income 27,441-38,113 euro	.17	.38
Net House Value * (age 40-60)	41077.73	170930.5	Household income between 38,113- 53.358	.10	.30
Net House Value * (age>60)	29809	77793.84	Household income above 53.358 euro	.06	.25
Age between 20 and 29 years old	2.11	.31	Number of persons in the area of residence: rural area	.26	.44
Age between 30 and 39 years old	.18	.38	Number of persons in the area of residence: less than 20.000	.16	.37
Age between 40 and	.21	.41	Number of persons in the	.13	.33

[18] In the 1998 survey, the reference person's age was given in brackets of ten-year width. For this reason,age is used in the form of non-overlapping range dummies in the 1998 regression. The same thing occurs – for both 1998 and 2004 – with respect to income.

49 years old			area of residence: between 20.000 and 100.000		
Age between 50 and 59 years old	.17	.38	Number of persons in the area of residence: more than 100.000	.29	.45
Age between 60 and 69 years old	.16	.37	Number of persons in the area of residence: Paris area	.11	.31
Age between 70 and 79 years old	.12	.33	Number of persons in the area of residence: Paris	.04	.20
Age over 80 years old	.04	.21	area of residence: Ile de France	.17	.38
Male	.76	.42	Area of residence: Paris Basin	.18	.38
Employee	.77	.42	Area of residence: North of France	.06	.24
Number of persons within the household	2.49	1.36	Area of residence: East of France	.09	.29
Single	.44	.50	Area of residence: West of France	.14	.35
Household income below 6.098 euro	.04	.20	Area of residence: South West of France	.11	.32
Household income between 6.098 and 9.147 euro	.07	.26	Area of residence: Centre East of France	.11	.32
Household income between 9.147 and 13.721 euro	.15	.36	Area of residence: Mediterranean area	.13	.33
Household income between 13.721 and 19.819 euro	.19	.39	Medium level of education (professional school or high school)	.13	.34
			Degree	.18	.39

Observations: 9053.

Table 14 – Summary Statistics: France 2004

Variable	Mean	Std. Dev.	Variable	Mean	Std. Dev.
Savings	.161815	.4290682	Household income above 72.000 euro	.0624675	.2420657
Net House Value * (age<40)	29048.2	85349.31	Number of persons in the area of residence: rural area	.1936491	.39526
Net House Value * (age	82142.51	186336.6	Number of persons in the	.1290994	.3353973

40-60)			area of residence: less than 20.000		
Net House Value * (age>60)	43945.09	145760.3	Number of persons in the area of residence: between 20.000 and 100.000	.1082769	.3108108
Number of persons within the household	2.521083	1.305716	Number of persons in the area of residence: more than 100.000	.3560645	.4789593
Age of the reference person	47.40708	16.2498	Number of persons in the area of residence: Paris area	.142634	.3497903
Male	.8016658	.398849	Number of persons in the area of residence: Paris	.0702759	.255678
Age squared	2511.35	1691.683	Number of persons in the rea of residence: Ile de France	.2347736	.4239676
Employee	.8474753	.3596224	Area of residence: Paris Basin	.1457574	.3529547
Single	.4440396	.4969879	Area of residence: North of France	.0614263	.2401732
Household income below 2.500 euro	.0130141	.1133639	Area of residence: East of France	.0858928	.2802786
Household income between 2.500 and 7.500 euro	.0395627	.1949803	Area of residence: West of France	.1332639	.3399482
Household income between 7.500 and 12.000 euro	.058303	.2343765	Area of residence: South West of France	.1197293	.3247293
Household income between 12.000 and 20.000 euro	.2066632	.4050172	Area of residence: Centre East of France	.1186882	.3235055
Household income between 20.000 and 30.000 euro	.242582	.4287559	Area of residence: Mediterranean area	.1004685	.3007019
Household income between 30.000 and 48.000 euro	.250911	.4336503	Medium level of education (professional school or high school)	.1608537	.3674916
Household income between 48.000 and 72.000 euro	.1264966	.3324948	Degree	.3800104	.4855154

Observations: 8356.

Housing is an important component of wealth for French households. The majority of households own at least one dwelling (about 60% in both waves). As described in Arrondel and Lefebvre (2002), it is one of the most popular assets after bank checking deposits. It also constitutes a conspicuous fraction of total wealth, approximately 65%.

Table 15 shows the estimation results for the first wave, 1998. Housing-related variables do not explain the probability of showing positive savings for all age categories. Even though this result is in contrast to the theoretical predictions, it is worth noting that a house price boom only materialised after 1998, while European households started experiencing an unexpectedly growing value of their homes only after 2000. Moreover, the data set not being a panel, the estimates can only provide the marginal effect of housing wealth, rather than housing capital gains, on the propensity to save.

Table 16 shows the same set of estimates relative to 2004, a sufficiently long time after the start of the 2000-2001 price boom. In 2004, saving propensity responded negatively to the value of housing; moreover, the older the age, the more pronounced the effect. Higher housing values correspond to a lower propensity to save, particularly for households whose head is aged above 55. This result corroborates our theoretical predictions, supporting the result that the age at which housing price increases occur contributes to determine a different impact on the saving rate.

Table 15 – Probit Estimation Results: France, 1998

Regressors	**Marginal Effects**
Net House Value * (age<40) *10^{-7}	5.576
	(5.023)
Net House Value * (age 40-55) *10^{-7}	1.096
	(0.794)
Net House Value * (age>55) *10^{-7}	-3.398
	(2.241)
Age between 20 and 29 years old	-0.308
	(0.194)
Age between 30 and 39 years old	-0.402**
	(0.195)
Age between 40 and 49 years old	-0.554***
	(0.195)
Age between 50 and 59 years old	-0.600***
	(0.195)
Age between 60 and 69 years old	-0.620***
	(0.196)
Age between 70 and 79 years old	-0.519***
	(0.196)
Age between over 80 years old	-0.647***
	(0.202)
Male	0.00121
	(0.0430)
Employee	-0.206***

	(0.0354)
Number of persons within the household	-0.147***
	(0.0144)
Single	-0.0770*
	(0.0406)
Household income between 6.098 and 9.147 euro	0.254***
	(0.0946)
Household income between 9.147 and 13.721 euro	0.620***
	(0.0863)
Household income between 13.721 and 19.819 euro	0.903***
	(0.0860)
Household income between 19.819 and 27.414 euro	1.193***
	(0.0878)
Household income between 27.414 and 38.113 euro	1.389***
	(0.0906)
Household income between 38.113 and 53.358 euro	1.646***
	(0.0975)
Household income above 53.358 euro	1.778***
	(0.106)
Number of people in the area of residence: rural area	0.056
	(1.20)
Number of people in the area of residence: less than 20.000	0.021
	(0.44)
Number of people in the area of residence: between 20.000 and 100.000	-0.004
	(0.09)
Number of people in the area of residence: more than 100.000	0.018
	(0.39)
Number of people in the area of residence: Paris Area	0.039
	(1.23)
Number of persons in the area of residence: more than 100.000	0.0542
	(0.0469)
Medium level of education (professional or high school)	-0.0559
	(0.0437)
Degree	0.167***
	(0.0422)
Constant	-0.263
	(0.222)

Observations: 9053. Standard Errors in parenthesis. *** p-value<0.01, ** p-value<0.05, **p-value<0.1. Regression includes geographical dummy areas.*

Table 16 – Probit Estimation Results: France, 2004

Regressors	Marginal Effects
Gross House Value * (age<40) *10^{-7}	-0.051
	(0.10)
Gross House Value * (age 40-55) *10^{-7}	0.220
	(0.76)

Gross House Value * (age>55) *10^{-7}	-0.586
	(1.85)*
Number of household components	-0.014
	(3.59)***
Age of the reference person	-0.012
	(5.55)***
Male	0.006
	(0.52)
Squared age of the reference person	0.083
	(4.13)***
Employee	0.010
	(0.92)
Single	-0.005
	(0.43)
Household's income between 2.500 and 7.500 euro	0.068
	(1.39)
Household's income between 7.500 and 12.000 euro	0.050
	(1.11)
Household's income between 12.000 and 20.000 euro	0.117
	(2.64)***
Household's income between 20.000 and 30.000 euro	0.178
	(3.83)***
Household's income between 30.000 and 48.000 euro	0.244
	(4.90)***
Household's income between 48.000 and 72.000 euro	0.355
	(6.06)***
Household's income above 72.000 euro	0.421
	(6.43)***
Number of people in the area of residence: rural area	-0.078
	(2.58)***
Number of people in the area of residence: less than 20.000	-0.085
	(3.01)***
Number of people in the area of residence: between 20.000 and 100.000	-0.090
	(3.20)***
Number of people in the area of residence: more than 100.000	-0.093
	(2.93)***
Paris Area	0.013
	(0.66)
Medium level of education (professional or high school)	0.039
	(3.00)***
Degree	0.023
Gross real estate heritage if reference person's age<40 (euro)	-0.051
	(0.10)
Gross real estate heritage if reference person's age is between 40 and 60 (euro)	0.220

Observations: 8356. t-statistics in parenthesis. *** p-value<0.01, ** p-value<0.05, * p-value<0.1. Regression includes geographical dummy areas. Number of people in Paris area is the excluded category.

4.5.2. Germany

Our sample of German households is drawn from the SAVE survey, a specific survey on saving and asset accumulation behaviour of German households. The sample covers the years 2001, 2003, 2004, 2005 and 2006 for a total of four waves. However, since the estimated model uses some variables which are constructed as variations from the previous year, saving behaviour in 2001 cannot be used for estimation purposes. Furthermore, the data in the SAVE wave that refers to 2001 were collected by means of a per quota sampling procedure, while in the other waves the sampling method was mixed.

The composition of the sample used for estimates is reported in Table 17.

Table 17 – Sample Composition: German Data

	Frequency	Percentage
Per quota sample	704	34.80
Random sample	1,319	65.20
Total	2,023	100.00

Otherwise, the SAVE survey collects information on about 3,000 households every year, as shown in Table 18.

Table 18 – Sample Composition: German Data

Wave	In the original dataset	Households in the sample
2003	3,154	284
2005	2,305	570
2006	3,474	1,169
Total	8,933	2,023

The core of the sample is represented by a panel component, thus the head of the household is interviewed for more than one wave: 406 households, out of the 2,023 used for estimation, are actually interviewed more than once.

Before using the data, some filters were applied. First of all, the original data set proved to have too many missing values for convergence in Tobit estimates to be achieved. Our results are robust to different imputation techniques. After removing potential outliers, our sample consists of 2,023 household observations. Four empirical models were eventually estimated: two cross sectional tobit models and two panel tobit models. The first and the third include income as a continuous variable, the second and fourth use income quintiles. Other regressors specific to the German application that deserve mention are dummies for different levels of education: basic education (when the highest certificate held is Elementary school leaving examination, *Hauptschul-/Volksschulabschluss*), medium education (Junior high school leaving examination, *Mittlere Reife/Realschulabschluss*, or year 10 leaving examination, *Abschluss Polytechnische Oberschule 10 Klasse*) or high education (Entrance standard for higher education, *Fachhochschulreife* or General senior high school leaving certificate or comparable certificate for University of Applied Sciences, *Abitur*). Moreover, we use a further dummy variable to capture the fact that respondents expect future incomes higher than current ones. Descriptive statistics for all the regressors are illustrated in Table 19.

Table 19 – Summary Statistics: German Data

Variable	Mean	Std. Dev.	Variable	Mean	Std. Dev.
Yearly saving	2734.779	7031.22	Nieders.	.0869995	.281904
Income	26491.05	20747.55	Bremen	.0039545	.0627761
Male	.5412753	.4984166	Nordrh.-West.	.1967375	.3976305
Age	50.21799	15.49051	Hessen	.0785961	.2691739
age2	2.761684	1.614038	Rheinland-Pf.	.0533861	.2248577
# of household components	2.438952	1.214447	Baden-W.	.0879881	.2833477
No partner	.3475037	.4762951	Bayern	.1230845	.3286154
Employee	.4621849	.4986912	Berlin-Ost	.0390509	.193764
Unemployed	.4013841	.4902996	Brandenb.	.0459713	.2094747
Medium education level	.3578843	.4794964	Meck.-Pom.	.0316362	.1750728
High education level	.2614928	.4395564	Sachsen	.0781018	.2683981
Delta house value *(age<40)	-284.7459	5739.79	Sachsen-An.	.0627781	.2426233
Delta house value *(age 40-50)	-646.6572	7282.946	Thueringen	.0350964	.184069
Delta house value *(age 50-60)	-532.4375	9144.39	Year 2003	.1403856	.3474725
Delta house value *(age>60)	-116.7598	8732.661	Year 2005	.2817598	.4499681
Schleswig-Hol	.0346021	.1828149	Year 2006	.5778547	.4940236
Hamburg	.0252101	.1568014	Positive exp. for income increase	.3702422	.4829889

In Table 20 we supplement this information by showing the evolution of the percentage of house owners and savers over time, more specifically the percentage of households owning any real asset in our sample.

Table 20 – Summary Statistics: German Data

	Frequency	Percent
Real asset >0	1,306	64.56
Real asset =0	717	35.44
Total	2,023	100.00

Savers	Frequency	Percent
Savings =0	889	43.94
Savings >0	1,134	56.06
Total	2,023	100.00

Saving in the SAVE survey is not constructed as the difference between income and consumption, as in Italy, but rather as the answer to the question "How much have you and your partner saved in the last twelve months?" For this reason, the variable 'saving' is left censored to zero and the model used for estimation is a tobit (as for the UK, and differently from Italy, for which OLS estimates are sufficient to capture the desired effects). The different definition of saving (and in particular the absence of possible negative values for saving) may to some extent provide a key to understand the differences in estimation results between Italy, UK and Germany.

Table 21 presents complete estimation results. Estimates are obtained controlling for the Bundesland the household resides in. Reported coefficients are marginal effects computed at the median of the regressors. Consistently with the estimates obtained for Italy and the UK, the effect of a growing household size is negative, probably due to the tendency of family expenditures and consumption to grow with size. Strangely enough, though, the effect of households being composed of only one member (a single) turns out to be strongly negative, but the effect becomes insignificant when we control for income quintiles instead of modeling income as a continuous variable.

The effect of being a non-self employed is not significant while the occupational status clearly influences saving behavior: being unemployed, given an identical level of income, causes saving to decrease. The only demographic feature which seemingly affects saving is the square of age, i.e., a non-linear effect, with a positive effect. Given age and income, also education has a positive effect, which is particularly significant for high educational levels (the benchmark here is given by a low education level).

Of even deeper interest are the coefficients for income and the presence of positive expectations for future income (both positive) and for the effect of capital gains from house and other real estate ownerships. On the one hand, we find that higher income induces higher saving, which is clearly supported by the standard economic theory (given the consumption level due to the permanent income level, a higher current income leads to higher savings) and is robust to different functional form specifications (such as the use of quintiles). However, other results are more surprising. For instance, standard theory predicts that savings (given the current income level) will decrease when the individual expects higher future incomes because of a decline in the perceived need to save for precautionary reasons, as the feeling is that present income may be relatively lower than permanent income.

We also find that as house values increase, so do savings. This effect can be explained in the following way: when house values are increasing, the positive capital gain causes people to save less, while consumers are seemingly less respondent to decreases in their real estate value, which can be due to slightly descending trends in real house prices, as were observed in Germany during our sample period.

Table 21 – Estimation results: German Data

	Tobit	Tobit, Income quintiles	Panel Tobit	Panel Tobit, Income quintiles
yearly income	0.086**		0.086**	
	(6.89)		(6.89)	
male	-557.042	-743.376	-557.196	-743.640
	(-1.11)	(-1.50)	(-1.11)	(-1.50)
age	-59.429	-191.049	-59.371	-191.005
	(-0.55)	(-1.77)	(-0.55)	(-1.77)
age squared	1951.563	2870.607**	1951.059	2870.191**
	(1.86)	(2.75)	(1.86)	(2.75)
Household components	-517.293*	-832.342**	-517.214*	-832.373**
	(-1.97)	(-3.18)	(-1.97)	(-3.18)
Single household	-2860.72**	-503.850	-2860.652**	-503.866
	(-4.29)	(-0.69)	(-4.29)	(-0.69)
Civil servant, wage earner or salaried employee	226.439	-444.621	226.410	-444.749
	(0.29)	(-0.57)	(0.29)	(-0.57)
unemployed	-3138.480**	-2938.358**	-3138.319**	-2938.432**
	(-3.52)	(-3.33)	(-3.52)	(-3.33)
medium_edu	1098.171	525.306	1098.103	525.541
	(1.82)	(0.87)	(1.82)	(0.87)
high_edu	2949.120**	1915.638**	2949.269**	1915.859**
	(4.61)	(2.95)	(4.61)	(2.95)
Delta house value*(age<40)	0.063	0.054	0.063	0.054
	(1.56)	(1.35)	(1.56)	(1.35)
Delta house value x (age 40-55)	0.031	0.023	0.031	0.023
	(1.34)	(0.99)	(1.34)	(0.99)
Delta house value x (age>55)	0.042*	0.045*	0.042*	0.045*
	(2.09)	(2.23)	(2.09)	(2.23)
Year = 2005	-1139.949	-764.900	-1139.985	-764.898
	(-1.33)	(-0.90)	(-1.33)	(-0.90)
Year = 2006	80.321	536.306	80.357	536.332
	(0.10)	(0.68)	(0.10)	(0.68)
Positive exp. for income	3704.743**	3070.206**	3704.762**	3070.343**
	(7.30)	(6.05)	(7.30)	(6.05)
Income 2^ quintile		4998.783**		4998.557**
		(6.25)		(6.25)
Income 3^ quintile		5266.712**		5266.548**
		(5.84)		(5.84)
Income 4^ quintile		8540.701**		8540.602**
		(9.06)		(9.06)
Income 5^ quintile		10830.251**		10829.993**
		(10.71)		(10.71)
Constant	-8348.990*	-6636.631	-8350.788*	-6637.535
	(-2.36)	(-1.86)	(-2.36)	(-1.86)
Sigma Constant	9509.502**	9362.941**		
	(45.89)	(46.03)		
sigma_u				
Constant			14.390**	16.147**
			(6.66)	(6.32)
sigma_e				
Constant			9509.513**	9362.912**
			(45.90)	(46.04)

4.5.3 Italy

Recent trends in the personal saving rate – which directly measures the ratio between savings and personal disposable income for households and other non-for-profit institutions – imply a steady decline in the US, the UK, and Canada at least since the mid-1980s. On the contrary, this pattern seems to have left untouched Italy (together with few other countries, such as Japan, France, Germany). What makes the Italian economy of particular interest for our study, is that Italy shares, along with the UK, the highest recorded value of housing investments out of total disposable income, with a value of about 8 times disposable income (Bartiloro et al., 2007). The general observation of Muellbauer (2007), that housing is the most important component of household wealth for OECD countries is then particularly true for the Italian households (see also Bertola and Hochguertel, 2007).

As we have seen, our theoretical model predicts the MPC on real estate wealth to be higher the higher the age of the household and the higher its net equity in real estate at the beginning of its planning horizon. We test such predictions on SHIW data, which is representative of the universe of Italian dwellings owned or rented by households. The data set contains several features that make it particularly suitable for our research questions. First, detailed information on households' asset holdings, including housing, are included in the data set: every household is asked about its outstanding debt on real estate asset. The net value of housing can thus be computed using the information available in the data. Second, the SHIW data provide information on socio-economic status (such as age, education, income, geographical residence) of each household in correspondence to every wave.

Stylized facts and the SHIW data

In 2005, Italian households' net wealth was estimated to be equal to 350,000 Euro per household, and 135,000 Euro per capita (Ministry of Finance, 2005). Net wealth has grown rapidly between 1995 and 2005, by 48%, which is equivalent to an average annual growth rate of 2.7%. The rate of growth has not been homogenous over time, ranging from 5.7% in 1997 to 0.3% in 2001, and then recovering to 4.3% by 2005. An increase in wealth can be generated either by new savings or by capital gains. While additional savings have been equally responsible along with capital gains for increases in wealth between 1995 and 2000, capital gains have been mostly responsible for the subsequent increase in wealth (D'Alessio et al., 2007). Indeed, over the whole period, capital gains accounted for 57% of real wealth growth in Italy.

Furthermore, Italy has shared with (most of the) other OECD countries a very significant increase in house prices over the last 15 years. The magnitude of the price increase has been comparable with that of other European countries, with a real annual increase of 6.6% for the time period 1989-2005.

We use the survey of Household Income and Wealth to examine whether housing price appreciation has displaced savings in other forms. The Bank of Italy's first Survey of Household Income and Wealth (SHIW) was conducted in 1965. Since then, the survey was conducted yearly until 1987 (except 1985) and every two years thereafter. The SHIW survey is a representative sample of the Italian resident population. Sampling takes place in two stages, first municipalities and then households. Households are randomly selected from registry office records. From 1987 through 1995 the survey was conducted every other year and covered about 8,000 households, defined as groups of individuals related by blood, marriage or adoption and sharing the same dwelling. Starting in 1989, each SHIW has re-interviewed some households from the previous surveys. Respondents included in the panel component of the data set have increased over time: 15 percent of the sample was re-interviewed in 1989, 27 percent in 1991, 43 percent in 1993, 45 percent in 1995, 37 percent in 1998 and 48 percent in the year 2000.

The SHIW data has the advantage of being representative of the universe of Italian dwellings owned or rented by the households. The data set contains several features that make it particularly suitable for our research design. First, detailed information on household asset, including housing asset are provided in the data set. More in detail, every respondent has to declare the subjective value of the house where he/she resides. Moreover, every household is asked about its outstanding debt on real estate asset. The net value of housing can thus be generated using the information available in the data.

Our final sample covers the year range 1995-2004 and is composed by 11,517 household-wave observations.

Estimation results

Our empirical model is as follows:

$$S_{it} = \mathbf{X}_{it}'\boldsymbol{\beta} + \theta\Delta H_{it} + \varepsilon_{it},$$

where S is annual household saving, $\mathbf{X}$ is a vector that collects a set of socio-demographic regressors, ΔH is the change in housing wealth, and ε is the error term. The subscript i is used to denote each household and t to indicate time. The main regressors of interest in our analysis are those related to the house capital gains (ΔH). Saving is defined as the difference between net available income and consumption. Saving does not include capital gains as it is not calculated as the difference of wealth over time. From our theoretical predictions, we expect that a positive change in housing value will increase consumption, thus decreasing saving. Thus, we expect the coefficient θ to be negative.

An additional test of our predictions focuses on the role played by age on the impact of housing wealth increase on saving. More specifically, the older the age at which an (unexpected) price increase occurs, the higher the impact of housing on consumption. Thus, interacting housing capital gains with the age of the household head could shed some light on the different effect that real estate price booms may have had on consumption, according to the age of the owner. For this reason, we also add a set of interaction terms, capturing the impact of housing wealth changes for households whose head-of-household is under 40, between 40 and 55, and older than 55, respectively.

Table 22 illustrates our estimation results for the Italian case. Young households do not react to house price increases. Conversely, older households (i.e. households whose head is aged over 40) do take into account the house capital gains by increasing their standard of living and decreasing resource accumulation, in accordance with our theoretical predictions. The older the household head, the stronger is the reaction. For households whose head is over 40 the (negative) elasticity of savings to house price increase is around 1%. Equivalently, an increase in house net value of 10,000 Euro would generate a decline in savings of approximately 50 Euros per year for households whose head is over 40. One possible interpretation for such findings is that young cohorts, having to face a longer time period of more expensive housing services, do not consider the increase in housing wealth as a welfare gain. For younger cohorts, housing wealth capital gains are entirely wiped out by the expected future higher prices for housing services.

The impact of the age of the household on their savings is strongly non-linear. Professional status like civil service and self-employment do not significantly affect savings and consumption. One additional component in the household decreases savings by approximately 1,400 Euro, the absence of the spouse in the household corresponds to higher savings by the same amount. Other remarkable empirical estimates imply that the propensity of Italians to save out of one Euro increase in their current income is substantially high, amounting to 0.65. Annual savings of Southern Italians are higher than those of the people living in Central Italy. Higher education has a detrimental effect on savings, the more educated households showing lower annual savings.

Table 22 – Estimation Results: Italian Data

Regressors	Coefficients
Delta house value *(age<40) *10-3	-0.428
	(-0.50)
Delta house value *(age:40-55) *10-3	-1.982*
	(-2.22)
Delta house value *(age>55) *10-3	-2.776***
	(-5.67)
Household head's age	-242.96***
	(-5.42)
Household head's age squared*10-3	2.34***
	(6.02)
Household head employee	-12.57
	(-0.06)
# of components	-1396.76***
	(-16.43)
No spouse in the household	1337.37***
	(4.69)
Household income	0.65***
	(151.15)
North	-153.53
	(-0.64)
South	3579.71***
	(14.27)
Degree	-5002.61***

	(-14.37)
College	-3126.48***
	(-14.20)
Constant	-2701.69*
	(-2.09)***

A possible drawback of our analysis is the potential endogeneity of capital gains on housing property. The observation of capital gains is in fact conditional on being a home-owner, which is not a random variable but rather a household choice. Moreover, total saving and individual components of savings in risky assets, such as housing, are driven by the same (unobserved) factors such as risk aversion and, more generally, preferences for uncertain income streams. Neglecting these factors might lead to a bias in the estimation of housing capital gains on savings. To address this concern, we jointly estimate the two regimes of savings according to whether or not the household is a homeowner by using an endogenous switching regression technique, with known regime separator. The two regimes of savings are jointly estimated as follows:

$$Own^*_{ht} = \mathbf{W}'_{ht}\, g + \nu_{ht}$$
$$S^{owner}_{ht} = \mathbf{X}'_{ht}\beta + \gamma^{owner}\Delta H_{ht} + \varepsilon_{ht1}$$
$$S^{renters}_{ht} = \mathbf{X}'_{ht}\beta + \gamma^{renters} P_t + \varepsilon_{ht2}$$

where $\mathbf{W}$ contains a set of socio-demographic variables at household and community level. The error terms ε_1, ε_2, and ν are normally distributed with variances σ_1, σ_1, and 1, respectively, and $Corr[\varepsilon_1, \nu] = \rho_{1\nu}$, $Corr[\varepsilon_2, \nu] = \rho_{2\nu}$. Each household's contribution to the likelihood function is the following:

$$\ln L_{ht} = Own * \left(\ln\left(\Phi \frac{(W'g + \rho_{1\nu}(\varepsilon_{ht1})/\sigma_1)}{\sqrt{1-\rho_{1\nu}^2}} \right) + \ln\big(\phi\big((\varepsilon_{ht1})/\sigma_1\big)\big) \right) +$$
$$+(1-Own) * \left(\ln\left(1 - \Phi \frac{(W'g + \rho_{2\nu}(\varepsilon_{ht2})/\sigma_2)}{\sqrt{1-\rho_{2\nu}^2}} \right) + \ln\big(\phi\big((\varepsilon_{ht2})/\sigma_1\big)\big) \right)$$

We maximize the following likelihood function, consisting of the sum of each contribution:

$ln\mathrm{L} = \sum_{ht=1..HT} \ln L_{ht}$ where HT is the total household-year observations.

Capital gains may now affect household savings conditional on owning housing property; therefore a change in house prices can only affect savings through capital gains for homeowners. However, the change in housing prices also affects the saving/consumption decisions of non-homeowners (i.e. renters) through the cost of renting. If house prices increase, the cost of housing services will increase as well, forcing renters to face higher future costs for housing services. For this reason, we include the house price level in the renters' equation (variable P). The coefficient γ^R captures the effect of a Euro increase in house prices on renters' savings. The a-priori sign of the latter is ambiguous. If renting households predict a permanent increase of future house price, they should increase their savings. Conversely, if the house price increase is considered transitory shock, renters would react to the latter by instantly reducing their saving to face current higher housing expenditures. The empirical results would guide us in distinguishing between the two cases.

Results are shown in Table 23, which contains the estimation results for owners' saving in column 1, for renters in column 2 and the determinants of the regime shifter (house ownership) in column 3. In order to facilitate the identification of the model we use a set of dummy variables that are likely to affect the supply of housing, hence the decision to own, but have no influence on the overall amount of savings. These are a set of dummy variables relative to the dimension of the city of residence. Taking into account the endogeneity of real asset ownership does not change results substantially. The coefficients loading savings on house capital gains are similar in magnitude to those obtained earlier. The coefficients on other variables do not differ in sign and magnitude from the OLS coefficients except for age that turns out to be non significant and the geographical areas of residence that are significant in this modified specification.

Table 23 – Estimation Results: Italian Data

	Model Specification (1)			Model Specification (2)		
	Savings of home-owners (1)	Savings of Non-homeowners (2)	Home Ownership (3)	Savings of home-owners (4)	Savings of Non-homeowners (5)	Home Ownership (6)
Delta house value *(age<40)	-0.002			0.003		
	(-1.06)			(1.51)		
Delta house value *(age:40-55)	-0.006***			-0.003		
	(-5.65)			(-1.54)		
Delta house value *(age>55)	-0.005***			-0.004***		
	(-5.49)			(-3.29)		
Household head's age	-49.777	1.644	0.054***	-39.871	33.210	0.054***
	(-0.79)	(0.02)	(8.69)	(-0.72)	(0.47)	(8.29)
Household head's age squared	1.110*	0.368	$-0.413*10^{-3}$***	1.054*	0.117	$-0.401*10^{-3}$***
	(2.07)	(0.62)	(-6.73)	(2.25)	(0.20)	(-6.28)
Household head employee	400.427	37.739	-0.112***	9.551	-1.805	-0.099**
	(1.45)	(0.12)	(-3.69)	(0.04)	(-0.01)	(-3.12)
# of components	-1507.474***	-1118.813***	-0.066***	-1309.569***	-1127.136***	-0.064***
	(-13.12)	(-8.82)	(-5.25)	(-12.67)	(-8.86)	(-4.83)
No spouse in the household	812.799*	1031.890*	-0.155***	1018.110**	1040.221**	-0.178***
	(2.11)	(2.56)	(-3.83)	(3.02)	(2.59)	(-4.24)
Household income	0.714***	0.648***	$0.347*10^{-3}$***	0.684***	0.638***	$0.030*10^{-3}$***
	(129.34)	(38.21)	(38.94)	(98.46)	(35.42)	(29.19)
North	-934.246**	393.648	-0.167***	-1135.621***	195.201	-0.201***
	(-2.97)	(0.99)	(-4.63)	(-4.05)	(0.49)	(-5.30)
South	3726.254***	3150.274***	0.233***	3189.719***	2884.007***	0.235***
	(11.35)	(7.40)	(6.06)	(10.99)	(6.77)	(5.81)
Degree	-5206.748***	-2915.346***	-0.122*	-3215.716***	-2501.871***	-0.098
	(-11.45)	(-4.18)	(-2.07)	(-7.33)	(-3.52)	(-1.51)
College	-2693.570***	-1852.603***	0.024	-1963.497***	-1826.940***	0.030
	(-9.22)	(-5.10)	(0.70)	(-7.46)	(-5.04)	(0.84)
Price *(age<40)		1474.792***			-0.866**	

Turning to the equations that capture the impact of price on renters' savings (column 2, table 23), our estimates suggest that a house price increase acts as a deterrent to saving:

a house price increase determines an equivalent increase in consumption for the renters, the coefficient on price being around -1 for all age categories[19]. From this result we can infer that renter-households passively react to house prices by simply increasing their consumption, and thus decreasing their savings, when a house price increase occurs. In other words, our data suggest that Italian households consider the price increase as an unexpected shock.

The impact of the determinants of house ownership (column 3, table 23) do not differ in their sign from those of savings with some exception. Age turns out to be significant on house ownership with a strong non-linear impact. Education variables do not play a role in the choice of owning a house. We also run the same regression isolating the impact of capital gains for the primary residence. Results are shown in column 5, 6, and 7 of Table 23. The coefficients on capital gains are smaller in magnitude and significant for older households only. As expected, capital gains on primary residence generate a less substantial impact than capital gains on real assets as a whole, suggesting that the house of residence is not perceived as disposable wealth except for, and to a minimum extent, older households.

4.5.4. Spain

The data used for the analysis are obtained from the Spanish Survey of Households and Finances (EFF), which is the only statistical source available in Spain from which it may be possible to link incomes, assets, debts and consumption (and therefore savings) at the household level. Unfortunately the only available wave, for the time being, is 2002. In particular, (e.g., with reference to with respect to the oversampling of wealthy households) the EFF survey has been constructed taking as a benchmark the SHIW panel prepared by the Bank of Italy and the US Board of Governors Survey of Consumer Finances.

The questionnaire is divided into nine main sections which reflect the aims of the EFF. These are as follows:

1. Demographics
2. Real assets and their associated debts
3. Other debts
4. Financial assets
5. Pension plans and insurances
6. Labour market situation and labour income (for all household members)
7. Non-labour income in previous calendar year (2001)
8. Means of payments
9. Consumption and savings

The survey was carried out by means of 'Computer Assisted Personal Interviews' (CAPI). The time perios spanned over seven months, from October 2002 to May 2003.

[19] Each price category coefficient results not to be significantly different from -1 at a 50% level.

Since many assets are held by a small fraction of the population (which would cause a random sample to contain too few or no observations), an oversampling of wealthy households is carried out. Additionally, Spain lists an active system of wealth taxation ('Impuesto sobre el Patrimonio'). This tax hits individual wealth and it is taken into account by EFF (for over-sampling purposes) on the basis of the tax file information provided by the Tax Office.[20] Eight strata were defined which were oversampled progressively at higher rates. Together with high unit non-response, item non-response is an inherent characteristic of wealth surveys.

Table 24– Reporting rates (%) for various EFF items

	Have item		Value for those having the item		
	Yes	Unknown	Value	DK	NA
Own main residence	84.5	0.0	86.5	13.0	0.5
Amount owed, 1rst loan, main residence	15.0	0.0	88.6	11.2	0.3
Other real estate, 1rst property	41.7	0.0	82.0	16.4	1.0
Amount owed, 1rst loan, 1rst other real estate	5.0	0.0	91.1	6.6	0.8
Wage income (reference person, 2001)	36.9	0.0	97.6	1.2	1.3
Self-employment income (ref. person, 2001)	13.4	0.0	89.6	5.2	5.2
13.4 0.0 89.6 5.2 5.2					
Non-durable expenditure	100.0	0.0	95.9	3.6	0.5

Source: Bover (2006), un-weighted sample.

Given the item non-response rates reported above, working with the available cases only and ignoring the problems posed by the presence of item non-response would not be sensible since it would imply a strong assumption: that the complete cases are randomly drawn from the original sample. Moreover, in multivariate analyses, working only with complete observations would lead to far too small samples. Therefore such an analysis could induce severe biases in the estimation results.

Most of the EFF imputations are based on random regression type models. One problem with providing one single imputation is that it ignores uncertainty about the imputation under the considered model and any additional potential uncertainty when more than one model could be chosen for imputation. Standard errors and other uncertainty measures would be underestimated. Multiple imputations (MI), as proposed

[20] In the Navarre and the Basque Countries, no oversampling of wealthy households is applied because the national Tax Office does not keep personal tax file information.

by Rubin (1987) have therefore been chosen to analyze EFF survey data in our empirical analysis.

The imputation program used is the SCF multiple imputation one (Fritz, Federal Reserve Imputation Technique Zeta), which implies a sequential and iterative structure. In a given iteration the variables are imputed sequentially and an imputed variable is taken as 'observed' for subsequent imputations in the sequence and in the next iterations (subject to updating). Variables with the least number of missing cases (which are also relevant as sufficient statistics for predicting other variables) are imputed first. This iterative and sequential imputation is related to some of the Markov Chain Monte Carlo developments (MCMC), in particular Gibbs sampling.[21] Five imputed datasets were first analyzed separately using complete data tools, and then the results were combined.

One of the most important variables in our empirical exercise is the amount of household savings, which for Spain has been constructed as the difference between income (obtained from the constructed total gross household income variable, corresponding to the month in which the interview took place, between 2002 and 2003) and non-durable consumption. As far as independent variables are concerned, the stock of real estate properties is considered instead of the variation from one year to the following, since only one wave of the survey is currently available. Finally, no deduction for outstanding mortgages has been performed because of the high proportions of missing values in the variables describing mortgage loans. Summary statistics are shown in Table 25.

Table 25 – Summary Statistics: Spain, 2002

Variable	Mean	Std. Dev
savings	29885.94	62722.09
age	57.88928	15.70562
agesq	3597.787	1807.328
hh_size	2.744503	1.33751
male	0.6520724	0.4763593
no_spouse	0.3187391	0.466033
real asset* age<40	18766.84	74068.16
real asset* age in 40-55	59917.45	193033.4
real asset* age>55	138862.6	374283.2
degree	0.2588052	0.438021
college	0.2043199	0.403243
income	41642.19	67112.84
employee	0.3263281	0.4689145
owner	0.8700136	0.3363212

[21] Different types of imputations are allowed in the Fritz program for continuous, binary, and multinomial variables.

Since the level of savings is not censored, we can use a simple OLS regression to obtain parameter estimates, shown in Table 26. Turning to the coefficient of our interest, the marginal propensity to save out of housing wealth (and not capital gains, as this measure is unavailable in the data) is negative and strongly significant for all age categories, corroborating the findings in Bover (2006). Moreover, the magnitude of the coefficients is comparable to the one found for Italian households. A €10,000 rise in housing wealth decreases (increases) annual savings (consumption) by 50-100 Euro. The highest effect is found among the middle aged who decrease their savings more than other households.

Table 26 – Estimation Results, Spain 2002

Regressors	Coefficients
real asset* age<40	-0.004***
	2.482
real asset* age in 40-55	-0.008***
	8.419
real asset* age>55	-0.005***
	6.738
Age	-233.700***
	4.362
age squared	1.800***
	3.882
HH size	-1008.700
	9.261
Male	316.200
	1.145
no spouse	1805.600***
	5.642
Degree	-5069.600***
	15.573
College	-1459.100***
	4.697
Income	1.000***
	403.818
Employee	-949.100***
	3.213

Observations: t-statistics in parenthesis. *** p-value<0.01, ** p-value<0.05, * p-value<0.1

4.5.5. United Kingdom

The empirical analysis is performed at the individual level and uses BHPS data for the period 1996-2004. In order to isolate changes in housing value due to a rise in the house price from changes generated by the purchase of new housing, the selected sample is restricted only to individuals who declared to be the outright owners of a given dwelling at the end of the previous year.[22] For the same reason a further selection has been performed according to the size of the change in the value of housing during the reference period: individuals who reported gains higher than the 99th percentile have been dropped.

Table 27 reports a few summary statistics specific to UK data that are further to those in Table 11.

Table 27 – Descriptive Statistics: BHPS UK data

Variables	Mean	Standard Deviation
Savings	902.22	2729.94
Delta house value*(age<40)	585.06	42311.55
Delta house value*(age: 40-55)	2049.27	84905.56
Delta house value*(age>55)	1877.44	52156.46
Male	0.46	0.50
College	0.38	0.48
Degree	0.14	0.34
Age	46.46	12.47
Number of household components	2.86	1.31
Employed	0.57	0.50
No spouse in the household	0.78	0.41
Own housing wealth	0.74	0.44
Income	16476.62	16459.77
Live in London	0.06	0.24

BHPS dataset, waves 7-15 (reference years: 1996-2004); total number of observations: 70,700. Saving, housing values and income are expressed in 2005 British pounds.

The left-censored (at zero) structure of the variable ‘Savings’ in the BHPS data set had led us to use Tobit estimation techniques. Table 28 reports Tobit estimation results. Households’ characteristics clearly influence the level of saving: a lower size of the household and the absence of a spouse in the family (i.e., the fact that the household is composed of a single individual) positively affect saving. The type of job of the head-of-household is a significant explanatory variable as well: a positive coefficient is associated to the dummy variable that captures the fact that the household head is an employee.

Once more, the effect of age is positive and decreasing on the level of savings: agents that are, *ceteris paribus*, in a later stage of the life cycle save more than younger ones. Given age and income, also education – a proxy for human capital – has a positive effect on savings. On the other hand, the estimated coefficient for current income has the expected sign: given the level of permanent income, higher current earnings determine higher savings.

[22] This information excludes all the individuals who bought or sold real estate during the previous year because it refers only to the dwelling house. This is the reason why other restrictions on the sample have not been imposed.

Table 28 – Estimation Results: UK Data

Regressors	Coefficients
Delta house value *(age<40)	0.0016**
	(2.679)
Delta house value *(age:40-55)	0.0014**
	(4.306)
Delta house value *(age>55)	0.0007
	(1.646)
Male	-412.502**
	(-8.833)
Household head's age	51.841**
	(3.238)
Age squared	-500.364**
	(-2.907)
Household head employee	1367.051**
	(25.006)
Number of household components	-487.352**
	(-21.189)
No spouse in the household	1241.221**
	(19.141)
Household income	0.080**
	(170.292)
Live in London	-244.507*
	(-2.507)
College	672.101**
	(12.941)
Degree	1516.746**
	(21.954)
Constant	-5239.889**
	(-14.642)
sigma	
Constant	4534.894**
	(203.135)
Observations	56282
Log likelihood	-239549.625

The main focus of our empirical analysis is, however, the link between capital gains in real estate and savings. Here it is intriguing to notice that the estimated coefficients that capture this relationship display an opposite sign to what predicted by theory: they are positive and significant (but only at 10% for the elders in the UK sample) for all the age classes considered. The main reason of these unexpected results can be attributed to the way we have constructed the dependent variable: differently from Italian data it derives from a survey question about how much the interviewed household think to be able to save (by setting aside funds into bank accounts or similar financial assets) and it is really observed only when it is positive (left-censoring). This limit in the informative content of this variable is likely to affect our econometric results.

5. Conclusion and agenda for future work

In recent years, house prices have been steadily growing: with some exceptions – such as Germany and Japan, where they have been decreasing in real terms – between 2000 and 2006 house prices in the OECD area have been growing at an average rate of 6.6 per year in real terms. As a consequence, homeowners have witnessed a growing value of their own dwelling.

Housing price increase have, thus, generated a positive wealth effect for homeowners; however, the price of housing services, which follows housing price closely, have also increased by reducing wealth. The net effect of housing price increase is particularly pronounced for older households for two reasons. First, they are more likely to be homeowners, as homeownership increases with age, second, their remaining lifetime is shorter than younger cohorts, this implying that they have to pay less in the future for housing services than younger households.

The case of future rents increase will thus generate different consequences to differently aged households, with the elderly benefiting more than the young, who could be left untouched or indeed even loose by an increase in house prices.

The age at which the house price increase materializes is, thus, a crucial factor in determining the net impact of an increase in housing prices on households consumption and savings decisions. The older the household head, the higher the impact of a house price increase on consumption and savings.

Our study tests this implication for five countries – France, Germany, Italy, Spain and the UK – by estimating if, and to what extent, household savings are displaced by real estate capital gains, both at micro and at micro level. We have exploited the panel dimension of the SHIW, for Italy, SAVE, for Germany, and the BHPS for Britain so as to derive the (perceived) real estate capital gains for each household. We then proceeded to estimate the marginal propensity to save out of capital gains. For countries where a panel dimension was not available, i.e. France and Spain, we have estimated the marginal propensity to save out of real estate assets.

Our results show little impact of dissaving as a consequence of real estate appreciation. France, Italy and Spain show a minimal reduction in saving to due to house price increase. Italy and Spain show a similar coefficient of displacement of real estate appreciation on households saving, with a €10,000 increase in real estate generating a reduction of €50-100 in household savings. In France, for additional €100,000 of housing capital gains, the probability of showing positive financial saving is 0.6 percentage points lower, with regard to households whose head is over 55.

In general, the age difference is not found with the exception of France, where older households only react to house price increase.

Our results corroborate the hypothesis that housing wealth is perceived, by many, as a shadow wealth instead of as disposable asset, regardless of its price dynamics. The explanation of this behaviour can be reconciled with the fact that converting real estate asset into consumption flows is normally very difficult in continental Europe, unless the house is sold and the proceeds are transformed into an annuity, which is very rare. Moreover, selling the house and moving into a different (possibly smaller) one usually involves great psychological costs. Making housing wealth more liquid without incurring in the welfare losses correlated to moving, i.e. with reverse mortgages, can represent the only alternative to increase the consumption opportunity set of older households.

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