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The Role of Housing in Shaping Household Economic Behavior in Europe

DOCTORAL DISSERTATION

Social Sciences,
Economics (S 004)

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Karolis Bielskis

Būsto vaidmuo formuojant namų ūkių ekonominę elgseną Europoje

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Introduction

Relevance of the topic

The first volume of the Handbook of Macroeconomics, published in 1999, contains almost no references to housing (Piazzesi and Schneider (2016)). Therefore, this fact summarizes the state of the housing related macroeconomic research at the time. Much of this early housing- (real estate-) related macroeconomic literature focused on the effects of balance sheet constraints on non-financial firms. However, according to Bernanke and Gertler (1995), such constraints can play a crucial role in the decisions of households and financial firms as well. Therefore, the events happening since the early 2000s, and especially the global financial crisis of 2008, have illustrated this (Bernanke and Gertler (1995)) as financial distress arose in all three sectors: households, financial, and non-financial firms (Gertler and Gilchrist (2018)). Moreover, it has revived both theoretical and empirical studies that continued over the last two decades, and which aim to investigate possible mechanisms how the financial crisis materialized and how it was transmitted to the real estate sector.

Some early literature focused on the financial markets in order to capture balance sheet effects and their transmission to unemployment fluctuations. For instance, Phelps (1999) points out the relationship between the stock market and unemployment, and, therefore, empirically relates the 1990s stock market boom with a significant reduction in the unemployment rate. Later on, Fitoussi et al. (2000) find a similar stock market effect on unemployment across a variety of European countries. Overall, this sequence of literature indicates an existing linkage between households' wealth, financial markets and the real economic activity. Therefore, the latest decades were related to the crises of confidence and household debt that have been associated with strong fluctuations in house prices, financial markets and consumption in the early 2000s.

Over the past decade, there has been a notable degree of correlation in the movements of house prices across a range of developed economies. Prior to the global financial crisis, house prices had been increasing at an unusually rapid rate, and, in some cases, they would reach levels that

had not been previously observed. Subsequently, house prices experienced a collapse between 2006 and 2011, after which, a recent resurgence has been observed in a number of countries. These highly synchronized fluctuations in housing markets initially coincided with a period of high growth, but were subsequently followed by severe financial disruptions and deep recessions. This raises the question: *what are the main shocks that drive movements in global house prices, and how do these fluctuations affect the real economy?*

The focus on house prices in this dissertation is clearly shaped by recent developments. However, there are also more fundamental, and arguably more straightforward, reasons to study the dynamics of housing markets, given the important role housing plays in modern societies. Primarily, housing provides individuals with a fundamental necessity: a place to live. Secondly, housing-related activities constitute a significant proportion of GDP and household expenditure. Thirdly, housing represents the primary asset, and mortgage debt constitutes the primary liability for many households in developed countries. Consequently, significant fluctuations in house prices can have significant macroeconomic implications, as they impact households' net wealth and their capacity to borrow and spend on residential investment (Hirata et al. (2013)). In theory, the relationship between house prices and the real economy can be exacerbated when financial imperfections are being present. This amplification is largely attributable to the financial accelerator and associated mechanisms operating through firms, households, and countries' balance sheets. According to these mechanisms, an increase (decrease) in asset prices improves (worsens) an entity's net worth, enhancing (reducing) its capacity to borrow, invest, and consume. This process, in turn, can lead to further increases (decreases) in house prices and produce general equilibrium effects. In other words, disturbances in housing markets can translate into much larger cyclical fluctuations in the real economy (Hirata et al. (2013)).

Investigating the reasons of the financial crisis, Mian and Sufi (2014b) shed light on the fact that the richest group of society was related to the stock market, while the poorer one was accumulating their wealth mostly through the value of their housings. Moreover, the authors document

that most household debts in developed countries are secured by housing collateral. Therefore, recent research shows that fluctuations in collateralized housing value affect the borrowing constraints and consumption choices for most of households (Hintermaier and Koeniger (2018)). All in all, these facts connect the dots how financially fragile the household balance sheet can be, how the wealth depends on the real and financial assets, and highlights the importance of housing for the majority of households.

The overall importance of housing to households and the real estate sector also interested many economists to study the potential determinants that could explain the housing dynamics in different markets. Therefore, soon after the recent Global Financial Crisis in 2008, economists proposed household expectations as one of the main factors in explaining the house price dynamics (Piazzesi and Schneider (2016); Guerrieri and Uhlig (2016); Kaplan et al. (2020)). It is reasonable to say that expectations represent a key variable in the description of aggregate market outcomes, given their important role in intertemporal decision-making in the context of uncertainty (Kuchler et al. (2022)). A significant part of decisions made within the housing market, for instance, the choice to either purchase or sell a property, are influenced by the expectations of individuals regarding future market conditions. In such cases, individual beliefs have the potential to exert an influence on the aggregate economy through their impact on market-level outcomes. In the wake of the Global Financial Crisis, numerous researchers have turned their attention to analyzing the formation of housing market expectations, the role of these expectations in shaping individual behavior, and the impact of such decisions on the broader economic landscape (Kuchler et al. (2022)). However, despite the significant macroeconomic and policy implications, interactions between expectations and the real economy remain weakly explored, particularly in contexts where conventional tools, such as the monetary policy, are unable to fully support economic growth. Even if household expectations about the future housing market developments can be modelled and analyzed on the theoretical level, to empirically study the determinants and effects of housing market expectations, researchers first need to be able to

credibly measure expectations. Since people's expectations are not directly observable, researchers mostly rely on survey elicitation. There has been a huge shortage at the European level, although the recent introduction of the HFCS (Household Finance and Consumption Survey) has partially solved this problem, allowing researchers to study households at a detailed level. It provides a better understanding of households' financial and wealth situation in Europe, but also allows to capture expectations of national housing markets as well as planned housing investments. In this thesis, I also supplement survey-based analyses with household expectations about their future housing values. This is estimated by using macroeconomic data, which introduces an alternative, readily available, macroeconometric method for estimating a proxy for households' expectations about their future housing values.

It is also of importance to consider the current ownership of housing, as this has an impact on the formation of house price expectations. A salient distinction between housing and other assets is that even those who are not homeowners in the housing market (i.e., renters) possess substantial insight into the asset's dividend stream, given that they pay rent on a monthly basis. Such information may provide useful signals regarding the intrinsic value of the asset, which owner-occupiers are not privy to. Consequently, a limited body of evidence indicates that, on average, renters are more accurate than owners in forecasting future house prices during a housing boom. However, it also suggests that renter forecasts are more dispersed (Kuchler et al. (2022)). While evidence from other asset markets indicates the existence of an endowment effect, whereby owners become more optimistic than non-owners when they receive positive signals about their assets, the existing evidence on housing markets suggests the opposite effect. Although the ownership aspect has been the subject of some discussion and analysis at the theoretical level, it remains limited in terms of significant cross-country empirical evidence and other stylized facts which could help to elucidate it more effectively. Therefore, to address this issue, I base my thesis on the HFCS dataset, which allows the identification of different households – owners, mortgage holders, and renters. Moreover, it also allows the identification of changes in the tenure status, which also gives more

credibility and robustness to the final results.

Since the housing-related research has been booming over the last two decades, it is mostly presented in three loosely connected segments of literature. One of the paths talks about the aggregate fluctuations of business cycles and the response of the economy to the fiscal or monetary policy. Second, housing is implicitly present in the large body of work on asset pricing concerned with differences in the average returns and price volatility across assets (Piazzesi and Schneider (2016)). Third, there is work on heterogeneous households that tries to explain the role of frictions and policy for inequality as well as the distributional effects of shocks. In this kind of literature, housing is included as the largest implicit component of household wealth as well as a significant share of consumption. While my dissertation touches up on all three paths, it focuses on the role of frictions and distributional effects of shocks (the third group) because of the heterogeneous effects that are commonly identified in the joint Euro area. Therefore, the extensive use of HFCS data allows me to analyze and estimate these heterogeneities by identifying different characteristics of households. Furthermore, it encompasses not only the ultimate transmission of the house price effects to the real estate economy, but also the initial stage of factors that drive disparate dynamics in house prices. While the new literature about the interaction of house prices and collateralized household borrowing with business cycles and monetary policy grew out of the three lines of research described above, the focus on it remains high, and this field has been attracting more and more interest from researchers as well as policy makers. Therefore, the current state of literature shows difficulties in describing the household behavior by ignoring uncertainty about house prices, or thinking about mortgage debt without heterogeneous agents. Another feature of this literature is that the *the housing market* is a collection of many different markets that differ by geography and by other attributes. Led by these ideas, in this dissertation, I aim to extend the current understanding about the importance of housing, about its role in the current stage of economy, about the importance of heterogeneous effects across households, and, most importantly, to investigate these questions at the European level, which has not been analyzed extensively before.

Goals and objectives

The main goal of this paper is to empirically analyze the interaction between the housing market and the real estate economy through the lens of the household. In the recent literature, there is still a lack of empirical analysis on the importance of housing as a key determinant in explaining the economic behavior of households. Therefore, in this dissertation, I conduct an empirical analysis on how *housing* affects household behavior, what are the key factors explaining *heterogeneous* effects across households, how housing effect can be measured and, most importantly, how large is the effect then transmitted to the real estate economy in terms of household consumption.

Therefore, this dissertation concentrates on two broad objectives. The first one is to explain the link and the importance between household uncertainty or beliefs about the housing or changes in house values and the real estate economy. In order to achieve this objective, the following steps are taken:

- To collect and manage of data about the housing market and household finances that is required to answer the research questions of the dissertation.
- To build several stylized results on household expectations about the house prices and household wealth portfolio changes over the last decade.
- To use micro-level household data to identify the main determinants that explain differences in household expectations about house prices.
- To highlight the theoretical linkage between household reactions to house price changes, the role of credit frictions, and the transmission to the real economy via the changes in household consumption.
- To develop a conceptual framework (a mechanism for shock identification) and estimate the effects of household behavior related to house price changes and credit frictions on their consumption by using easily accessible macro-level data.

The second broad objective is to measure empirically heterogeneous housing effects on household consumption. Specifically, this dissertation empirically evaluates the importance of homeownership and how the housing status can explain differences in household consumption dynamics. To achieve these objectives and thereby contribute to the growing literature in financial and housing economics, the following steps are taken:

- To review international literature on housing economics which analyzes heterogeneous households and explains the role of housing that leads to different distributional effects of shocks.
- To explain the possible channels how the tenure status can be linked with different expectations about the changes in house prices. Moreover, to observe these differences in reality by using micro-level data.
- To develop another conceptual empirical framework to create a synthetic instrumental variable that can explain variation in house values but remain uncorrelated with other general unobserved economic variables (e.g., general economic activity, socio-demographic changes, etc.).
- To estimate the marginal propensity to consume out of housing wealth.
- To suggest and empirically identify some possible channels how the levels of marginal propensity to consume out of wealth are driven by different tenure statuses of households.

Methodology

Different goals and different angles of the main objective are addressed in three research chapters presented in the thesis. Each of these chapters contain empirical studies that have been published as articles in the working paper series and in academic journals. Therefore, each chapter has its own framework and methodology, which contributes to the overall value of the dissertation. One of the three articles was written with a co-author, while the other two are an individual work of mine. Therefore,

the exact issues raised, the questions answered, and the methods used in these three chapters are discussed in detail below.

In the first chapter of my dissertation, I use data from the *European Central Bank's Household Finance and Consumption Survey* (HFCS) to examine how house price expectations differ across Europe, and to identify the main drivers of such expectations. Details from the HFCS data allow me to estimate the wealth portfolio at the household level and to construct some stylized facts about its dynamics over the last decade. In addition, I use cross-sectional regressions to show that the housing wealth drove the evolution of the household balance sheets over the period of 2010–2017. Hence, house price expectations remained highly heterogeneous across European countries, while changes in the income and house prices were the main determinants of house price expectations. Finally, in the second chapter, I run separate cross-sectional regressions based on the household position (quintile) in the wealth distribution or in terms of the tenure status. This allows me to highlight some stylized facts about heterogeneous effects driven by the household position in the wealth distribution or the homeownership status.

The second chapter of the thesis concentrates on the demand side of economy and shows that the household balance sheet is an essential driver of aggregate fluctuations, particularly household consumption spending. I start this chapter by building a small theoretical model which helps to understand the relationship between consumption, credit, and housing. Additionally, I introduce a new empirical framework that uses the house price-rent spread variable and models it in a way to capture (used as a proxy for) expectations about the residential property's future worthiness, into a simple model with an optimizing household sector and the borrowing frictions. In this chapter, I test key the model's predictions on half-century data from 28 developed OECD countries by using local projections (Jordà (2005)) and confirm the prediction of a substantial asymmetry effect when shocks to credit and spread variables occur simultaneously.

In the last chapter of the dissertation, I use *Household Finance and Consumption Survey* (HFCS) microdata to estimate the marginal propensity to consume out of housing wealth. Many studies estimating

marginal propensity to consume also highlight the necessity to control for a possible endogeneity problem, since the dynamics of house prices tend to correlate with the general economic trends measured as economic activity or socio-demographic shifts. Therefore, in order to avoid a possible endogeneity issue in estimation, I use additional information from interviewers about the housing conditions and value. This personal level information allows me to create a new synthetic instrumental variable which captures variation in house values but does not correlate with other unobserved variables about the general economic conditions. This two-step estimation procedure lets me identify the causal effect of house price changes on consumer spending.

Scientific novelty and contribution

The findings of this dissertation are novel, and they contribute to the financial and housing economics literature in at least a few dimensions.

First, I contribute to the literature by analyzing the key determinants of household expectations about their house prices. Since the literature has already looked at and highlighted the key determinants of house price expectations, little has been done so far in explaining the possible differences between households. In particular, my work contributes to the recent literature by providing empirical evidence about the determinants of individual level house price expectations. On the theoretical level, the main determinants have been analyzed before, but empirical evidence was missing nevertheless, especially in Europe. This happened because there was a shortage of detailed individual level data in Europe. Therefore, I employ the *Household Finance and Consumption Survey* (HFCS) data to bring the empirical facts about the determinants of house price expectations in Europe. This dataset allows me to analyze household-specific expectations about the house values, and also the composition of household assets, income and other family characteristics that can affect expectations. It also gives a better policy understanding about the heterogeneity of households that is captured on the European level – that also represents a very different pool of housing markets. Therefore, the aggregate policy conclusions are important

considering the fact of the unanimous monetary policy among the Euro area (EA) countries. Finally, I contribute to this literature by providing an additional dimension of the tenure status with the objective to explain different expectations among heterogeneous households.

Another important empirical contribution comes from the fact that I study household reaction and consumption relative to changes in the house price and credit. Moreover, it is analyzed through the lens of easily accessible macroeconomic variables, which makes this framework easy to replicate. I also contribute to the literature by introducing an alternative measure to house price expectations from the long and aggregate time-series. Since the global financial crisis revealed the importance of the household balance sheet and house price expectations, different modelling techniques were used account for it. However, literature was still facing with the shortage of alternative variables that can be used to analyze long-term macro time-series over a panel of countries. The novelty in my dissertation is the house price-rent spread variable that is shown as an alternative to account for household expectations about the house price dynamics. Moreover, a simple and clear methodology allows me to estimate the house price-rent spread variable for different countries and to analyze house price expectations over the panel of time and countries.

Therefore, I contribute to the literature and policy debates with the empirical confirmation of the importance of tracking not only house prices (Madsen (2012)), which is still a dominant approach, and credit conditions (Annicchiarico et al. (2019)), but also joint dynamics, which helps to capture expectations about house price changes as well as the combined effect between credit frictions and the house spread shock, resulting in asymmetric impacts when shocks act together, particularly in crisis periods ('bad' states).

Finally, I also contribute to the recent literature by analyzing the housing wealth – the consumption channel in Europe – and by looking for particular mechanisms behind this relationship. Since literature agrees that significant endogeneity exists between the aggregate house prices and consumption changes, I introduce a new instrumental variable that solves for the endogeneity issue. More precisely, I create a

new synthetic variable which controls for the house price dynamics but is also uncorrelated with changes in consumption. This approach also allows me to identify heterogenous estimates of the marginal propensity to consume (MPC) among different households. Therefore, the results suggest the borrowing constraint as one of the key drivers of heterogeneous MPC results among households. Such a conclusion becomes crucial for the central banks to keep an eye on in their macroprudential policy, especially nowadays, when house prices were increasing significantly. It brings an additional tool for policy makers to track the following developments in house prices and household expectations, and to react quickly if significant (housing) market imbalances are observed to appear.

Statements for defense

- Results from the micro-level HFCS dataset showed that household expectations about the future house price dynamics are significantly heterogeneous across different countries in Europe. While averages for some countries were showing negative expectations, others were expecting more than 3 percent increase in house prices through the same period. Therefore, it suggests the importance of local factors and differences of housing markets that forms different household expectations.

- Results show that changes in house prices play a key role in explaining the dynamics of household expectations about future house prices. It is important to highlight that this happens on both levels – local and personal experience in house price changes.

- The tenure status is one of the key determinants explaining different house price expectations across countries in Europe. The key difference between households comes from the fact that renters have better information about the dividend stream of housing as an asset, as they pay their rent on a monthly basis. In addition, the composition of housing markets is also very different across Europe, and it is important to bear this in mind.

- The analysis of the Euro area countries sharing the same monetary policy shows that house price expectations are influenced

by other institutional factors and are highly heterogeneous across households and countries. Thus, the results show that the effects of the tenure status, income and wealth distribution are stronger for renters and for households with the lowest income or wealth.

- Sentiments about future house price changes influence and explain part of the dynamics of individual household consumption. Therefore, it remains important for policymakers to track not only house prices and credit conditions separately, but also deviations of house prices from their fundamentals (which are explained as an alternative to capture the household sentiment). Moreover, the asymmetric effect (when the shocks from credit frictions and the house price-rent spread occur simultaneously) has been captured, and it should also be taken into account for better policy decisions that would prevent economic fluctuations.

- The housing wealth-consumption channel is an important determinant in explaining business cycle fluctuations in Europe. The effect is mostly captured by the marginal propensity to consume (MPC) from the wealth (housing) gain, which is captured by the analysis of the household balance sheet. The results show that the MPC in Europe is around 0.12–0.13, and it is relatively similar to the values obtained in studies from other countries.

- The marginal propensity to consume out of wealth appears to be higher for home owners with mortgage than for renters. More specifically, MPC from wealth is significantly higher than the Euro area average, and it is estimated at around 0.18–0.19 for homeowners who also hold the mortgage. Moreover, the results point to higher responses among credit-constrained households. This highlights for policymakers the importance of understanding the composition and distribution of households and housing markets within the country in order to address the right fiscal, monetary or macroprudential policies.

Dissertation outline

The dissertation consists of four different chapters. The introductory chapter provides an overall introduction and sets the main goals for the rest of thesis. The remaining three chapters are designed to fulfil the above outlined objectives and reflect the aim of this paper. The first chapter is dedicated to an introduction of the *Household Finance and Consumption Survey*, which is employed extensively throughout the remainder of the dissertation. It also brings some new micro-level facts about the development of the household balance sheet and potential drivers of households' expectations about the housing prices. The second chapter not only suggests a theoretical linkage between the housing market, credit frictions and consumption, but also explores these linkages empirically. The third chapter introduces a new empirical approach by employing an instrumental variable to capture the endogenous effects of changes in house prices. Furthermore, it estimates the marginal propensity to consume out of wealth gains. In conclusion, the various standalone chapters are summarized in a comprehensive overview and follow-up proposals.

1 Determinants of House Price Expectations in Europe

This chapter is based on the paper entitled "Portfolio Composition and Home Ownership Importance for the Wealth Distribution in Europe" which is my individual work that is published in the *Journal of Organizations and Markets in Emerging Economies*.

1.1 Introduction

The 2008 Global Financial Crisis was the culmination of an extensive boom-bust cycle in house prices all around the world. Soon after the crisis, economists proposed overly optimistic house price expectations as a main factor in explaining the dynamics of house prices. More specifically, huge aggregate consumption losses during this period were related to credit liberalization and expansion as well as overestimated expectations of house prices (Piazzesi and Schneider (2016); Guerrieri and Uhlig (2016); Kaplan et al. (2020)). Expectations are a natural candidate to be a key variable describing aggregate market outcomes, since they are a crucial factor in intertemporal decision-making in the presence of uncertainty (Kuchler et al. (2022)). Many decisions in the housing market – for example, whether to buy or sell a house – are partly determined by individual expectations about future market conditions. In such cases, individual beliefs have the potential to influence the aggregate economy through market-level outcomes. Following the financial crisis, many researchers focused on better understanding how individuals form housing market expectations, how these expectations explain individuals' behavior, and how those decisions affect aggregate outcomes in the economy (Kuchler et al. (2022)). However, interactions between expectations and the real economy are still too under-researched to draw clear conclusions, despite the macroeconomic and policy implications especially in times when standard tools, such as monetary policy, do not support the economy as well as intended.

A large part of the literature on expectation formation concentrates on extrapolations, and shows that individuals extrapolate from recent information when forming expectations (Fuster et al. (2010); Green-

wood and Shleifer (2014); Barberis et al. (2015); Liu and Palmer (2021); Giglio et al. (2021a); Giglio et al. (2021b)). Various papers have found that stock market expectations tend to be serially uncorrelated, whereas house price expectations are serially correlated in the short run but exhibit mean reversion in the long run ((Shiller and Case (1989); Cutler et al. (1991); Guren (2018)). Moreover, Armona et al. (2019) show that, in the short run, individuals underreact to recent house price changes but also overreact in the long run in comparison with the actual predictiveness of past house price changes in the data.

In addition to the evidence above, extrapolation and expectations are often based on recent personal experiences. Put differently, in forming beliefs, individuals tend to put considerable weight on their personal experience. Recent work by Kuchler and Zafar (2019) has shown that when individuals form expectations about aggregate housing market performance, they usually overemphasize recent, geographically local information. Additionally, the expectations of less educated and less numerate respondents are more heavily influenced by personal local experiences. Finally, since personal experience differs across individuals, the emphasis on personal experiences naturally leads to heterogeneous expectations across individuals, even if we consider the process of belief formation to be the same among them.

Another stream in the literature claims that current ownership status also affects the formation of house price expectations. In particular, a key difference between housing and other assets is that renters have better information about the dividend stream of the asset, because they pay rent each month (Kuchler et al. (2022)). This information may provide useful signals about the value of the asset itself, which renters can easily capture. By contrast, owner-occupiers miss part of this information as they simply consume housing services and do not need to pay attention to the value of their consumption (Kindermann et al. (2021)). Moreover, Kindermann et al. (2021) found that renters are not only more accurate in their house price expectations, but their expectations show more dispersion than those of owners. An explanation for such findings was constructed through Bayesian learning, showing that ownership status-dependent information can quantitatively capture all

these stylized facts (Kindermann et al. (2021)). Specifically, individuals can learn about house price growth from signals that differ in their precision depending on whether they rent or own. Renters receive signals about rent that are more precise, but also noisier in terms of house prices in comparison to owners. In this case, the noisier signals about house prices result in a larger dispersion of renter forecasts.

Another mechanism for how ownership status can affect belief formation comes from the endowment effect. Studies that analyze the stock market have found that stock owners over-predict future stock prices in response to positive signals about their stocks compared to non-owners (Hartzmark et al. (2021); Anagol et al. (2021); Anagol et al. (2018)). However, Kindermann et al. (2021) point to a specific period with positive signals about house prices and find that owners of houses have lower house price expectations in comparison to renters. This suggests the opposite results than what we would expect from the endowment effect. The paper goes on to investigate homeownership status in greater depth and discuss its possible effects in various countries.

Finally, diverging from much of the current literature, which concentrates on financial frictions in macroeconomics, López-Salido et al. (2017) have suggested a behavioral view and argued that investors' sentiments in credit markets explain economic fluctuations. The key point is that present economic activity strongly influences expectations about future credit defaults. Specifically, investors become too optimistic once they are influenced by good news about fundamentals, leading to situations in which credit spread narrows and the quantity of credit expands (López-Salido et al. (2017)). This mechanism leads to endogenous reversals of sentiments, as the later periods of further economic news will be disappointing compared to optimistic expectations. The same mechanism can be applied to the housing market, and influence the dynamics of house prices.

In this paper, I use data from the European Central Bank's Household Finance and Consumption Survey (HFCS) to explore how individual expectations about house prices differ across Europe, and what the main determinants of these differences are. I start with a brief analysis of the household balance sheet in Europe and highlight the import-

ance of housing among other types of assets. In real numbers, household assets grew slightly from the average 255 300 EUR per European household in 2010 (HFCS Network (2013a)) to 259 400 EUR per household in 2017 (HFCS Network (2020)), while housing remained responsible for the major part of the balance sheet. This makes it important to analyze the main determinants of how actual house price changes affect expectations about future house price change, which later cascade into individual economic decisions.

In this first chapter I investigate the relationship between housing and household expectations of house prices and highlight the importance of the tenure status. Also, I observe the average household portfolio after the recent financial crisis and how it developed over the 2010-2017 period. Aggregate changes seem to be minor, while distributional results have changed more significantly. Notably, I analyze the micro-level HFCS dataset to see how households were moving between wealth quintiles in 2014-2017 and with which factors these movements were associated. I also draw some stylized facts about house price expectations and their heterogeneous results among different countries. Finally, I show the importance of housing and other factors such as income or personal risk attitude in explaining differences in house price expectations across Europe.

1.2 Data

1.2.1 Overview of HFCS

The Household Finance and Consumption Network (HFCN) was established with the objective of attaining a profound understanding of the relationship between the monetary transmission mechanism and financial stability. This understanding cannot be derived from the aggregate information on the assets and liabilities of households. To illustrate, alterations in interest rates influence the consumption patterns of net savers in a manner that differs from their impact on the consumption habits of net borrowers. A decline in interest rates is likely to result in a reduction in consumption expenditure by those who save, while borrowers are more likely to increase their consumption. Accordingly, in order

to identify the response of aggregate consumption to interest rate shocks (HFCS Network (2009)), it is necessary to capture the share of indebted households, the level of debt relative to savings or income, and the type of debt held. Such information can only be obtained through the utilisation of micro-level data pertaining to household finances. Furthermore, the consequences of the considerable surge in household borrowing across numerous Eurozone countries prior to the Great Recession might have been more readily recognisable had micro-level data on household balance sheets been accessible (HFCS Network (2013b)).

To have a better understanding of the information and micro-level dataset that HFCS brings, Table 1.1 is provided. It shows that the main aggregates of households' wealth are captured over real assets, financial assets and debt. As shown in Table 1.1, household net wealth is calculated by deducting the value of the total debt from the sum of the total real and financial assets. Specifically, real assets are taken as a combination of housing, other real estate properties, self-employed businesses, vehicles and valuables. Financial assets include household deposits, mutual funds, bonds, public shares, voluntary pensions/whole life insurance plans, money owed by other households and other financial assets. On the other side of the balance sheet, total liabilities are accumulated through mortgage and non-mortgage debts (credit lines, credit cards and more). One benefit not captured in HFCS is the amount of pension benefits a household expects to receive in retirement. Technically, every working person accumulates this benefit over the years, but it is hard to estimate the expected amount of pension and include it in today's net wealth (Bielskis and Ciginas (2020)).

It is also noteworthy that the HFCS is a cross-section survey conducted every 3-4 years by the European Central Bank and delegated authorities in each country. The HFCS provides the most comprehensive and highest quality survey microdata on European household wealth. In HFCS, households respond to questions about their financial and non-financial assets, debts, employment status, income, consumption, and demographic characteristics. Additionally, many countries also complement their results with detailed microlevel institutional data. As housing and real assets are the interest of this paper, it is important to mention

Table 1.1: Household Balance Sheet in HFCS

Assets	Liabilities
Real assets:	**Collateralized debt:**
Main residence	*By main residence*
Other real estate property	*By other real estate property*
Investments in self-employeyed business	
Vehicles	
Valuables	
+	+
Financial assets:	**Uncollateralized debt:**
Deposits	*Bank overdraft*
Mutual funds	*Credit card debt*
Bonds	*Other uncollateralized debt*
Publicly traded shares	
Money owned to other households	
Voluntary pension/insurance plans	
Other financial assets	
Gross wealth	Debt
Net wealth = Gross wealth - Debt	

that such information is collected by survey during a face-to-face interview. Households respond about their expectations or different asset values. Some countries also use aggregated registries data to evaluate households' valuation of their assets, but the majority of results remain supported only by household answers.

The HFCS is also designed around a common set of methodological principles, which ensures the comparability of results between countries. In particular, all country-level HFCS datasets provide a set of core output variables according to a set of common definitions and descriptive features, using an output-oriented approach (HFCS Network (2020)). On top of this, household samples have been designed in each country to ensure representative results at both the euro area and national level. More than 91 000 households participated in the last wave, with sample sizes varying across countries. However, all country surveys have a probabilistic sample design, which means that each household in the target population has an ex ante defined non-zero probability of being part of the final sample. A strict and methodologically consistent sampling procedure in all participating countries ensures the representativeness of all main variables, including real assets. Additionally, given the unequal distribution of household wealth, a random sample of families is unlikely to capture the small minority of families who hold the large majority of wealth (Bricker et al. (2019)). Therefore, to capture financial instruments that are almost exclusively held (and in large quantities) by the wealthiest households, most countries apply various techniques to oversample the wealthy households.

Another important feature to mention about the HFCS is that it captures the panel component over the different survey waves. This entails that a subset of the sample households is followed and interviewed repeatedly over the various survey waves. This is an essential feature that is required to address specific research questions and to track changes in wealth, financial status, and even sociodemographic characteristics for the same households.

Some researchers also try to analyze the HFCS database by looking at differences in the sampling processes between countries, taking into consideration oversampling techniques, unit and item non-response

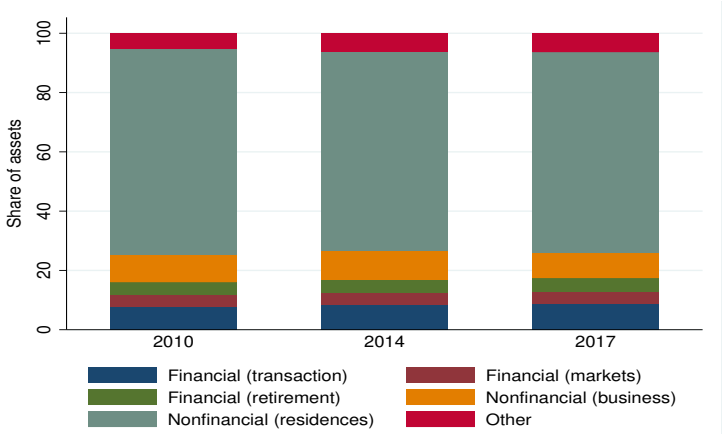
rates, and how they are dealt with via weighting and imputation. Tiefensee and Grabka (2014) analyze the HFCS database over different criteria as institutional environment, comparability, accuracy and others. The authors conclude that HFCS is the best dataset for cross-country analysis and comparisons of balance sheets, wealth and inequality.

1.2.2 Composition of Average Household Portfolios

I start my analysis by looking at the household portfolio and how different asset classes are distributed within it. Households can hold two major types of assets: financial, such as those held at depository institutions and brokerages, or non-financial, such as housing, business, cars and others. The 2008 financial crisis was associated with the collapse of various kinds of asset classes (i.e. housing, stocks) (Mian et al. (2013)). However, analysis of the post-crisis period, using the sample of 2010-2017, shows that most families continued owning assets of some kind (Figure 1.1). The ownership rate after the 2008 financial crisis was around 97 percent for financial and 91 percent for non-financial assets. Thereafter, it remained relatively stable over the following 7 years, reaching almost 98 percent for financial and 91 percent for non-financial assets in 2017.

Median asset holdings in the early part of the sample (2010) were about 153 100 EUR, decreasing to 141 600 EUR in 2017 (HFCS Network (2013a), HFCS Network (2020)). Over the same period, median outstanding balance of households' liabilities grew from 23 900 EUR in 2010 to 29 300 EUR in 2017. Composition-wise, financial assets accounted for 17.2 percent of total assets after the 2008 financial crisis, mostly concentrated in deposits, savings and retirement accounts. Over the following 7 years, the share of financial assets grew up to 19.1 percent of total assets, mainly driven by increases in deposits and savings, and minor changes in trading or retirement accounts. However, Figure 1.1 clearly shows that the majority of total assets remained highly concentrated on real assets and particularly on housing. The housing-related share of assets shrank a bit over this time, but continued to account for more than 60 percent of total assets.

As Figure 1.1 indicates, housing assets represent a highly signific-



Notes: The aggregate composition of household assets were captured during the different waves (in 2010, 2014, and 2017) of HFCS survey.

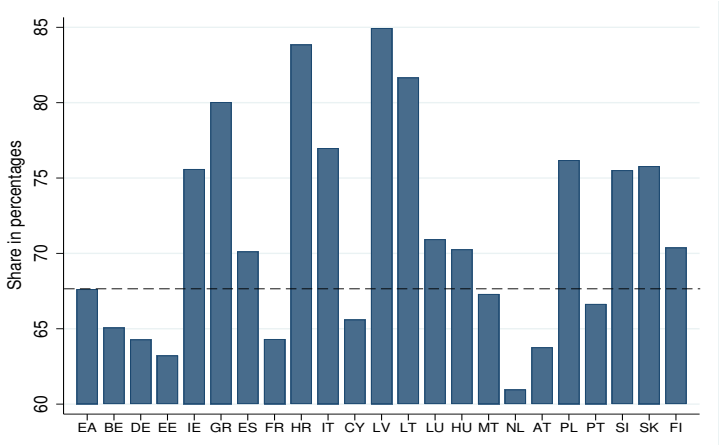
Figure 1.1: Portfolio Composition in Europe

ant portion of the average household portfolio in Europe: more than 60 percent of the total portfolio is related to housing. However, heterogeneity remains strong between different countries, as can be seen in the following figure. Figure 1.2 shows that the share of the portfolio related to housing varies between 60 and 85 percent across different countries. Finally, heterogeneities in housing-related assets are perfectly correlated with homeownership, which could also lead to heterogeneous house price expectations in Europe. Therefore, I will include homeownership in the later empirical analysis in order to explain its relationship with house price expectations.

1.2.3 Portfolio Composition Across the Wealth Distribution

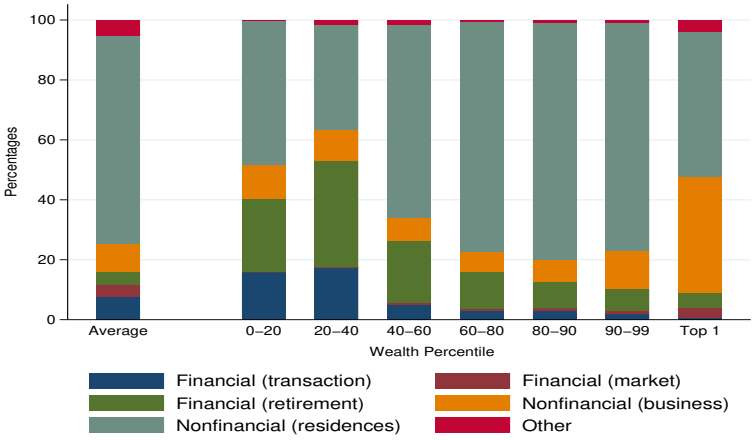
Though the average or median household asset portfolio is a mix of real and financial market assets, the main asset for most families in Europe is housing, with financial assets representing a relatively small portion of the portfolio (HFCS Network (2020)). In fact, because asset (especially financial) holdings are highly concentrated at the top of the asset distribution (Bricker et al. (2020)), much of the change that appears in the aggregate portfolio is driven by asset changes in the top 10 percent of the asset distribution.

Figure 1.3 shows the asset composition of households along the wealth



Notes: The dashed line represents the average share of housing assets to the total assets in Euro area. Results are taken from HFCS wave 2017.

Figure 1.2: Share of housing-related assets to total assets



Notes: Percentages on the horizontal axis are based on wealth distribution derived from HFCS. To better understand the graph, the following average net wealth values are summarize by wealth percentiles. The bottom cohort (0-20) has the average net wealth of -3 100 Eur. The second cohort (20-40) 28 600 Eur. The third cohort (40-60) 108 800 Eur. The fourth cohort (60-80) 230 700 Eur. The fifth cohort (80-90) 392 700 Eur. The last cohort (90-100) 1 158 000 Eur. The average net wealth overall is 228 000 Eur.

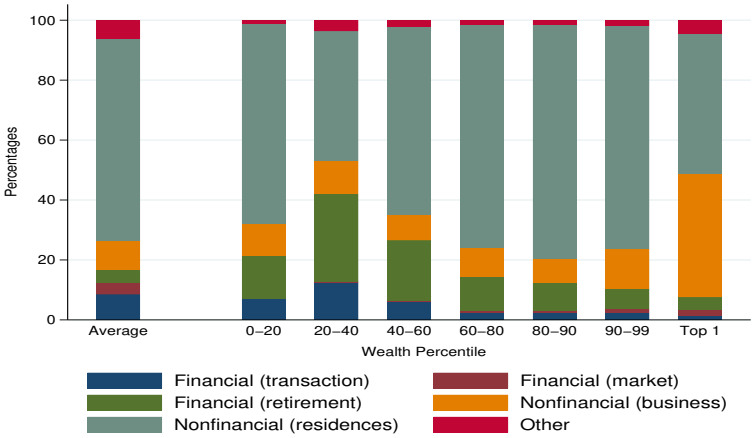
Figure 1.3: Portfolio Composition in Europe by Percentiles, 2010

distribution and the average asset composition in 2010. The most noticeable feature is the degree to which asset portfolios vary across the

distribution. Housing is the most common asset class for most households, except those in the top 1 percent of the wealth distribution. These households concentrate a smaller share of their wealth on housing and a much higher share on private equity in businesses. A similar composition of assets and the overall picture was captured in the US (Bricker et al. (2019)) and Sweden (Bach et al. (2016)), where the wealthiest families invest in private equity, while the other families mainly concentrate their wealth in housing. This also suggests that leverage ratios decline as assets increase.

Figure 1.3 suggests that the main assets of households in the bottom 40 percent of the wealth distribution are housing and retirement accounts. The same households also concentrate a high share of their assets in deposits and savings. The asset portfolio of families around the median (40th to 60th percentile) becomes more skewed toward housing reaching more than 60 percent of total asset portfolio, whereas the share of retirement accounts, deposits and savings shrinks. It becomes even more skewed toward housing for households between the 60th and 99th percentiles, with more than 70 percent of their total asset portfolio concentrated on residential assets. However, the portfolio composition of families at the top 1 percent shows a different distribution from the remaining percentiles. For families in the top 1 percent, the share of housing-related assets decreases to 50 percent or even less. Unlike the rest of the distribution, the wealthiest 1 percent of households concentrate about 40 percent of their asset portfolio on private equity in businesses. Retirement and financial accounts also represent a smaller share of their assets.

The next available data point in HFCS is 2014 and it shows how portfolio composition across distribution changed over the first 4-5 after the financial crisis. Figure 1.4 shows that the housing-related share of assets recovered more quickly increasing their share in the poorest families' portfolio. More precisely, the housing-related share of assets increased by more than 10 percent for households in the bottom 40 percent of the wealth distribution. This took place alongside a drop in the share of assets related to deposits, savings and retirement accounts. For households in the 40th to 99th percent of the wealth distribution,

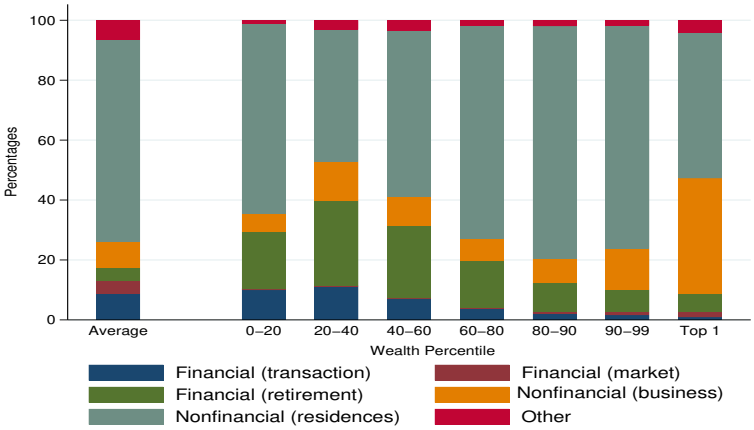


Notes: Percentages on the horizontal axis are based on wealth distribution derived from HFCS. To better understand the graph, the following average net wealth values are summarize by wealth percentiles. The bottom cohort (0-20) has the average net wealth of -4 700 Eur. The second cohort (20-40) 26 400 Eur. The third cohort (40-60) 99 700 Eur. The fourth cohort (60-80) 216 100 Eur. The fifth cohort (80-90) 377 600 Eur. The last cohort (90-100) 1 147 000 Eur. The average net wealth overall is 219 900 Eur.

Figure 1.4: Portfolio Composition in Europe by Percentiles, 2014

portfolio composition remained stable. Minor changes for these families were seen in a small decrease in housing share and an increase in the share of wealth related to private equity in businesses. The wealthiest 1 percent of families also faced compositional changes in their assets portfolio over the first years after the financial crisis. From 2010 to 2014, their share of portfolio in housing, retirement and financial accounts shrank while the share related to private equity in businesses increased.

The last point in HFCS survey is 2017 and it shows the portfolio changes that appeared over a longer time period after the 2008 financial crisis. It shows how the household portfolio recovered over the medium-to-long term of 7 years. The household portfolio across the wealth distribution remained similar between 2014 and 2017, but significantly changed in comparison to 2010. Families in the bottom 40 percent of the wealth distribution increased their share of total assets in housing, in parallel to a drop in the share of deposits, savings and retirement accounts (Figure 1.5). This indicates that household confidence in real estate recovered well, whereas confidence in financial and



Notes: Percentages on the horizontal axis are based on wealth distribution derived from HFCS. To better understand the graph, the following average net wealth values are summarize by wealth percentiles. The bottom cohort (0-20) has the average net wealth of -4 600 Eur. The second cohort (20-40) 26 800 Eur. The third cohort (40-60) 101 600 Eur. The fourth cohort (60-80) 225 800 Eur. The fifth cohort (80-90) 408 300 Eur. The last cohort (90-100) 1 197 400 Eur. The average net wealth overall is 230 400 Eur.

Figure 1.5: Portfolio Composition in Europe by Percentiles, 2017

more liquid instruments did not. A more stable situation can be seen for households between the 40th and 99th percentiles, for which small decrease in the share of housing in their total asset portfolio was replaced with an increase in the share of their retirement accounts. Finally, the wealthiest 1 percent of families did not adjust their asset portfolio, keeping it similar to its composition in 2010.

1.2.4 House Price Expectations

In the third wave of HFCS data collection, many countries included an additional question on individuals' potential house price change in the upcoming year. Moreover, respondents were asked not only to say if they expected an increase or decrease in their house prices, but also to include probabilities of those possibilities. For example, one household might estimate a 100 percent chance that its house price would stay around the same level, while another could distribute percentages by assigning a 70 percent probability to a small change in its house price (0-2

percent) and the remaining 30 percent to a larger change in house prices (2-5 percent). Given the complex nature of the survey question about the house price expectations, this paper analyzes the expected value of personal house price expectations, which is calculated by multiplying each value by its probability that the individual provides in the answer. Therefore, descriptive statistics of the house price expectations variable are summarized in Table 1.2.

Table 1.2 summarizes responses of individuals that were interviewed in 2017 and asked about the expected house price change of their apartments in the upcoming year. Averages show highly heterogeneous results among countries in Europe. On the one hand there are pessimistic countries as Croatia, Italy or Greece , in which households expected house prices to decrease in the immediate future. On the other hand appear very optimistic countries as Malta, Austria or Luxembourg, in which individuals expected their house prices to grow by more than 2 percent in the upcoming year. Similar country polarization is confirmed by the skewness results from the last column in the table. Moreover, results from descriptive statistics suggest that the majority of countries remained at least slightly more optimistic about their house prices growing rather than decreasing in the immediate future. It is also important to mention that country weights can no longer be used in the the following tables as not every household responded regarding their house price expectations. Therefore, the following analysis concentrates on the large set of households across Europe, analyzing individual-level determinants of house price expectations.

Table 1.2: Descriptive statistics of house price expectations

House price expectations	Obs	Mean	Std. Dev.	Min	Max	Variance	Skewness
AT	1,147	2.71	1.98	-5	5	3.93	-1.42
BE	2,138	0.63	2.18	-5	5	4.77	-0.09
CY	1,303	0.51	2.03	-5	5	4.14	0.10
DE	4,617	1.51	1.85	-4	4	3.43	-0.68
EE	2,679	1.22	2.49	-5	5	6.22	-0.45
ES	6,413	1.06	2.48	-6	6	6.14	-0.29
GR	1,930	-0.71	1.20	-2	5	1.44	1.11
HR	1,199	-1.26	2.76	-5	5	7.59	0.26
IE	2,247	2.00	2.33	-5	5	5.42	-0.80
IT	7,420	-0.93	2.13	-5	5	4.52	-0.20
LT	55	0.88	3.00	-5	5	8.99	-0.17
LU	1,616	2.70	1.76	-5	5	3.11	-0.94
LV	899	1.12	2.73	-5	5	7.48	-0.46
MT	1,004	3.18	1.72	-5	5	2.95	-1.62
NL	1,253	1.98	1.86	-5	5	3.47	-0.86
PT	5,289	0.71	2.43	-5	5	5.92	-0.30
SI	2,014	0.30	2.48	-5	5	6.17	-0.03
SK	1,163	1.80	2.65	-5	5	7.02	-0.81

Calculations of house price expectations are based on HFCS 3rd wave results (from 2017). The first column represents the countries, while the second column shows the number of observations (describing their expectations) in each of the countries. Household house price expectations (index) can vary between -6 and 6 in all countries. For most of them it varies between -5 and 5. The third and fourth columns show the mean and standard deviation of house price expectations that vary (between -6 and 6 minimum and maximum values in) columns 5 and 6 in different countries. The last two columns show the variance and skewness of the distribution of house price expectations across countries.

1.3 Possible Determinants for House Price Expectations

1.3.1 Extrapolation and Personal Experiences

As mentioned in the beginning of this paper, the literature identifies extrapolation and personal experience as possible determinants in house price expectations. In order to link income and house price growth with households' expectations, I look at Table 1.3 which summarizes income and house price growth between 2014-2017, as well as house price expectations. The first three columns summarize results from 18 countries based on aggregate statistics from HFCS. In other words, it provides weighted country averages for income and house price growth between 2014 and 2017. House price expectations are summarized based on cross-country averages in 2017. The table clearly shows heterogenous results among different countries on all three parameters. We can also interpret the results as indicating that weighted country averages represent the local situation in the country and provide the local-economy experience for the households. Moreover, this local-country experience matters, as the negative average house price expectations tend to appear in countries (Greece, Italy) with negative house price growth, as well as lower income growth in the past. Of course, income and house price growth are not the only determinants of house price expectations. As all countries with positive income and house price growth expect house price increases in the immediate future, the magnitudes of expectations vary greatly between them. It is also important to remember that in this case, the income and house price growth represent the change over the preceding three years. However, it could be that due to the recency effect, only the previous year's experience matters in order to identify house price expectations for the future.

While the first three columns account for the aggregated data and suggest some insights about the local-country experience, the last three columns in Table 1.3 reflect the panel data and personal experience. In this case, I reduce the number of households included by only considering the panel households that provided answers in both periods – 2014 and 2017. By using this procedure I analyze a smaller number of countries and observations, but I am able to look at the same households and

Table 1.3: Descriptive statistics of income changes, house price growth and future expectations

	Income growth	HP growth	HP expectations	Income growth	HP growth	HP expectations
		Aggregated			Panel households	
AT	16.40	0.14	2.71			
BE	8.46	9.06	0.63	1.85	0.19	0.48
CY	7.87	22.02	0.51	0.30	0.20	0.39
DE	9.71	11.84	1.51	0.37	0.20	1.43
EE	33.92	6.36	1.22	1.29	0.70	1.18
ES	10.47	2.19	1.06	0.47	0.15	1.04
GR	6.13	-13.17	-0.71			
HR			-1.26			
IE	19.23	65.67	2.00			
IT	1.20	-6.32	-0.93	5.38	0.04	-0.97
LT			0.88			
LU	6.77	14.23	2.70			
LV	0.70	18.48	1.12	3.68	0.93	0.85
MT	12.64	16.37	3.18	0.41	0.27	3.15
NL	8.95	11.73	1.98			
PT	14.42	9.96	0.71			
SI	12.63	15.31	0.30			
SK	31.82	38.23	1.80	0.96	0.34	1.64

All values are presented in percentages. All the results are based on either the 2014 or 2017 HFCS waves. Aggregated values are calculated as the mean values for particular countries based on household responses. Panel values are estimated as changes (in income and house prices) between periods for the same households.

compare their answers in 2014 and in 2017. Moreover, the individual differences that I identify can be seen as a personal experience for each household. The last three columns from Table 1.3 show the averages per individual changes in income and house prices based on my reduced sample. In most cases, we can see that personal experience (last three columns) tends to be much smaller than the average changes (first three columns) in the country. In contrast, house price expectations remain extremely similar among both groups of observations. Moreover, house price expectations are much closer in their magnitudes to the personal experience than the aggregated changes among countries. This suggests that individuals place much more weight on their personal experience regarding income and house price changes and form future house price expectations in a similar manner.

An individual's position along the income or wealth distribution could also play a role in shaping future expectations. A majority of households from the lowest income quintiles could be without employment income, thus making it harder for them to experience significant income changes. Therefore, a poor experience with income could lead to low house price expectations. A similar mechanism could also appear regarding the wealth distribution. Many households from the lowest wealth quintiles do not own their own houses or any other real estate. Therefore, it is hard for the lowest wealth quintiles to gain experience regarding house prices that could affect formation of their future house price expectations.

Tables 1.4 and A.1 summarize average house price expectations over the country-specific income and wealth distributions. Table 1.4 shows that house price expectations tend to increase over the income distribution. The bottom quintile expects only a 0.256 percent house price change in the upcoming year while the top quintile expects 1.239 percent. Moreover, average house price expectations increase with each higher income quintile. Interestingly, higher quintiles tend to have lower variance than the bottom ones. Overall, Table 1.4 suggests that the average house price expectations tend to be higher among the top quintiles, while the variance of expectations remains lower. Similar conclusions can be derived from Table A.1, which summarizes average house price

Table 1.4: Descriptive statistics of house price expectations by country-specific income quintiles

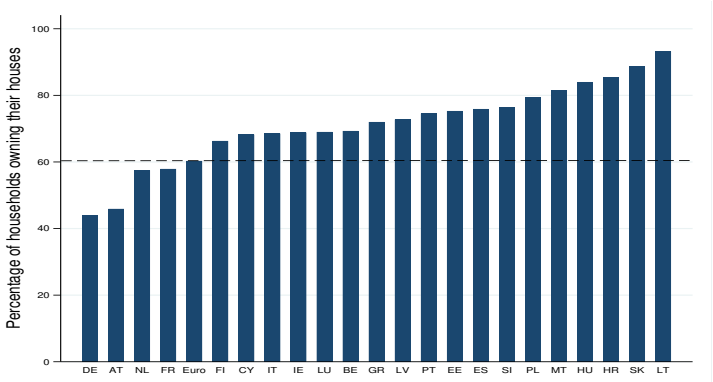
House price expectations	Obs	Mean	Std. Dev.	Min	Max	Variance	Skewness
All	44,386	0.77	2.51	-6	6	6.28	-0.29
Q1	6,772	0.26	2.58	-6	6	6.64	-0.14
Q2	7,642	0.43	2.60	-6	6	6.77	-0.18
Q3	8,152	0.72	2.52	-6	6	6.33	-0.24
Q4	9,408	0.86	2.43	-6	6	5.91	-0.29
Q5	12,412	1.24	2.36	-6	6	5.58	-0.43

Calculations of house price expectations are based on HFCS 3rd wave results (from 2017). Income quintiles are derived separately for each country and based on HFCS wave 2017 results. The summary statistics are based on aggregated and weighted values for the euro area.

expectations over the country-specific wealth distribution. It shows that the average house price expectations are much lower among the bottom two quintiles, whereas the top wealth quintile has higher expectations and lower variance.

1.3.2 Housing and Homeownership

As previous results about household portfolio showed, housing still remains crucially important in describing household total assets and wealth overall. Therefore, in the following section, I consider home ownership further and discuss its possible effects in the different countries. From Figure 1.6, we can see that home ownership variation in Europe is high - from a bit more than 40 percent in Germany or Austria to as high as 90 percent in Slovakia or Lithuania. At the same time, the average for the euro area remains at 60 percent. Accordingly, it is crucial to check whether the same factor of ownership-status holds in Europe and if results differ across countries.

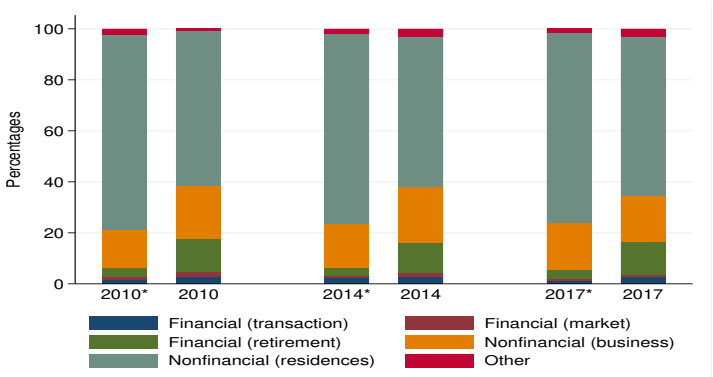


Notes: The dashed line highlights the average Euro area homeownership rate.

Figure 1.6: Homeownership rates in Europe in 2017, HFCS results

I start by looking at the total asset portfolios based on different home ownership groups. Figure 1.7 shows that in 2010 (at the end of the recent financial crisis) households in home ownership countries (defined as those with home ownership rates higher than the Euro area average) concentrated their total assets on housing – about 80 percent of total assets. More than 15 percent of their total assets were represented by business-related private equities and only minor shares were left for the other asset classes. A somewhat different situation was captured in the same years for non-homeowner countries (defined as countries with home ownership rates lower than the Euro area average). In their case, housing maintained an important role, but only 60 percent of total assets were represented by real estate properties. A further 20 percent of total assets were represented by business related private equities and an additional 15 percent was concentrated in retirement accounts. From the time perspective, we can see that portfolios remained stable over the decade after the financial crisis. For home ownership countries, the business-related private equity share of assets increased slightly between 2010 and 2017, replacing the parallel negative change in housing assets. For non-home ownership countries, business-related private equity shares decreased between 2010 and 2017, whereas an equivalent increase appeared in other assets (cars, jewelry and others). This indicates that households remained apprehensive about housing-related

assets after the recent financial crisis, and accordingly, they decided to decrease their portfolio share related to housing and redistribute it to other asset classes. It also suggests that house price expectations could be lower in comparison to normal times. Overall, results from Figures 1.6 and 1.7 show that the housing share in household portfolios did not change significantly over the period under study, remaining important for all households but differing between high and low home ownership countries.



Notes: Country groups are based on their home ownership rates. Countries without the * include Austria, Germany, France and Netherlands (countries with home ownership rates below the Euro area average). The group of countries with the * include those whose home ownership rates are above the Euro area average. All the calculations across countries are based on the household as the unit.

Figure 1.7: Portfolio composition in Europe for home ownership rate based subgroups

The richness of the HFCS data and its panel component also enables me to look at how particular households reacted in situations where their housing status was changing from renter to home owner or vice versa. Notably, I examined how such households were changing position over the wealth distribution, how portfolio components were changing and how this interacted with the ensuing household behavior. To investigate this, I used household-level HFCS data and looked at the changes in variables for the same households between 2014 and 2017. More specifically, I looked at changes in country-specific wealth quintiles, income, home ownership status, share of household portfolio in financial assets, and share of household portfolio in housing-related assets.

In Table 1.5, we can see the first set of results showing numbers of panel households which did or did not change their home ownership status, and how they shifted position on wealth distribution between 2014 and 2017. To be more precise, a change in wealth quintiles shows by how many quintiles households' position along the wealth distribution changed. For example, if the change in wealth quintile is equal to -1, this means that the household in question dropped by one quintile in wealth distribution. This can be a drop from 5th quintile to 4th, from 4th to 3rd and so on. Positive numbers in this case mean that household moved up over the wealth quintiles in the period between 2014 and 2017. Table 1.5 shows that over the time period being analyzed 19528 households, which repeatedly participated in HFCS, retained the same housing status, 759 households moved from home ownership to becoming renters, and 795 households became homeowners. What is intriguing in these results is the appearance of distributions for each situation of home ownership status. Results show that moving between wealth quintiles supports the normal distribution idea for the case when home ownership status remained the same as in the beginning of the period (column 2). Analysis of the scenario of a homeowner becoming a renter (column 1) suggests a left-skewed distribution of changes in wealth quintiles. This means that the majority of households that switched from home ownership to renting tended to remain in the same wealth quintile or even dropped to a lower quintile. The opposite situation appears when analyzing the scenario of a renter becoming a homeowner (column 3). In this case, I capture a right-skewed distribution of changes in wealth quintiles. Such results mean that households which switched from renters to homeowners also tended to remain in the same wealth quintile as before or even moved up along the wealth distribution.

It is important to mention that no causation was analyzed in Table 1.5. Theoretically, the fact of becoming a homeowner should not bring any advantage to the balance sheet. The process of purchasing a new house should be supported by individual savings or by the mortgage loan. In both cases, net wealth should remain the same. However, from the microdata we can see that house ownership creates a difference, allowing owners to increase their net wealth more quickly. Results also

suggest that becoming a house owner after the recent financial crisis allowed households to advance more easily over the wealth distribution. The position in wealth distribution affects households' prior experiences and thus house price expectations.

Table 1.5: Changes in homeownership status between 2014 and 2017

Change in Wealth Quintiles	Homeownership status		
	Owner → Renter	No change	Renter → Owner
-4	67	25	0
-3	152	105	3
-2	196	447	11
-1	190	2742	23
0	119	12663	220
1	29	2868	254
2	5	518	172
3	1	122	83
4	0	38	29
Total number of obs	759	19528	795

All the results are based on either the 2014 or 2017 HFCS waves. This shows the number of households in a given wealth quintile changing their housing status between 2014 and 2017.

Another way to analyze household behavior through the micro perspective is by looking at the separate case of changes in wealth distribution. Instead of looking at how people moved over the wealth distribution by changes in their home ownership status, I look at how other factors – income, home ownership status, shares of portfolio in financial and in housing-related assets – change based on different scenarios. In this case, scenarios represent by how many quintiles households moved over the wealth distribution in comparison to their distributional positions in previous HFCS waves. Table 1.6 shows all the related statistics and changes that occurred between 2014 and 2017. From the results, we can see that majority of households did not change their position in wealth distribution (column 5). Over the analyzed period, their average income increased slightly, home ownership status did not change, the share of portfolio in housing assets increased by 0.3 percent, and the

share of portfolio in financial assets increased by 0.5 percent.

Table 1.6 also shows that by moving in any direction away from 0 (no change) of wealth distribution, average statistics of other variables change significantly and in the same direction. Moving to the left along the wealth distribution means analyzing households that moved down to lower wealth quintiles in 2017 compared to their position in 2014. Results show that average income decreased significantly for households that dropped by 2 or more wealth quintiles. Home ownership status also changed for many of these households, from being owners to becoming renters. Finally, these households on average also faced significant changes in their portfolio composition. The share of their portfolio related to housing assets dropped by 22-57 percent on average, while the share of the portfolio in financial assets rose by 15-33 percent.

The opposite situation obtains when the other side of the wealth distribution is analyzed. Columns 6-9 in Table 1.6 show households that moved up by 1, 2, 3 or 4 quintiles over the wealth distribution between 2014 and 2017. From the statistics of these households, we can see that their income tended to increase over the period, while home ownership status also changed positively – many such households became owners instead of renters. Unsurprisingly, the portfolio compositions of these households also changed towards the housing side. The share of portfolio in housing-related assets increased by 18-31 percent for households that moved up by 2 or more quintiles in wealth distribution. In contrast, the share of the portfolio in financial assets dropped by 11-23 percent for the same pool of households between 2014 and 2017.

Previous results have showed heterogeneous effects among households based on their home ownership status. Moreover, the situation can quickly change once the household changes its ownership status, leading to varying individual situations (experience) that informs their subsequent behavior. In this case, household personal experience, housing and homeownership status can generate heterogenous house price expectations. Accordingly, descriptive statistics from Table 1.7 summarize house price expectations based on ownership status.

Table 1.7 shows that our analysis shrinks to 18 countries which provide results on specific variables using 44,386 observations. The av-

Table 1.6: Summary of household changes in income, homeownership and portfolio between 2014 and 2017

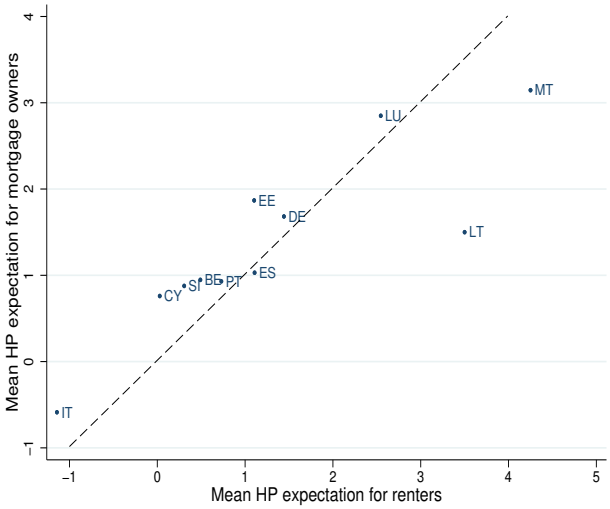
	Change in Wealth Quintiles								
Summary statistics	-4	-3	-2	-1	0	1	2	3	4
Change in Income	-.502	-.204	-.048	.049	.101	.173	.286	.222	.134
Change in Homeownership	-.728	-.573	-.283	-.057	.008	.071	.240	.398	.433
Change in Share of Housing	-57.44	-42.01	-22.02	-2.95	.279	4.25	18.63	30.89	30.99
Change in Share of Fin Assets	33.39	27.02	14.75	1.91	.539	-.930	-11.15	-15.76	-23.19
Total number of obs	92	260	654	2955	13002	3160	695	206	67

Table 1.7: Descriptive statistics of house price expectations

House price expectations	Obs	Mean	Std. Dev.	Min	Max	Variance	Skewness
All	44,386	0.77	2.51	-6	6	6.28	-0.29
Owners	25,874	0.58	2.53	-6	6	6.40	-0.21
Mortgage	10,229	1.40	2.31	-6	6	5.34	-0.52
Renters	8,283	0.60	2.53	-6	6	6.40	-0.25

Valuation of house price expectations are based on HFCS 3rd wave results (from 2017). Moreover, results are concentrated using the sample of 18 countries that provided respondents' answers about their house price expectations.

erage house price expectation for the following year was around 0.774 of the current one with a standard deviation of 2.5. Table 1.7 also summarizes results over different house ownership status – owners, owners with mortgages, and renters. Based on the previous discussion, it would be natural to expect different expectations between owners and renters. However, the results do not support this expectation. Renters have only slightly higher average house price expectations than owners, 0.599 compared to 0.584. However, owners with mortgages show different results, combining much higher average house price expectations by almost 1.4 percent. Moreover, owners with mortgages also tend to have lower variance and higher negative skewness compared to other house ownership groups. Finally, these results suggest that owners with mortgages tend to be more optimistic about future house price changes than both owners without mortgages and renters.



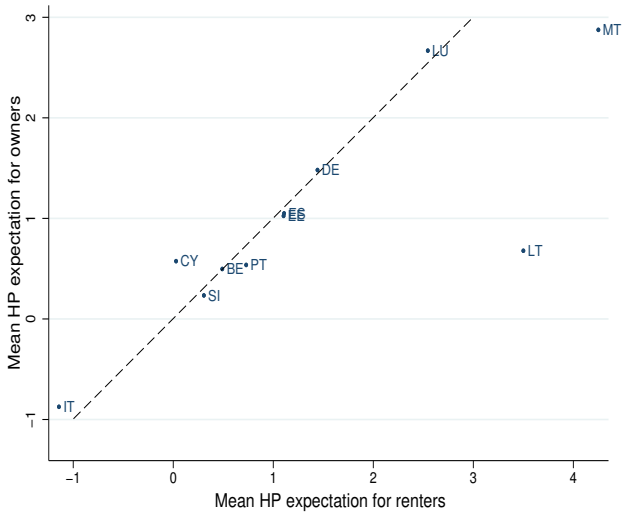
Notes: The dashed line represents the 45 degree line between analyzed variables. Calculations are based on HFCS 3rd wave (2017) results.

Figure 1.8: Average house price expectations between mortgage owners and renters

Similar results are confirmed in Figure 1.8, 1.9, and A.1. They all compare countries based on their average house price expectations by different homeownership status. Moreover, each figure also includes a 45 degree line, which describes the situation if both analyzed house ownership groups had the same expectations. Figure 1.8 summarizes results between owners with mortgages and renters. It shows that owners with mortgages tend to be above the 45 degree line and more optimistic about future house prices than renters in Italy, Cyprus, Slovenia, Belgium, and Estonia. Similar expectations between these groups are identified in Portugal, Spain, Germany, and Luxembourg, whereas results show renters to be much more optimistic about house prices in Lithuania and Malta. However, these results should be interpreted carefully, as results for Lithuania and Malta are limited due to the low number of renter respondents. Some other countries were even excluded from these calculations due to data problems or limitations in the observations. Similar results are captured in Figure A.1, where owners with and without mortgages are analyzed. The results show that Greece is the only country

in which owners without mortgages have higher average house price expectations than owners with mortgages. The remaining countries show either similar results between these groups, or owners with mortgages being more optimistic about future house price changes than owners without mortgages.

Different dynamics are captured once renters are analyzed against owners without mortgages. Figure 1.9 shows that in Italy and Cyprus, owners tend to be more optimistic than renters. The opposite is seen in Malta, Lithuania, and Portugal, whereas similar expectations for both groups appear among the rest of analyzed countries (Slovenia, Belgium, Spain, Estonia, Germany, Luxembourg). Overall, the results indicate that owners without mortgages and renters tend to be less optimistic about future house price changes than owners with mortgages in most countries in Europe.



Notes: The dashed line represents the 45 degree line between analyzed variables. Calculations are based on HFCS 3rd wave (2017) results.

Figure 1.9: Average house price expectations between non-mortgage owners and renters

1.4 Results

The previous section suggested different channels by which personal experience, housing, and homeownership status can influence household expectations about future house prices. Some descriptive statistics at the country level brought additional perspectives which factors, such as whether a house owner has a mortgage or not, can explain heterogeneous house price expectations in Europe.

I begin the empirical section with a simple model analyzing house price expectations over local economic conditions and household individual characteristics (Niu et al. (2014), Hjalmarsson and Osterholm (2020)). In other words, aggregated macrodata-based results should represent households' local experience with house prices and income on the country level. More precisely, equation 1.1 shows that individual level house price expectations are regressed over the aggregated house price growth (local country-level experience about house prices) and income growth (local experience of income changes) at the country level[1]. In this exercise, I use individual-level data from HFCS as well as aggregated country-level variables from National Account Statistics. The final specification is:

$$HP\_exp_i = \beta_1 HP\_growth_n + \beta_2 Income\_growth_n + \beta_3 X^{'}{}_i + \epsilon_i, \quad (1.1)$$

where i is an individual, n is a country-level index, and vector $X^{'}$ summarizes results over the individual-level control variables. Moreover, house price expectations account for the future change between 2017 and 2018, whereas the growth variables account for the percentage change between 2014 and 2017[2].

Results (with different control variables) from equation 1.1 are shown in all four columns of Table 1.8. It identifies recent (3-year) house price growth as the main factor explaining the house price expectations for

[1] All the growth variables are taken as percentage changes over the analyzed period.

[2] This uses three-year growth rate to keep results consistent with the rest of HFCS data. This is because HFCS waves use 2014 and 2017 as the reference years and the whole survey is run repeatedly every 3-4 years.

the immediate future of 12 months. At the same time, income growth does not play a crucial role. Results in all four columns also show that the model explains about 20 percent of fluctuations in individual house price expectations. Different columns in Table 1.8 include additional regressors such as individual-level risk attitude, age, education and expectations about future income and price changes. It is important to include control variables about household-level characteristics, as they allow me to control additional household-level factors that can affect overall expectations. In this case, I control for individual risk level, age cohort, level of education, and additional expectations about future income and general price changes. However, the main results regarding the importance of the local house price experience remain robust even after accounting for individual-level controls.

Table 1.8: Cross-sectional estimator for macro-aggregated variables

	(1)	(2)	(3)	(4)
g_HP	.096***	.098***	.090***	.089***
	(.019)	(.017)	(.016)	(.016)
g_income	-.063*	-.054	-.065	-.064
	(.034)	(.046)	(.041)	(.041)
risk attitude		-.038	-.253***	-.248***
		(.076)	(.046)	(.044)
age [bracket]			-.004	-.003
			(.003)	(.003)
education			.222***	.219***
			(.040)	(.037)
labour status			+	+
exp_income_vs_price				+
Number of obs	41,452	41,391	41,383	41,383
Number of countries	16	16	16	16
R^2	0.199	0.200	0.224	0.224

Standard errors are clustered for robustness. * corresponds to the 10% confidence interval, ** to the 5% confidence interval, and *** to the 1% confidence interval.

As the previous model used aggregated macrodata from the National Accounts, I continue with a similar approach by using cross-country average growth rates in house price and income from HFCS data. In other words, I use household answers about valuation of their income and houses, and compare those averages between 2014 and 2017. Therefore, equation 1.2 looks like this:

$$HP\_exp_i = \beta_1 HP\_growth_n^{HFCS} + \beta_2 Income\_growth_n^{HFCS} + \beta_3 X'_i + \epsilon_i, \tag{1.2}$$

where i is an individual, n is a country-level index, and vector X' summarizes results over the individual-level control variables. By running equation 1.2, I aim to check if household responses and valuation are better determinants of house price expectations than statistical procedures of the National Accounts. Results from all four columns show that the recent house price growth remains an important determinant for future house price expectations. In other words, local experience about house prices based on household level valuation tends to wield a significant effect on future house price expectations under both estimations (equations 1.1 and 1.2). At the same time, equation 1.2 also identifies that the local experience from income growth over the preceding years remained an insignificant determinant for house price expectations after controlling for individual-level characteristics.

In addition to the local house price and income growth experience, Table 1.9 also provides results for other individual-level regressors such as risk attitude, labour status, age, and education. The final model from column 4 also includes individuals' expectations about their financial situation in the immediate future – whether their income is going to increase more than prices or not. Table 1.9 shows that under any of the models, recent house price growth remains a robust and important determinant of house price expectations in the future. Results from the model 3 and 4 in Table 1.9 also show that risk attitude and education also affects house price expectations. Risk-averse and more educated individuals tend to have higher expectations about house price changes in the immediate future.

Table 1.9: Cross-sectional (mean) estimator for micro-aggregated (HFCS) variables

	(1)	(2)	(3)	(4)
g_HP_mean	.029**	.029**	.026**	.026**
	(.013)	(.013)	(.012)	(.011)
g_income_mean	.046**	.045*	.037	.036
	(.016)	(.024)	(.024)	(.023)
risk attitude		.004	-.192***	-.187***
		(.114)	(.059)	(.058)
age [bracket]			-.004	-.002
			(.004)	(.004)
education			.213***	.206***
			(.042)	(.041)
labour status			+	+
exp_income_vs_price				+
Number of obs	43,132	43,074	43,066	43,066
Number of countries	16	16	16	16
R^2	0.173	0.173	0.196	0.200

Standard errors are clustered for robustness. * corresponds to the 10% confidence interval, ** to the 5% confidence interval, and *** to the 1% confidence interval.

Survey data usually raises the question of whether averages or medians should be used for analysis. For this purpose, I run a robustness check using median values to compute percentage changes in house prices and income. The final results and conclusions from Table A.5 remain the same, favoring for risk attitude, education, and, most importantly, the country's median house price growth (taken as local experience of recent changes in house prices) as the most significant determinants.

Finally, I conclude this section by running a model that uses individual level results to analyze determinants of house price expectations. The model looks like this:

$$HP\_exp_i = \beta_1 HP\_growth_i^{HFCS} + \beta_2 Income\_growth_i^{HFCS} + \beta_3 X'_i + \epsilon_i, \tag{1.3}$$

where i is an individual, n is a country-level index, and vector X' summarizes results on the individual-level control variables. By running equation 1.3, I aim to check whether individual level house price expectations can be determined by personal experience in house price and income growth, as well as the individual-level characteristics. Results from equation 1.3 show that change in house prices (at the individual-level of experience) is one of the main determinants explaining individual house price expectations, whereas personal experience in income growth is not. Different models presented in Table 1.10 extend the results by including additional control variables such as individual risk attitude, labour status, age, education and individual expectations about income and prices. Therefore, the final results from model 4 shows that personal experience from house price changes remains an important determinant of future house price expectations, after considering all the controls. Other important drivers also remain the same – individual risk attitude and level of education. Model 4 also explains almost 12 percent of the variance in individual expectations, after considering results from 12 countries.

In general, all three methods suggest a similar outcome - either local or personal house price experience remains significant. At the same time, experience from income growth does not matter for house price

Table 1.10: Personal house price expectations from micro-level HFCS data

	(1)	(2)	(3)	(4)
g_HP_personal	.064***	.030***	.023**	.023**
	(.010)	(.010)	(.010)	(.010)
g_income_personal	-.001	-.001*	-.001	-.001
	(.001)	(.001)	(.001)	(.001)
risk attitude		.164***	-.118***	-.117***
		(.006)	(.032)	(.032)
age [bracket]			-.004**	-.002
			(.002)	(.002)
education			.320***	.308***
			(.014)	(.014)
labour status			+	+
exp_income_vs_price				+
Number of obs	15,223	15,209	15,207	15,207
Number of countries	12	12	12	12
R^2	0.003	0.058	0.109	0.117

The number of analyzed countries shrinks to 12, due to the lack of observations for panel variables in some of the countries. Standard errors are clustered for robustness. * corresponds to the 10% confidence interval, ** to the 5% confidence interval, and *** to the 1% confidence interval.

expectation formation. Other characteristics also retain the same effects and significance under all three methods. Risk attitude, education and expectations about future income and price levels significantly affect house price expectations, while age and labour status do not (Tables A.2, A.3, A.4). Therefore, based on the importance of local and individual experience in house price growth expectations, the next sections delve deeper into housing, homeownership and the results driven by these factors.

1.4.1 Homeownership Importance

Earlier sections presented some possible mechanisms for house price expectations could be formed between different homeownership groups. In this section, I will not only check whether house price changes remain an important determinant of expectations, but also if the magnitude differs between groups. Model 1 in Table 1.11 uses the specification from equation 1.2. More importantly, main results come from the models 2 and 3, which uses the same specification but runs it over different home ownership subgroups. The results show that income change is an important determinant of expectations only among owners with mortgages, while house prices changes are important among both groups of homeowners – with and without mortgages. However, in terms of magnitude, the effect from house price changes tends to be higher for owners without mortgages.

To follow the literature, I expand the analysis by looking at renters as well as owners. In order to do this, I need to shrink the analysis sample to 11 countries due to many missing variables and lack of information about renters in certain countries. Table 1.12 summarizes the results based on the same specification from equation 1.2. It is important to use the smaller sample of 11 countries as it allows us to analyze effects on renters and to compare them with owners. Therefore, Table 1.12 splits the results for owners, owners with mortgages, and renters. Results from Table 1.12 suggest that owners show a higher local house price changes effect in comparison to owners with mortgages. However, model 4 indicates that renters tend to have a similar and even a slightly higher local house price change effect on their expectations than owners.

Table 1.11: Cross-sectional (mean) estimator for micro-aggregated (HFCS) data

	(1) All	(2) Owners	(3) Owners with mortgage
g_HP_mean	.026**	.026**	.015*
	(.011)	(.010)	(.008)
g_income_mean	.036	.035	.027*
	(.023)	(.021)	(.019)
risk attitude	-.187***	-.177***	-.288***
	(.058)	(.057)	(.059)
age [bracket]	-.002	.001	.001
	(.004)	(.005)	(.006)
education	.206***	.208***	.156***
	(.041)	(.045)	(.025)
labour status	+	+	+
exp_income_vs_price	+	+	+
Number of obs	43,066	24,736	10,076
Number of countries	16	16	16
R^2	0.200	0.169	0.318

Standard errors are clustered for robustness. * corresponds to the 10% confidence interval, ** to the 5% confidence interval, and *** to the 1% confidence interval.

The other determinants, such as individual risk attitude and education, remain similarly important among all the models.

Table 1.12: Cross-sectional (mean) estimator for micro-aggregated (HFCS) variables for different homeownership subgroups

	(1) All	(2) Owners	(3) Owners with mortgage	(4) Renters
g_HP_mean	.075**	.073**	.056	.086**
	(.030)	(.029)	(.033)	(.035)
g_income_mean	.026	.022	.026	.031
	(.016)	(.015)	(.017)	(.021)
risk attitude	-.234***	-.217***	-.319***	-.221**
	(.039)	(.036)	(.057)	(.068)
age [bracket]	.001	.004	.001	.003
	(.004)	(.004)	(.007)	(.003)
education	.184***	.200***	.152***	.158**
	(.046)	(.054)	(.027)	(.062)
labour status	+	+	+	+
exp_income_vs_price	+	+	+	+
Number of obs	34,448	18,957	7,237	8,254
Number of countries	11	11	11	11
R^2	0.187	0.156	0.262	0.198

Standard errors are clustered for robustness. * corresponds to the 10% confidence interval, ** to the 5% confidence interval, and *** to the 1% confidence interval. A subsample of 11 countries (Belgium, Cyprus, Germany, Estonia, Spain, Italy, Lithuania, Luxembourg, Malta, Portugal, and Slovenia) is used due to missing observations for renters for the other countries.

Tables 1.11 and 1.12 both analyze effects of aggregated country average changes in house prices, which suggest something about the local experience of house prices, giving an idea of how people form their house price expectations based on the general country changes in house prices and income. The results from Table A.6 not only check the robustness of changes in house price and income effects, but also the importance of personal experience and the extrapolation of expectations from it. Table A.6 compares local and personal experience in changes in house prices and in income, and shows that local experiences are more significant in determining individual house price expectations. Local house price experience remains an important determinant among owners without

mortgages, while local experience from income affects house price expectations for all owners – with and without mortgages. Notably, personal experience from income growth significantly affects house price expectations among owners with mortgages (see model 3). This is reflected in the fact that more than 25 percent of the variation in house price expectations for owners with mortgages is explained using model 3 in Table A.6. However, we should also keep in mind that variables for personal experience have much more noise than local experience variables, which are based on aggregated results. Additionally, we decrease the number of analyzed countries by including personal experience variables. This could also affect overall results and significance of local and personal results. Nonetheless, such results can be explained by the fact that owners with mortgages, in contrast to owners without mortgages, have to pay attention to the value of their consumption which comes in the form of mortgage payments (Kindermann et al. (2021)). Therefore, experience from personal income changes becomes an important factor for owners with mortgages in describing their future house price expectations. Finally, Table A.6 suggests that local experience plays a higher role for owners without mortgages and for renters, while personal experience in income growth remains more important factor for owners with mortgages in describing their personal house price experiences. Additionally, risk attitude and education appeared as important drivers of house price expectations for all categories of households.

1.4.2 Distributional Effects over Income and Wealth

Summary statistics in previous sections showed that house price expectations can vary over the income and wealth distributions. This could occur due to differences in household portfolios and working status, which could affect prior experience and expectations formation. At the same time, different determinants could play a role in forming expectations for each of the quintiles. To analyze this, Table 1.13 provides the results of using the specification from equation 1.2. The first column represents aggregated results, whereas the following 5 columns summarize results for each income quintile. Results show that local house price changes

remain an important expectations determinant for all the income quintiles except the top one. The magnitude of effect also remains similar between all quintiles. However, change in income acts differently, remaining an important expectations driver only for the top two income quintiles. Table 1.13 also shows that education remains a strong and important driver of house price expectations for all the income quintiles. Finally, the results show that the current model can explain behavior in the top quintiles better than in the bottom. It explains only 11 percent of variation in house price expectations for the bottom income quintile, while it captures almost 30 percent of variation in expectations in the top income quintile.

Position in wealth distribution could play an even larger role, as many households from the lowest wealth quintiles do not own their homes or own very little other real estate. Also it is hard for the lowest wealth quintiles to collect experience from house prices, which could affect formation of future house price expectations. Moreover, lack of wealth could also contribute to the fact that majority of households from the lowest wealth quintiles are renters. In addition, empirical results from portfolio analysis show that housing or other real assets tend to play a smaller role for the top wealth quintiles, while the importance of financial and business related assets tend to grow over the wealth quintile. This could reduce the impact of the local experience from house price changes on house price expectations among the top wealth households. Results in Table 1.14 confirm this by showing that house price changes exert the highest effect on households in the bottom quintile. In general, the results show that changes in house prices remain an important driver for expectations of the top four wealth quintiles, whereas the magnitude of the effect differs and increases for the bottom quintile. In addition, income change remain an important factor in forming house price expectations for the 3rd and 4th wealth quintiles. The magnitude of the income change effect is even stronger for the top quintiles than that from house price changes. This could be due to the fact that housing corresponds to a lower share of total wealth for the richest households than for the poorest. Results also show that house price expectations among the top quintiles are affected by individuals'

Table 1.13: Cross-sectional (mean) estimator for micro-aggregated (HFCS) variables over income quintiles

	(1) All	(2) Q1	(3) Q2	(4) Q3	(5) Q4	(6) Q5
g_HP_mean	.026**	.029**	.035***	.030**	.026**	.018
	(.011)	(.011)	(.012)	(.012)	(.011)	(.011)
g_income_mean	.036	.026	.028	.035	.041*	.042*
	(.023)	(.021)	(.022)	(.024)	(.022)	(.024)
risk attitude	-.187***	-.199**	-.162	-.150*	-.110	-.181***
	(.058)	(.073)	(.098)	(.084)	(.073)	(.051)
age [bracket]	-.002	-.004	-.003	-.005	-.005	-.001
	(.004)	(.004)	(.006)	(.005)	(.005)	(.005)
education	.206***	.214***	.153***	.149***	.142***	.178***
	(.041)	(.045)	(.051)	(.036)	(.042)	(.045)
labour status	+	+	+	+	+	+
exp_income_vs_price	+	+	+	+	+	+
Number of obs	43,066	6,520	7,373	7,881	9,160	12,132
Number of countries	16	16	16	16	16	16
R^2	0.200	0.117	0.143	0.186	0.211	0.295

Standard errors are clustered for robustness. * corresponds to the 10% confidence interval, ** to the 5% confidence interval, and *** to the 1% confidence interval. Income quintiles are derived separately for each country and based on HFCS wave 2017 results.

risk attitude and education. Finally, the model based on the specification from equation 1.2 explains about 12 percent of the variation in house price expectations among the bottom quintiles, while it is more effective for the top quintile, explaining almost 28 percent of variations in expectations.

Overall, Tables 1.13 and 1.14 showed that both income and wealth distributions matter in explaining heterogeneous house price expectations among households in Europe. Results show that changes in house prices and income remain important drivers for the most of quintiles. Education and risk attitude also play a role in forming household expectations about house prices in the immediate future. Finally, Tables 1.13 and 1.14 show that the model used tends to capture variation in expectations better for the top quintiles than for the bottom ones.

1.5 Concluding remarks

Understanding the determinants of household expectation formation about house prices is becoming increasingly important. In order to identify the causes and consequences of heterogeneous expectations, as well as to monitor household economic behavior, it is crucial to start with and understand the household balance sheet and differences across the different income and wealth groups. After bringing some stylized facts about the household balance sheets in Europe, I look at the main determinants of house price expectations over the income and wealth distributions.

In more detail, the data from the Household Finance and Consumption Survey (HFCS) that I reviewed establishes clear patterns that allow me to draw some stylized facts. First, more than 60 percent of the average household portfolio in Europe is concentrated on the real estate. In the period following the 2008 financial crisis, the share of portfolio in real estate swung slightly but remained a significant majority in comparison to other asset classes. Second, average house price expectations and variance tend to be highly heterogeneous across 18 European countries. While on average some countries expected a house price decrease in the immediate future, others expected more than a 3 percent increase over the same period. This suggests that local factors are key to forming

Table 1.14: Cross-sectional (mean) estimator for micro-aggregated (HFCS) variables over wealth quintiles

	(1) All	(2) Q1	(3) Q2	(4) Q3	(5) Q4	(6) Q5
g_HP_mean	.026**	.059**	.030**	.031***	.026**	.016
	(.011)	(.027)	(.012)	(.010)	(.011)	(.010)
g_income_mean	.036	.014	.023	.033*	.045*	.044
	(.023)	(.019)	(.017)	(.019)	(.024)	(.025)
risk attitude	-.187***	-.156**	-.039	-.141	-.185**	-.154**
	(.058)	(.068)	(.075)	(.092)	(.069)	(.055)
age [bracket]	.002	-.001	-.014**	-.018***	-.005	-.001
	(.004)	(.004)	(.005)	(.004)	(.005)	(.005)
education	.206***	.147**	.168***	.107**	.151***	.150***
	(.041)	(.057)	(.055)	(.047)	(.041)	(.041)
labour status	+	+	+	+	+	+
exp_income_vs_price	+	+	+	+	+	+
Number of obs	43,066	5,222	6,409	8,182	9,479	13,774
Number of countries	16	16	16	16	16	16
R^2	0.200	0.122	0.132	0.197	0.229	0.279

Standard errors are clustered for robustness. * corresponds to the 10% confidence interval, ** to the 5% confidence interval, and *** to the 1% confidence interval. Wealth quintiles are derived separately for each country and based on HFCS wave 2017 results.

household expectations about house prices.

Third, my results support the current literature by showing that recent household experience in house price changes and income are important drivers for future expectations, though the local household experience tends to exert more weight on expectations formation than personal experience. Additionally, results showed that prior experience in the form of homeownership status or position along income or wealth distribution are important factors in explaining expectation heterogeneity among households. Households from the top income or wealth quintiles tend to have higher house price expectations, whereas mortgages owners are associated with lower expectations than renters or owners without mortgages.

Fourth, I tried to identify relationships between different determinants and household expectations about house prices in European countries. I used three different models to estimate the relationship between changes in house price, changes in income, and house price expectations. Models were built by using one of the following three sources: 1) aggregated country-specific information on house prices and income from National Accounts; 2) aggregated results from the Household Finance and Consumption Survey; 3) individual household-level information from HFCS. All three models delivered similar conclusions, showing that changes in house prices play a key role in explaining household expectations about future house prices. Moreover, this happens on both levels – local and personal experience in house price changes. Education remains an another important factor in explaining households' formation of expectations of house prices; higher expectations were associated with a higher level of education. In light of the fact that some related literature has found opposite results, showing that individuals with lower education tend to expect higher increases in house prices, I will note that my analysis concentrates only on post-financial crisis results. Possibly, the recent financial crisis affected less educated people more by making them more pessimistic about future expectations in house prices. In contrast, better performance and a positive experience from a growth in house prices after the financial crisis affected highly educated people more and formed their higher expectations for the immediate future.

Finally, the model used in this paper also showed that house price growth remained not only important driver in forming household expectations, but wielded a greater effect on renters. This can mostly be explained by the fact that renters pay every month for their housing services thus pay more attention to its value. The distributional factor was another determinant, playing a key role in forming house price expectations. Households from the lowest wealth quintile were associated with a higher effect then the other households, while the effect of changes in house prices remained similar across all the income quintiles.

I leave some important questions for future research. It is not clear if these stylized facts regarding households also hold for income distribution from the pre-financial crisis periods. Most importantly, we still know very little about the mechanisms or causations leading to these stylized facts. Therefore, the following chapter will try to address some of these questions by examining alternative methods for approximating household expectations and estimating them. Furthermore, it will investigate the potential mechanisms through which changes in house prices (and household understanding of them) influence household behaviour and transmit into the real economy through aggregate private consumption.

2 The Role of Housing Market and Credit on Household Consumption Dynamics

This chapter is based on the paper entitled "The Role of Housing Market and Credit on Household Consumption Dynamics: Evidence from the OECD Countries" which is a joint work with dr. Povilas Lastauskas that has been accepted for publication in the *Journal of Economic Behavior and Organization*.

2.1 Introduction

The global financial crisis of 2008-2009 placed the demand side and household balance sheet effects at center stage to account for the business cycles. More specifically, substantial aggregate consumption losses during that time were attributed to the credit liberalization and expansion as well as overly optimistic expectations about house prices (Piazzesi and Schneider, 2016; Guerrieri and Uhlig, 2016). Though there is a vast literature on consumption reactions to changes in (expected) house prices (e.g., Attanasio et al., 2011; Campbell and Cocco, 2007; Muellbauer and Murphy, 1997), there is less work on house price deviations from the fundamental value and its effects on consumption dynamics. Therefore, this chapter develops a simple theoretical framework, supported by empirical results, to analyze housing-related wealth, its effects on household expectations about future house prices and ensuing spillovers to the real economy. We do so by defining the *house price-rent spread shock*, which captures household expectations as the unexplained deviation between house price growth and rental rate growth. As we demonstrate, such deviation can be driven by multiple sources, such as quick and steep house price growth, rental price stagnation or household preferences about buying or renting the apartment. Moreover, we demonstrate that a spread shock brings asymmetric effects once it interacts with borrowing (credit market) frictions.

We endow a household sector with borrowing frictions, which helps us explore the role of credit and interest rate shocks. Our stylized model helps us link *expectations* about future house markets to the *house price-rent spread shock*. Deterioration of households' expectations leads to

postponement of consumption, increased precautionary savings, drop in demand, and increased risk of a lower stream of future income. One of the benefits of our approach is that the key measure, the house price-rent spread, is readily available for many countries, unlike survey-based series that capture households' expectations or sentiments, but that use various formats and time frames, and are based on a range of methodologies. Using a simple theoretical framework, we demonstrate that the housing spread shock, observed for a sufficiently long period, is an informative and persistent measure of expectations regarding future house prices. An added value of our series is the long-time coverage – a half-century – and broad country coverage, 28 OECD countries overall.

Due to endogeneity, we first extract shocks to key variables of interest, namely, the house-rent spread and credit. Using a large panel, we find that an unexpected increase in the housing spread yields an extra stimulus and, in line with the theory predictions, increases the aggregate household consumption. This effect is persistent and lasts longer than the credit shock, which impacts consumption instantaneously only, confirming important qualitative differences in the two drivers of consumption dynamics. We also analyze the interest rate shock, separating domestic and US interest rates (the latter captures the global financial cycle's idea, as put forward by Rey (2015) and further documented by di Giovanni et al., 2021; Miranda-Agrippino and Rey, 2020; Rey, 2015; Lastauskas and Nguyen, 2023), documenting the 'boom-bust' episodes in household consumption. Though the literature has explored the impact of expectations, relatively little work has been done on combined effects between credit and household expectations concerning house prices (Attanasio et al., 2009, 2011).

Our key contributions to the literature and policy debates are the empirical confirmation of the importance of tracking not only house prices (Madsen, 2012), still a dominant approach, and credit conditions (Annicchiarico et al., 2019), but also joint dynamics, which help to capture expectations about house price changes as well as the *combined effect* between credit frictions and house spread shock, resulting in asymmetric impacts when shocks act together, particularly in crisis periods ('bad' states). Our emphasis on the role of housing spread shock in

explaining consumption dynamics aligns with the findings of Kaplan et al. (2020). Specifically, Kaplan et al. (2020) demonstrate that the increase in the price-to-rent ratio (a gap between housing and rental prices) during the 2000s largely stemmed from household expectations regarding future house price growth. These expectations are believed to have stimulated household consumption. In our paper, we adopt an alternative framework to establish a connection between expectations of house price growth and changes in household consumption by using a house price-rent spread (housing spread for short) shock. Empirically, we demonstrate that shocks to the housing spread, reflecting these growth expectations, lead to consumption responses in the OECD sample. We also compare our results to the single-country evidence, linking to the existing literature, and country groups, exploring the role of country heterogeneity.

One important implication is that economic policies that tackle credit conditions (e.g., macro-prudential regulation) or expectations about future asset prices (e.g., forward-guidance) should be analyzed jointly due to existing co-movements and state asymmetries between the two forces driving consumption dynamics. More precisely, the house price-rent spread can respond to credit frictions; when acting together, credit and housing spread shocks produce a sizeable drop in consumption growth, lasting for a quarter, in the negative state (when the growth of both – credit and house spread shocks – is negative). The opposite (positive) effect on consumption is documented in the positive state as well, though it appears smaller than in the negative state (crisis), generating evidence for stronger recessionary impacts when credit and future house price expectations deteriorate simultaneously. Overall, our empirical exercise shows an asymmetric contribution of credit and housing spread shocks to the business cycle, warning policymakers to track housing spread and credit dynamics jointly to better target stabilization policies.

2.1.1 Household Balance Sheet

Our emphasis on housing is rooted in the well-documented household balance sheet effects. Over the past decades, financial asset prices have experienced significant swings and even some precipitous drops. As such,

the literature concentrated on this side of assets but neglected another side: non-financial assets. The situation changed after the recent global financial crisis when house prices experienced a substantial decline and affected households' ability to consume in most advanced economies. Moreover, housing constitutes the largest asset class (see Figures 2.1 and A.2) in the household balance sheets across developed countries. Figure 2.1 depicts household assets' decomposition in the United States based on the data from the Survey of Consumer Finances (SCF). By contrast, Figure A.2 summarizes the situation in Europe by quoting Household Finance and Consumption Survey (HFCS) results. As is clearly evident, residential property remained the largest share of total household assets in the United States during the analyzed period of 30 years. A similar conclusion holds for European countries as housing plays a crucial role there as well. This first stylized fact provides us with a clear link between household wealth and current house prices.

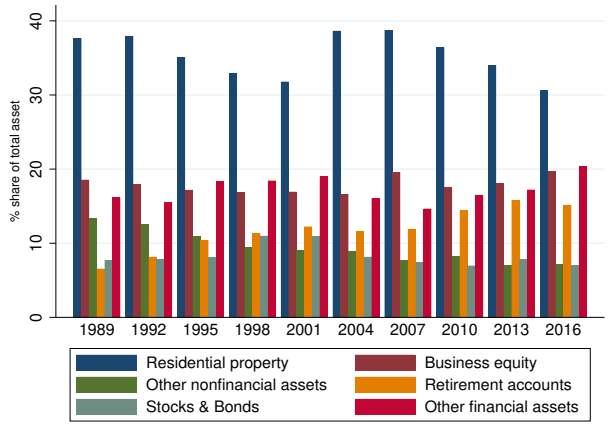
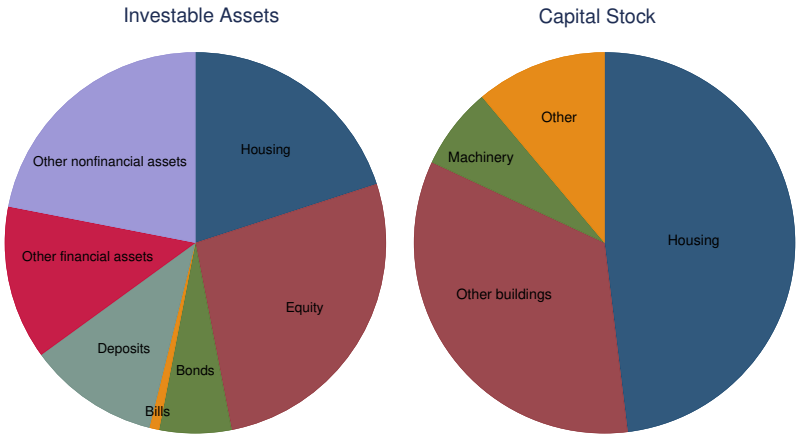


Figure 2.1: Household asset shares by asset classes in the United States

Moving away from household wealth, we also look at the decomposition of economy-wide investible assets and capital stocks in five major economies at the end of 2015: France, Germany, Japan, United Kingdom, and the United States (see Figure 2.2). The left panel of Figure 2.2 identifies the composition of investable assets, while the right-hand panel brings us the picture of capital stocks. Other asset categories outside the scope of the current study are: commercial real estate, business as-

sets, agricultural land, corporate bonds, pension and insurance claims, and deposits. However, this does not constitute a real issue, as most of these assets represent claims of other assets as well. For instance, pension claims are usually invested in stock and bonds, while commercial property tends to co-move with residential property prices (Jordà et al., 2019). In sum, these empirical facts confirm the importance of housing and its price dynamics in household wealth analysis. Moreover, household consumption dynamics is governed by changes in wealth and expectations about its future value.



Note: Composition of total investible assets and capital stock. Average of the individual asset shares of major economies: France, Germany, Japan, United Kingdom, and United States, as of end-2015. Data are taken from national accounts and national wealth estimates published by the countries' central banks and statistical offices. *Source:* Figure I of Jordà et al., 2019.

Figure 2.2: Composition of investible assets and capital stock in the major economies

2.1.2 Related Studies

Given the empirical evidence, it is no surprise that a great deal of post-financial crisis literature identified household balance sheets as one

of the key conduits for the materialization of the crisis and its transmission into the real economy. After a significant increase, house prices collapsed, triggering a financial crisis and a drop in household expenditures, which – in combination with macroeconomic frictions – led to a slump in employment (Mian et al., 2013; Mian and Sufi, 2014a). The current literature identifies two main driving forces to explain 'boom and bust' episodes in house prices: credit conditions and beliefs about future housing demand (Kaplan et al., 2020). However, interactions between different shocks (e.g., credit), expectations regarding future housing value, and the real economy are still too under-researched to draw clear conclusions. This is so, despite the fact that policies affecting housing and credit markets play a key role in stabilizing or boosting the real economy, especially at times when standard tools, such as monetary policy, do not support the economy as much as intended. The recent financial crisis re-opened questions about macroeconomic modeling and the assumption of frictionless financial markets as neither the modeling nor the assumption served to anticipate the crisis or to analyze the disruption of credit markets (Gertler and Gilchrist, 2018).

The aggregate effects of household balance sheet on consumption dynamics during the 2008 financial crisis were documented by an influential set of papers by Mian et al. (2013); Mian and Sufi (2014a, 2016). The authors found that low-income households in the United States increased their spending in line with a rise in house prices between 2002 and 2006, and faced a massive drop in income and consumption afterward. Housing comes into play as the low-income households liquefied their home equity during the house prices boom and increased their spending simultaneously. By contrast, high-income households barely changed their borrowing and spending behavior before the financial crisis. The result was that low-income households experienced significantly lower income and spending growth and a longer recovery period after the financial crisis materialized (Mian and Sufi, 2014a). Recent IMF work (Caceres et al., 2019) supports the idea that housing is one of the most relevant forms of equity to affect consumption dynamics, at least judging from US household-level data. Against the background of other empirical studies, Kaplan et al. (2020) built a model with multiple aggregate shocks to

generate fluctuations in equilibrium house price, and found beliefs to be the main driver for the shift in house prices. Based on their model, the 'boom-bust' in house prices explained half of the corresponding swings in non-durable expenditures in the United States over the past decades.

In addition to housing and households' expectations concerning house prices, the post-crisis literature also analyzed other shocks and their impacts on aggregate consumption and real economy fluctuations. Credit shock is a usual suspect as it affects borrowing constraints and gets transmitted into the real economy through changes in households' abilities to smooth consumption in the face of shocks. An individual credit data analysis in the United States identified a rapid mortgage credit expansion among low-income zip codes before the recent financial crisis. Liberalization of credit access was the dominant factor before the crisis, as it made it easy to borrow even for those households, which had previously found it difficult due to poor credit records or insufficient income (Amromin and McGranahan, 2015). Such a situation was particularly pronounced in mortgage lending, while other types of credit, particularly auto lending, were dominated by the business cycle movements (Amromin and McGranahan, 2015).

However, sentiments and expectations about the future state of the economy also played an important role in driving economic fluctuations. Unlike much of the current literature that concentrates on financial frictions in macroeconomics, López-Salido et al. (2017) suggested a behavioral view and argued that investors' sentiments in credit markets explain economic fluctuations. The key point is that current economic activity strongly influences expectations about future credit defaults. Specifically, investors become overly optimistic once they are influenced by good news about fundamentals, which leads to a situation in which credit spread narrows and the quantity of credit expands (López-Salido et al., 2017). This mechanism leads to endogenous reversals of sentiments as the later periods of further economic news will be disappointing compared to optimistic expectations. We emphasize the literature on sunspots and non-fundamental sources in causing economic fluctuations (Adam et al., 2011; Farmer, 2010, 2013; Levchenko and Pandalai-Nayar, 2020) since, as we will see, our main object of interest, housing spread

shock, has substantial overlap with households' confidence.

Although the above-mentioned literature focuses on the interaction between housing and consumption, this paper highlights the behavioral aspect of households. It refers to the new and growing literature that analyzes how house price expectations are formed, how they affect households' behavior and how they are transmitted to their individual consumption decisions (Massenot and Pettinicchi, 2019). Recent literature has used different ways to target and analyze household expectations – through unconventional monetary policy (D'Acunto et al., 2022), tax policy (Martin et al., 2021), or expected economic outlook (Roth and Wohlfart, 2020). In addition, the literature shows that house price and housing cost expectations are one of the main factors to explain the general household expectations (Carroll et al., 2020; Piazzesi and Schneider, 2016). However, from an empirical point of view, it remains challenging to measure house price expectations at the aggregate level and to do so consistently across different countries. Our paper tries to fill this gap by proposing an empirical solution to analyze these issues across a larger number of countries. Finally, before jumping into the theoretical and empirical parts of the paper, it is important to address the issue of the (ir)rationality of expectations. While some papers have shown that some house price changes may be driven by irrationality (Hoffmann et al., 2012), others have found no evidence of behavioral biases in expectations related to individual housing tenure decisions (Gohl et al., 2024). Therefore, we adopt the traditional assumption of rational expectations, while keeping the main focus on a consistent empirical way to measure household expectations regarding house prices.

From a macroeconomic perspective, Mian et al. (2017) conclude that a rise in the household debt to GDP ratio is associated with a consumption boom followed by a reversal in the trade deficit since imports collapse, and that predicts a lower output growth and unemployment increase over the medium run. Numerous empirical studies employ sentiments and different other shocks, stemming from the household balance sheet, to explain aggregate consumption fluctuations. Recent literature on diagnostic expectations, which overweight future outcomes that become more likely in light of incoming data, indicate that these expect-

ations are able to generate excessive volatility, overreaction to news, and predictable reversals (Bordalo et al., 2018).

Though a significant portion of the literature identifies house price expectation or credit shocks as the fundamental forces responsible for the slump in economic activity, mainly through changes in consumption and demand, the empirical focus remains on the U.S. or a handful of economies. We fill this gap by asking how housing market dynamics impact consumption smoothing and how the household expectation shock interacts with financial frictions in driving household consumption dynamics. To address this question, we analyze quarterly data from 28 OECD countries over a half-century period (1970 - 2020). Large cross-sectional and temporal dimensions enable us to shed new light on the determinants of household consumption. In particular, it has been challenging to assess external validity beyond the United States, having institutional and structural heterogeneities in mind. From the theoretical perspective, studies tend to model house prices, credit frictions, and changes in 'animal spirits' (Farmer, 2010, 2013) in isolation to explain macroeconomic movements. As covered above, the literature on housing and consumption contains relatively few applications of households' expectations about the worthiness of their houses. At the same time, credit and stock market shocks are analyzed more extensively through the lenses of sentiments and expectations. Therefore, we contribute by analyzing housing spread shock-driven fluctuations in consumption, jointly with credit frictions. Our focus on the sources of credit shock as well as evidence on the credit-spread complementarities can help to formulate better-targeted and more effective economic policy.

The remainder of this paper is organized as follows. We motivate our empirical analysis with the theoretical model, which outlines how housing spread shock and borrowing frictions affect consumption dynamics in Section 2.2. We translate the main ideas into the empirical framework and conduct data-explanatory analysis in Section 3.2. Section 3.3 concentrates on the empirical findings and compares them with the current literature. Section 2.5 discusses extensions of the baseline model, covering the interest rate channel, the role of uncertainty, and cross-country heterogeneity, whereas Section 2.6 covers a set of robustness

checks. Finally, Section 3.4 concludes and highlights some directions for future research, whereas the separate Online Appendix collects supporting evidence and more technical details.

2.2 Theoretical Motivation

Consider a simple environment of an economy where households draw utility from consumption C_t and housing services H_t (we abstract from disutility to work as under the standard additively separable utility function, it does not affect our key findings).[3] We are seeking to derive the relationship among consumption, credit, and housing. We stick to the rational expectations environment and explore whether such a simplified setting can give rise to empirically relevant dynamics. For now, we assume that uncertainty (and thus the use of the expectations operator) stems from the stochastic endowment, but we will be more specific about parametrization of stochastic processes later when it comes to exploring the role of uncertainty.

2.2.1 Households

The household welfare function is given by

$$\mathbb{E}_t \sum_{s=t}^{\infty} \beta^{s-t} \left(\frac{(C_s)^{1-\nu}}{1-\nu} + \phi \frac{(H_s)^{1-\nu}}{1-\nu} \right), \tag{2.1}$$

where consumption C_t and housing services H_t are discounted by β and other features include isoelastic utility function with the elasticity of intertemporal substitution ν^{-1}, which, in this class of utility functions, also governs the coefficient of relative prudence; finally, $\mathbb{E}_t$ stands for the rational expectations operator. The lifetime welfare function is maximized subject to[4]

$$\begin{aligned} C_t + Q_t \left(H_t - H_{t-1} \right) + i_t B_{t-1} & \qquad (2.2) \\ \leq B_t + Y_t, & \\ B_t \leq (1-\chi)\, Q_t H_t, & \qquad (2.3) \end{aligned}$$

[3] The labor supply would then be pinned by the consumption path under given input prices (in our case, wages).

[4] Note that total wealth in our model is given by $W_t = Q_t H_{t-1} - i_t B_{t-1}$.

where (2.2) is the resource (budget) constraint, allowing for debt B_t, endowment (income) Y_t, house prices Q_t, and interest rates i_t on debt B_t. The borrowing constraint (2.3) à la Kiyotaki and Moore (1997) is such that, if a housing asset is purchased, a household can borrow at most $1 - \chi$ of the house value. In other words, we assume a down-payment, equal to χ. Once $\chi \to 0$, the full nominal value of house can be used as collateral to expand debt, whereas $\chi \to 1$ implies that households have no access to the debt market.[5] As we are abstracting away from fully determining borrowing and lending, we will assume that $\chi \to 1$ implies that the house can be purchased from savings, stemming from the endowment (income) Y_t. We assume away the depreciation rate of the housing stock, which plays no substantial role for our results. We assume debt accrues interest rates i_t, exogenous from the household's perspective. One can think of interest rates as following a law of motion, similar to, for instance, Fernandez-Villaverde et al. (2011), specifying an international and country-specific component of the interest rate.[6] We will empirically explore a domestic interest rate controlled for domestic macroeconomic dynamics and the role of the US interest rate (capturing the global financial cycle and financially integrated markets case).

Finally, a relative share of housing services is governed by the parameter ϕ. In this stylized environment, the fact that markets are not complete due to the borrowing constraint is what generates a relationship between housing markets and consumption. In Appendix A.2.5, we cover requirements for the debt and no-Ponzi-game condition, as well as the rationale for why we do not need varying preferences β to justify positive or negative savings, which do not violate the transversality condition.

[5]Note that $1 - \chi$ in $B_t \leq (1 - \chi) Q_t H_t$ can be interpreted as the loan-to-value ratio.

[6]Fernandez-Villaverde et al. (2011) embed stochastic volatility in the law of motion for real interest rates; instead, we will allow for observed uncertainty in the empirical exercise.

2.2.2 Optimality Conditions

The lifetime utility (2.1) maximization subject to constraints (2.2)-(2.3) delivers the following optimality conditions:

$$H_t^{-\nu} = \frac{1}{\phi}\left\{(C_t)^{-\nu} - \mu_t(1-\chi)\right\}Q_t - \frac{1}{\phi}\mathbb{E}_t\beta(C_{t+1})^{-\nu}Q_{t+1}, \tag{2.4}$$

$$\begin{aligned}\mu_t &= (C_t)^{-\nu} - \beta\mathbb{E}_t(C_{t+1})^{-\nu} i_{t+1} \\ &= (C_t)^{-\nu}\left(1 - \beta\mathbb{E}_t\left(\frac{C_{t+1}}{C_t}\right)^{-\nu} i_{t+1}\right),\end{aligned} \tag{2.5}$$

where μ_t captures a shadow price of borrowing constraint (credit frictions). The equation (2.4) describes how housing services interact with house prices and consumption changes. Notice that there is one source of consumption smoothing – debt markets – as captured in the borrowing constraint (2.5). Using an endogenously determined borrowing with a collateral constraint, we can reduce the system (2.4)-(2.5) into:

$$\begin{aligned}H_t^{-\nu} = \frac{1}{\phi}\left\{\chi(C_t)^{-\nu} + \beta(1-\chi)\mathbb{E}_t(C_{t+1})^{-\nu} i_{t+1}\right\}Q_t \\ -\frac{1}{\phi}\mathbb{E}_t\beta(C_{t+1})^{-\nu}Q_{t+1},\end{aligned} \tag{2.6}$$

We obtain housing services spending, linking a path of current and future consumption as well as house prices, encapsulating intertemporal consumption smoothing conditions. Housing demand clearly depends on consumption patterns, especially what is expected in the future, including future interest rates and future house prices (as captured by the terms $\mathbb{E}_t(C_{t+1})^{-\nu} i_{t+1}$ and $\mathbb{E}_t\beta(C_{t+1})^{-\nu}Q_{t+1}$. In other words, intertemporal consumption smoothing exemplifies the importance of expectations about the future, especially the path of interest rates and house prices for today's consumption of house services.

Last, to see how optimal consumption-housing choice gets determined, we can re-express (2.6) as

$$\begin{aligned}R_t^H = \left\{\chi + \beta(1-\chi)\mathbb{E}_t\left(\frac{C_{t+1}}{C_t}\right)^{-\nu} i_{t+1}\right\}Q_t \\ -\mathbb{E}_t\beta\left(\frac{C_{t+1}}{C_t}\right)^{-\nu}Q_{t+1},\end{aligned} \tag{2.7}$$

where the rent (denoted by R_t^H) is given by the ratio of marginal utilities with respect to housing and consumption (an *intra-temporal* choice); given functional form in equation (2.1), it is equal to

$$R_t^H = \phi \left(\frac{H_t}{C_t} \right)^{-\nu}. \tag{2.8}$$

Using (2.7), the rent (fundamental) to house price ratio is driven by

$$\begin{aligned} \frac{R_t^H}{Q_t} &= \chi + \beta (1-\chi) \mathbb{E}_t \left(\frac{C_{t+1}}{C_t} \right)^{-\nu} i_{t+1} - \mathbb{E}_t \beta \left(\frac{C_{t+1}}{C_t} \right)^{-\nu} \frac{Q_{t+1}}{Q_t}, \\ &= \chi + (1-\chi) \left(1 - (C_t)^{\nu} \mu_t \right) - \mathbb{E}_t \beta \left(\frac{C_{t+1}}{C_t} \right)^{-\nu} \frac{Q_{t+1}}{Q_t}, \end{aligned} \tag{2.9}$$

where we embedded a borrowing constraint (2.5). Unlike Berger et al. (2018) who assume a constant rent to price ratio in their study on consumption and house prices,[7] there are two forces in our setting that can make this ratio systematically change: shocks to the borrowing constraint and stochastically discounted growth rate of house prices, driven by, for instance, sentiments about the future housing market. It thus becomes clear that (2.7) and (2.9) demonstrate how house prices are related to fundamentals (R_t^H) and possibly speculative (bubble) yet rational components in house prices. To see the link more transparently, we first analyze an economy absent any borrowing frictions.

2.2.3 Economy without Borrowing Frictions

Rearranging the demand for house equation (2.4) and imposing zero shadow prices of constraints, i.e., $\mu_t = 0$, we are led to the first result.

Proposition 1. *The house price, absent borrowing frictions, is equal to the rental rate and the expected discounted future price,*

$$\begin{aligned} Q_t &= R_t^H + \mathbb{E}_t M_t^{t+1} Q_{t+1} \\ &= R_t^H + \mathcal{S}_t, \end{aligned} \tag{2.10}$$

where $\mathcal{S}_t \equiv \mathbb{E}_t M_t^{t+1} Q_{t+1}$ stands for the house price-rent spread (note that in this particular case, $\mathcal{S}_t \equiv \mathbb{E}_t M_t^{t+1} Q_{t+1} = Q_t - R_t^H$).

[7] There is empirical and theoretical literature showing that rent to price ratio is co-moving with fundamentals (Sommer et al., 2013) and the state of the economy, reflecting expectations of future housing returns (Favilukis et al., 2017).

Proof. The house price under no borrowing constraints follows from (2.4), setting $\mu_t = 0$, using (2.8), $M_t^s \equiv \beta^{s-t} (C_s/C_t)^{-\nu}$, and rearranging results in (2.10). □

Iterating (2.10) forward, one obtains a decomposition:

$$Q_t = \underbrace{\mathbb{E}_t \sum_{j=0}^{T-1} M_t^{t+j} R_{t+j}^H}_{\text{fundamentals (discounted rental rates)}} + \underbrace{\mathbb{E}_t M_t^{t+T} Q_{t+T+1}}_{\text{bubble term}} = F_t + \mathcal{B}_t, \tag{2.11}$$

where the stochastic discount factor (pricing kernel) is $M_t^s \equiv \beta^{s-t} (C_s/C_t)^{-\nu}$ for $s \geq t$, F_t is the fundamental price component (discounted rental rates) and $\mathcal{B}_t$ stands for the bubble component that violates the transversality condition. Such a decomposition has roots in Blanchard and Watson (1982): it is clear that for the rational bubble component to exist, its growth can *neither dominate nor be dominated* by the stochastic discount factor M_t^s. Consider perfect consumption smoothing, then $M_t^s = \beta^{s-t}$, and

$$\begin{aligned} Q_t &= \mathbb{E}_t \textstyle\sum_{j=0}^{T-1} (\beta\phi)^j \left(\frac{H_{t+j}}{C_{t+j}}\right)^{-\nu} + \beta^T \mathbb{E}_t Q_{t+T+1} \\ &= \mathbb{E}_t \textstyle\sum_{j=0}^{T-1} \beta^j R_{t+j}^H + \beta^T \mathbb{E}_t Q_{t+T+1}, \end{aligned}$$

therefore linking the bubble component to the time preference β and the relative weight of housing in the utility function. It is also true that the asset should be infinitely-lived for the bubble to exist as it would be terminated at its fundamental value at maturity, i.e., $Q_t = \mathbb{E}_t \sum_{j=0}^{\infty} \beta^j R_{t+j}^H + \lim_{T\to\infty} \beta^T \mathbb{E}_t Q_{t+T+1}$.[8]

However, as demonstrated by Allen et al. (1993), this is no longer true if agents' beliefs are heterogeneous since then they are not aware of others' beliefs. This opens the door to rational beliefs of selling a house (an asset) above the fundamental price if agents hold different beliefs; absence of common knowledge breaks the backward induction argument

[8] To ease interpretation, further assume that house rent rate is time-invariant, i.e., $R_{t+j}^H = R_t^H$. It then follows that $Q_t = \frac{1}{1-\beta} \mathbb{E}_t R_t^H + \lim_{T\to\infty} \beta^T \mathbb{E}_t Q_{t+T+1}$, implying that the fundamental component is just a discounted rental rate, $\frac{1}{1-\beta} \mathbb{E}_t R_t^H$, and a bubble component, $\lim_{T\to\infty} \beta^T \mathbb{E}_t Q_{t+T+1}$, which may not be equal to zero due to the violation of the transversality condition in the infinite horizon setting or under heterogeneous beliefs even in the finite horizon setting.

and therefore enables the bubble's existence even in the *finite horizon environment*. This idea justifies why shocks to the deviation between house prices and rental rates contain information about households' held beliefs and sentiments about the housing market. The idea that heterogeneity is sufficient to generate rational bubbles even for finitely-lived assets implies that the decomposition into fundamental and bubble components can be used for empirical strategy.

To make this operational, we will denote a house price-rent spread variable as $\mathcal{S}_t \equiv Q_t - R_t^H$, defined as a disconnect of house prices from the rental rates in the case of no borrowing frictions. Absent borrowing frictions, Proposition 1 tells that $\mathcal{S}_t$ enters the bubble component that might violate the transversality condition in the limit. We will use the decomposition of house prices to base our empirical strategy. However, we do *not* take a stance on the nature of the belief shock: in fact, it can be intrinsic or extrinsic (Cass and Shell, 1983). An example of an intrinsic shock is dependence of the bubble component on rent, as proposed by Froot and Obstfeld (1991).[9] Alternatively, there may be a reason outside the model (fundamentals) that makes the bubble component move (so-called extrinsic uncertainty or sunspots).

A belief or general bubble component-driven change in house prices may thus be self-fulfilling (Azariadis, 1981). It can be that agents hold expectations about future house prices, as they are external variables to them (they choose housing consumption but take price as a given) as in Adam and Marcet (2011). The authors show that the equilibrium asset price is then pinned down by investors' expectations of the price and dividend in the next period, not by expectations of the discounted sum of dividends.

Another recent stream of literature deviates from the rational expectations framework and introduces so-called that become more likely in light of incoming data, thus giving rise to excessive volatility, overre-

[9]Suppose a bubble component is given by $\mathcal{B}_t \equiv c\left(\frac{H_t}{C_t}\right)^{-\nu\lambda}$, then $dQ_t/d\left((H_t/C_t)^{-\nu}\right) = \beta + c\lambda\left((H_t/C_t)^{-\nu}\right)^{\lambda-1}$. The price-rent may systematically deviate if the bubble component exists; this observation led Froot and Obstfeld (1991) to suggest a cointegration test as the means to determine the existence of intrinsic bubbles. That is why we consider the spread variable as the driver of consumption dynamics, rather than house prices or rental rates separately, as is often considered in the literature (Adam et al., 2012; Beltratti and Morana, 2010; Iacoviello, 2004).

action to news, and predictable reversals (Bordalo et al., 2018). All in all, we will remain agnostic about deep sources of systematic house price deviations from rental rate, but we will stick to rational expectations and explore their relationship with main "suspects", as just discussed: households' sentiments and household heterogeneity in terms of propensities to consume (the so-called "hand-to-mouth" consumers).

2.2.4 Economy with Borrowing Frictions

To help us structure our empirical exercise, we shall now bring back the borrowing frictions. We start deriving house prices provided the borrowing frictions are binding.

House Prices

The use of the borrowing constraint gives rise to the updated housing price, that is, instead of (2.10), which is $Q_t = R_t^H + \mathcal{S}_t$, we now obtain:

$$\begin{aligned} Q_t &= \{1 - \mu_t (C_t)^{\nu} (1 - \chi)\}^{-1} \left(R_t^H + \mathcal{S}_t\right) \\ &= \underbrace{\left\{1 - (1 - \chi)\left(1 - \mathbb{E}_t M_t^{t+1} i_{t+1}\right)\right\}^{-1}}_{\text{An amplification effect}} \left(R_t^H + \mathcal{S}_t\right), \end{aligned} \tag{2.12}$$

where the second equality follows after having incorporated the shadow price of the borrowing constraint (2.5). As before, the stochastic discount factor (pricing kernel) is given by $M_t^s = \beta^{s-t} (C_s/C_t)^{-\nu}$ for $s \geq t$. The house price with borrowing frictions is equal to the rental rate and a housing spread (expected discounted future price), adjusted for the shadow price of the borrowing constraint and the loan-to-value ratio.

Proof. By inspection of (2.12). □

In other words, a combination of Proposition 1 and Lemma 2.2.2 leads to a corollary that a bubble component, which is a discounted long-run non-zero spread term, can arise even absent the borrowing frictions, whereas a multiplier effect of the borrowing frictions on house prices can occur even though the spread component was time-invariant. For the time-varying bubble term to arise, we only require violation of the transversality condition or belief heterogeneity. For the amplification

effect to operate, we require incomplete markets that deliver borrowing frictions. However, it is both channels, the time-varying spread component and borrowing frictions, that are of interest when exploring the impact of housing on the real economy.

That is why in our empirical exercise we will consider if the house price in (2.12) contains predictive power on the patterns of consumption, while simultaneously accounting for the expectations about house prices (the spread) and borrowing frictions. Notice that absent debt market, $\chi = 1$, there is no tradeoff between savings and debt to smooth consumption. What is more, along a balanced growth path, $M_t^{t+1} = \beta$, in which case, an additional assumption of the subjective discount factor β coinciding with the interest rate, $1/i_{t+1}$, would remove the effect of the borrowing constraint (but would retain the expectations' term about the future house prices, $\mathcal{S}_t$).

2.2.5 Household Consumption Spending

We now turn to the empirical implications of the household spending patterns. Rearranging the house prices with the borrowing frictions in (2.12), we obtain:

$$C_t = \underbrace{\left(\left(1-\chi\right)\mu_t\right)^{-\frac{1}{\nu}}}_{\text{Borrowing (credit) friction}} \underbrace{\left(1-\left(\frac{R_t^H+\mathcal{S}_t}{Q_t}\right)\right)^{\frac{1}{\nu}}}_{\text{Relative fundamentals and housing spread}} . \quad (2.13)$$

The first term captures binding credit-frictions, whereas the second term accounts for the relative fundamentals and spread shares in terms of the house prices. First, notice that the equation (2.13) makes it crystal clear that the impact of an exogenous change in house prices on consumption depends on the magnitude of the borrowing frictions constraint.[10] Since the shadow costs of borrowing and the spread contain forward-looking components (see (2.5) and (2.10)), we will explore their role in generating consumption patterns. In other words, as cast in the

[10]For comparison, Berger et al. (2018) find that consumption response to changes in house prices can be approximated by the marginal propensity to consume out of temporary income times the value of housing. Our framework is much simpler and features no heterogeneity, yet provides another way to link house prices and consumption, where borrowing frictions are made to play a key role.

equation (2.13), consumption endogenously depends on the stochastic discount factor, which reflects consumption growth. Since an increase in the house price-rent spread makes house prices rise, other things being equal, the amplification effect will make the ratio go down since house prices will increase by more than a change in the spread. This would lead to higher current consumption (and lower savings). Conversely, an increase in the shadow costs of borrowing constraint would make savings more attractive and would lead to a drop in current consumption. Under the no-arbitrage condition, the borrowing constraint would disappear; however, because of the policy intervention, the constraint may be acting, and frictions exist even in equilibrium. This opens up the possibility for current consumption to be driven by beliefs about interest rates and house prices.

An alternative interpretation of the equation (2.13) stems from making use of the rent-to-house-price ratio, (2.9), leading to the expression:

$$\mathcal{S}_t = \mathbb{E}_t \beta \left(\frac{C_{t+1}}{C_t} \right)^{-\nu} Q_{t+1}, \tag{2.14}$$

demonstrating that spread is a forward-looking variable, determined together with consumption and house price growth. The spread is nothing else but an expected house price in the future, discounted by the stochastic discount factor, capturing consumption dynamics. Note that using the house price in (2.12), the spread can be expressed in a more convenient format:

$$\mathcal{S}_t = \left(1 - \mu_t \left(C_t\right)^{\nu} \left(1 - \chi\right)\right) Q_t - R_t^H. \tag{2.15}$$

It makes it clear that the existence of credit frictions would enter the spread variable (when $\mu_t = 0$, the expression collapses to a familiar form: $\mathcal{S}_t = Q_t - R_t^H$).

Lastly, the shadow price of borrowing constraint (2.5) constitutes

the last part to make the setting amenable to the empirical analysis:

$$\begin{aligned} C_t &= \left((1-\chi)\,\mu_t\right)^{-\frac{1}{\nu}} \left(\tfrac{Q_t - R_t^H - \mathcal{S}_t}{Q_t}\right)^{\frac{1}{\nu}}, \\ \mathcal{S}_t &= \left(1 - \mu_t\,(C_t)^{\nu}\,(1-\chi)\right) Q_t - R_t^H, \\ \mu_t &= (C_t)^{-\nu} \left(1 - \mathbb{E}_t \beta \left(\tfrac{C_{t+1}}{C_t}\right)^{-\nu} i_{t+1}\right), \end{aligned} \tag{2.16}$$

making it clear that consumption responds to unexpected changes to a borrowing constraint, μ_t, simultaneously determined with the house price-rent spread, $\mathcal{S}_t$. Due to this relationship, we will first extract shocks and then run conditional regressions that account for both shocks when tracking how consumption moves to an unexpected change in credit (borrowing) or housing spread (i.e., when learning about the former, we still have to account for the latter and the other way around).

2.2.6 Elaboration on the Mechanisms

Consumption Smoothing and Housing

Let us elaborate on consumption dynamics further. We can use equation (2.13) to derive the updated Euler equation. For the moment, let us assume that the interest rate is non-stochastic. That assumption would imply that:

$$\mathbb{E}_t \left(C_{t+1}/C_t\right)^{-\nu} = \left(C_{t+1}/C_t\right)^{-\nu} = \frac{1 - (1-\chi)^{-1}\left(1 - \left(\frac{R_t^H + \mathcal{S}_t}{Q_t}\right)\right)}{\beta i_{t+1}}. \tag{2.17}$$

Hence, an increase in the next period's interest rate would lower the right-hand side of the equation, leading to an increase in consumption in the next period (recall that an increase in consumption growth is raised to a negative power). That implies that households are engaging in precautionary savings by postponing consumption to the next period.

Rearranging (2.17), we obtain

$$\mathbb{E}_t \left(C_{t+1}/C_t\right)^{-\nu} = \tfrac{1}{\beta i_{t+1}} \tfrac{R_t^H + \mathcal{S}_t - Q_t \chi}{(1-\chi) Q_t}.$$

If households could expand their debt by using the full house price, then $\chi \to 0$ and the consumption Euler equation collapses to $\mathbb{E}_t \left(C_{t+1}/C_t\right)^{-\nu} = \tfrac{1}{\beta i_{t+1}} \tfrac{R_t^H + \mathcal{S}_t}{Q_t}$.

Absent borrowing constraints, we obtain $\mu_t = 0$, also implying that $\mathbb{E}_t \left(C_{t+1}/C_t\right)^{-\nu} = \frac{1}{\beta i_{t+1}}$, since $Q_t = R_t^H + \mathcal{S}_t$. Consumption growth is pinned down by the opportunity costs of consuming in the current period versus next period (intertemporal choice), summarized by the interest rates.

The presence of borrowing frictions, however, leads to the following result:

$$\frac{\partial \mathbb{E}_t (C_{t+1}/C_t)^{-\nu}}{\partial \chi} = -\frac{1}{\beta i_{t+1} Q_t} \frac{\left(Q_t - R_t^H - \mathcal{S}_t\right)}{(1-\chi)^2}.$$

As long as $0 < 1 - (1-\chi)\left(1 - \mathbb{E}_t \beta \left(C_{t+1}/C_t\right)^{-\nu} i_{t+1}\right) < 1$,[11] we obtain $Q_t - R_t^H - \mathcal{S}_t > 0$ and $\frac{\partial \mathbb{E}_t (C_{t+1}/C_t)^{-\nu}}{\partial \chi} < 0$. That means that the lower debt expansion (higher χ) leads to higher savings (for $\mathbb{E}_t \left(C_{t+1}/C_t\right)^{-\nu}$ to decrease, we require consumption in the current period to decrease, so that it could rise in the next period).

Consumption Smoothing, Housing, and Uncertainty

However, in reality, the process driving the interest rate i_{t+1} is not known at time t, and it entails substantial interest rate (and monetary policy) uncertainty. To derive more transparent implications, we will assume parametric forms. In particular, under joint log-Normality of consumption and interest rates, we obtain

$$\mathbb{E}_t \left(\frac{C_{t+1}}{C_t}\right)^{-\nu} i_{t+1} = \mathbb{E}_t \exp\left(-\nu \triangle \ln C_{t+1} + \ln i_{t+1}\right),$$

where $\mu_c \equiv \mathbb{E}_t \triangle \ln C_{t+1}, \mu_i \equiv \mathbb{E}_t \ln i_{t+1}$. Following the same logic for the house prices,

$$\mathbb{E}_t \left(\frac{C_{t+1}}{C_t}\right)^{-\nu} \frac{Q_{t+1}}{Q_t} = \mathbb{E}_t \exp\left(-\nu \triangle \ln C_{t+1} + \triangle \ln Q_{t+1}\right),$$

where $\mu_c \equiv \mathbb{E}_t \triangle \ln C_{t+1}, \mu_q \equiv \mathbb{E}_t \triangle \ln Q_{t+1}$. Using properties of the log-normal distribution,[12] taking natural logarithms, we find that (note that Var_t stands for conditional variance):

[11] This condition is satisfied for the expected consumption growth bounded by $\mathbb{E}_t \beta \left(C_{t+1}/C_t\right)^{-\nu} i_{t+1} < 1$.

[12] Refer to Appendix A.2.5 for full derivations.

$$\mathbb{E}_t \triangle \ln C_{t+1} = \nu^{-1} \ln \beta - \nu^{-1} \ln \left(\frac{\chi Q_t - R_t^H}{Q_t} \right)$$
$$+\nu^{-1} \ln \Big[\exp \left(\mathbb{E}_t \triangle \ln Q_{t+1} + \frac{\nu^2}{2} \mathrm{Var}_t \left(\triangle \ln C_{t+1} - \frac{1}{\nu} \ln \triangle \ln Q_{t+1} \right) \right)$$
$$- (1 - \chi) \exp \left(\mathbb{E}_t \ln i_{t+1} + \frac{\nu^2}{2} \mathrm{Var}_t \left(\triangle \ln C_{t+1} - \frac{1}{\nu} \ln i_{t+1} \right) \right) \Big] . \tag{2.18}$$

Therefore, consumption growth, unlike standard applications with precautionary savings, depends on the difference between down-payment and rental rates, $\left| \chi Q_t - R_t^H \right|$, and thus also on the spread, $\mathcal{S}_t$, as well as a nonlinear function, capturing long-term averages of house price growth rates and interest rates, the conditional variability of consumption growth rate, the house prices growth rate and the interest rate. In other words, higher-order terms capturing uncertainty might be additional factors driving consumption dynamics (note that uncertainty about consumption and interest rates is captured by their respective variance terms). These parametric assumptions follow the lines of Hansen and Singleton (1983) (see Appendix A.2.5).

Hence, as portrayed in (2.18), an exogenous change in, say, interest rate uncertainty drives house prices, price-rent spread, and the rental rate to adjust, given all other factors are fixed. For instance, an exogenous rise in the interest rate uncertainty makes the right-hand side rise, too. That is compatible with the spread variable rising, among other configurations. Similarly, a change in borrowing constraint, captured by the down-payment χ, makes not only consumption but also interest rate, its variance, and covariance to adjust. In the extension of the empirical exercise, we will explore whether uncertainty indeed plays a role in determining the impact of credit and house price-rent effects on consumption (see Section 2.5.2).

2.3 Empirical Framework

2.3.1 Data

We start by describing data to test the relationship between the housing spread shock, capturing expectations about future house prices, as noted above, and credit frictions. We use aggregate housing and rental prices to capture changes in household consumption patterns.

Table 2.1 summarizes descriptive statistics based on quarterly data for 28 OECD countries, namely: Austria, Belgium, Canada, Czech Republic, Germany, Denmark, Estonia, Spain, Finland, France, United Kingdom, Greece, Hungary, Ireland, Israel, Italy, Japan, Korea Republic, Lithuania, Luxembourg, Netherlands, Norway, New Zealand, Poland, Portugal, Sweden, Turkey, and the United States.

All the variables fall into the time range from Q1 1960 to Q2 2020. The household consumption per capita shows quarterly expenditures and constitutes our main object of interest to capture dynamic consumption smoothing patterns. Housing and rental variables refer to indexes, which are used to map the theory-consistent housing spread shock into its empirical counterpart. Household credit per capita summarizes the level of credit at each quarter, whereas the long-term interest rate refers to the rate at which long-term government paper is issued and the prices of government bonds maturing in ten years.

Venturing into descriptive statistics, the third column of the Table 2.1 gives an idea of the minimum and maximum number of observations for each variable at the country level. Unsurprisingly, the higher number of observations are related to the longer time-series in Western economies such as France, Germany, Canada, United Kingdom, Netherlands, United States, and others, while the lower number are from catching-up countries such as Czech Republic, Greece, Hungary, Lithuania, and Turkey. The consumer confidence index is also included in descriptive statistics and captures consumer sentiments in each quarter. Other statistics on the mean, standard deviation, minimum and maximum values give a better understanding about variables and their distribution. Finally, all the aggregate data are extracted from OECD (Quarterly National Accounts and Main Economic Indicators), IMF (International Financial Statistics), BIS, and some other data sources, with more details outlined in Appendix Table A.10.

2.3.2 Measuring House Price-Rent Spread

To connect theory with the empirical data, we present examples from the United States, United Kingdom, Spain, and Italy, which serve as a foundation for our housing spread (gap between house price and rent)

Table 2.1: Descriptive statistics for the panel data (quarterly data)

	Obs	Min - max quarters	Mean	Std. dev.	Min	Max
HH consumption per capita	3587	50 - 202	4153.70	2203.15	809.85	12016.95
Housing index	4986	42 - 242	64.67	40.47	1.83	174.75
Renting index	4791	42 - 203	69.52	30.08	3.68	154.89
HH credit per capita	3519	49 - 201	21531.37	21320.5	208.98	112116.6
Long-term interest rate	4188	50 - 202	5.80	3.81	-.78	25.4
Consumer confidence index	3956	42 - 242	99.98	1.91	84.12	107.96

Total household consumption and household credit variables are in real terms while housing and renting indexes represent their nominal values. For the estimation part, we are using the spread between housing and renting indexes. The household consumption variable shows quarterly expenditures (in equivalent EUR), while the credit variable gives cumulative values (in equivalent EUR).

shock identification framework. As shown in Figure 2.3, we examine historical quarterly fluctuations in housing and rental indexes across all four countries from 1970 to 2020. Notably, the rental index exhibits a consistent upward trend throughout this period without experiencing significant declines. In contrast, the housing index displays more volatile dynamics, with pronounced fluctuations, particularly evident in the early '80s and '90s. The onset of the 21st century introduces even greater volatility, marked by substantial fluctuations in the housing index.

By linking housing and rental prices, we introduce a conventional asset pricing concept. Specifically, we regard the rental index as a variable that represents fundamentals, expected to be the primary driver of housing variation over the long term. This perspective aligns with the theoretical framework outlined in Section 2.2, which suggests that persistent deviations from house price and rental rates can be attributed to expectations regarding future house prices. Furthermore, these expectations may appear in line with frictions in the credit market. In accordance with the theoretical framework, we define the housing spread shock as the unexplained difference between the house price and its fundamental value. Importantly, both the housing and rental indexes share the same reference year, ensuring that deviations are not influenced by differences in the choice of baseline period.[13]

With the slight abuse of notation, we map the theory-implied spread (a gap between house price and rental) variable (see equation (2.10)) into the empirical counterpart in the equation (2.19):

$$\mathcal{S}_{i,t} = \ln(housing\,index)_{i,t} - \ln(rental\,index)_{i,t}. \tag{2.19}$$

We employ logarithmic transformations on the housing and renting indexes and then calculate the difference to obtain the housing spread variable, denoted as $\mathcal{S}_{i,t}$. This definition excludes the amplification effect[14] due to borrowing frictions (refer to the equation (2.15)). However,

[13]For robustness purposes, we also conduct an analysis using the growth rates of the gap between house price and rental rates variables. The results of this analysis, as shown in Figure A.3 in the Appendix, align with the findings presented in Section 3.3.

[14]The general spread variable accounts for the amplification effect on house prices: $\mathcal{S}_t = (1 - \mu_t (C_t)^{\nu} (1 - \chi)) Q_t - R_t^H$. Empirically, a shock to the spread variable

Figure 2.3: Housing and renting indexes evolution in the United States, United Kingdom, Spain and Italy

they are unobservable, so we will be careful in the empirical analysis to always control for credit shocks when inferring the spread shock (and vice versa).

Throughout our analysis, subscripts refer to specific countries indexed by i and time periods indicated by t. This housing spread variable serves as a metric for tracking temporal disparities between house prices and rental rates. In practical terms, if the $\mathcal{S}_{i,t}$ variable exhibits an increase, it means that the housing index is growing at a faster pace than the rental rate within country i. Moreover, the unexplained part of this difference between variables reflects a rising optimism in expectations regarding future house prices. Consequently, households tend to favor homeownership over renting in such circumstances. Conversely, an unexplained decrease in $\mathcal{S}_{i,t}$ implies a preference for renting over purchasing a house.

Figure 2.4 provides an overview of the housing spread variable ($\mathcal{S}_{USA,t}$)

controls for changes in credit conditions as well as additional factors (see Section 3.3 for a full description of the identification strategy).

dynamics in the United States spanning the past five decades. Additionally, the graph includes the NBER crisis variable, highlighting periods of recession. A noteworthy observation is that during recessionary periods, the appeal of purchasing a house diminishes relative to renting, largely due to financial challenges faced by households. The accumulation of equity based on the appreciation of house prices prior to the crisis, or the confidence generated by rising house prices that led to increased expenditure, ultimately exacerbated households' financial difficulties and reduced their motivation to engage in long-term financial commitments such as buying a house. As previously mentioned, these dynamics were particularly pronounced during the global financial crisis of 2008, which was primarily driven by a substantial decline in house prices and the associated impact on households' perceptions of their housing wealth. Consequently, this effect translated into a prolonged period of weak demand.

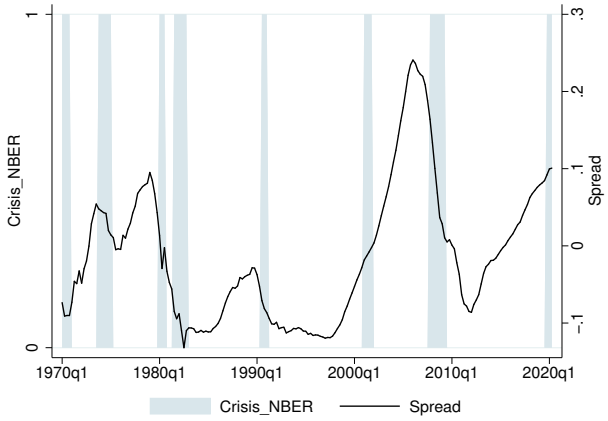


Figure 2.4: House price-rent spread and NBER crisis variables for the United States

2.3.3 Housing Spread Shock Identification

To evaluate the effects of the housing spread shock and credit frictions on consumption patterns, we start with the description of the empirical strategy. As the theory implies, we deal with the endogenous relation-

ship between consumption and housing choice. To alleviate the endogeneity problem, we identify 'shocks' to the housing spread and credit (and its determinants). Rather than constraining the contemporaneous responses with traditional Cholesky decomposition, we instead identify a shock by imposing longer-horizon restrictions (Ramey (2016)).

To be more precise, we identify shocks for the house price-rent spread and credit by running country-by-country autoregressive distributed lag regressions, controlling for household consumption dynamics, house price-rent spread, and all variables associated with credit frictions. Our identification strategy is similar to the exercise done in the seminal paper by Gertler and Gilchrist (2018) and in line with the estimation method suggested by Shapiro and Watson (1988). We identify shocks as orthogonal residuals to consumption dynamics, housing spread, and credit variables, thereby making them surprise movements in those variables (see Appendix for detailed estimation results).

Our key relationships, summarized by the equations in (2.16), describe how the housing spread, credit (borrowing) frictions, and consumption depend on each other. The empirical counterpart equations (2.20) and (2.21) summarize our empirical identification strategy for the spread and credit (borrowing) variables:

$$\mathcal{S}_{i,t} = \alpha_i + \sum_{h=1}^{4} \rho_{1,i,h} \mathcal{S}_{i,t-h} + \sum_{h=1}^{4} \gamma_{1,i,h} \Delta \ln Cr_{i,t-h} + \sum_{h=1}^{4} \omega_{1,i,h} \Delta \ln C_{i,t-h} + \mu_{i,t} \tag{2.20}$$

$$\Delta \ln Cr_{i,t} = \beta_i + \sum_{h=1}^{4} \rho_{2,i,h} \mathcal{S}_{i,t-h} + \sum_{h=1}^{4} \gamma_{2,i,h} \Delta \ln Cr_{i,t-h} + \sum_{h=1}^{4} \omega_{2,i,h} \Delta \ln C_{i,t-h} + \varepsilon_{i,t}, \tag{2.21}$$

where $\mathcal{S}_{i,t}$, $Cr_{i,t}$ and $C_{i,t}$ stand for the house price-rent spread, credit and household consumption variables, respectively. We regress house price-rent spread $\mathcal{S}_{i,t}$ during each time period on four lags of itself, on four lags of household credit change $\Delta \ln Cr_{i,t}$, and four lags of the change in quarterly household consumption $\Delta \ln C_{i,t}$ (equation (2.20)). We also repeat the same procedure using the household credit change

instead of the house price-rent spread on the left side of the equation (2.21). As already mentioned, the most important piece of information comes from the residuals matrix as we interpret them as shocks to the house price-rent spread and credit change, which cannot be explained by the lags of house price-rent spread, credit change, or consumption dynamics. The residuals in these regressions should also be interpreted as 'innovations' in analyzed variables that are orthogonal to fluctuations in consumption and to each other.

Drawing from the insights in Section 2.2, shocks to the housing spread should encapsulate households' expectations about future housing wealth (prices), stemming from factors akin to 'animal spirits,' which are not reflected in the fundamentals. Given that borrowing frictions can exacerbate this effect, we must also account for credit dynamics. Our empirical approach is best understood by considering the consumption equation (2.13) and the shadow price of the borrowing constraint (2.5). There are three underlying sources of dynamics driven by changes in consumption, interest rates, and house prices, which are encapsulated by the spread variable, encompassing both house prices and rental rates. After controlling for co-movements, we isolate orthogonal residual terms, which are interpreted as shocks to the housing spread and credit.

Furthermore, it is important to acknowledge the inherent volatility and noise in the $\ln Cr_{i,t}$ variable. To mitigate this, we opt for a moving average approach that considers the preceding four periods, along with the current level of the variable, to estimate changes in credit.[15] Finally, in exploring potential connections between the housing spread and credit shocks, we employ the panel Granger causality test introduced by Juodis et al. (2021). The results presented in Appendix Table A.8 indicate that the credit shock does not exert a causal influence on the house price-rent spread. Conversely, the reverse causal relationship holds true. Our principal variable, capturing households' expectations, demonstrates predictive power concerning the credit shock, affirming its significant role in driving aggregate fluctuations.

[15] Our qualitative findings remain unaffected when employing the original shock series; however, for visualization purposes, we employ the adjusted series as our baseline.

2.3.4 What Do Identified Shocks Capture?

To further motivate the importance of the housing spread shock and provide additional intuition, we present plots of the housing spread and credit shocks for major countries. In Figure 2.5, we display 4-period (1-year) moving averages of housing spread and credit shocks for the United States. We employ a moving averages approach to smooth the shocks, making them visually easier to inspect. Additionally, we overlay the consumer sentiment index and recession periods onto the graph to highlight common dynamics and facilitate the interpretation of our shocks.

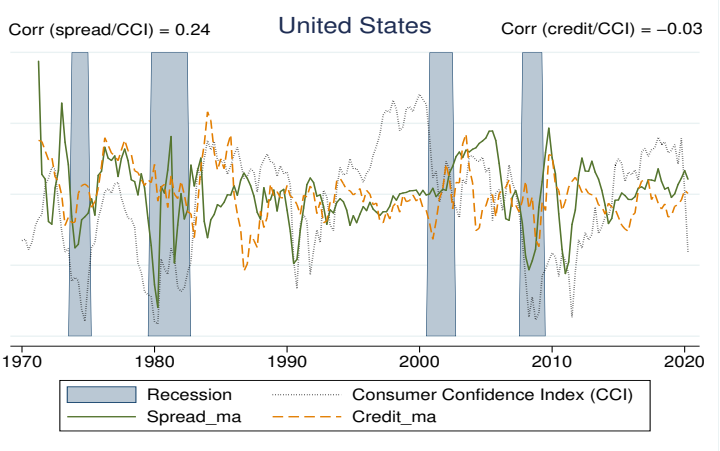


Figure 2.5: Recession, Consumer Confidence Index, Spread, and Credit smoothed (by moving average) variables for U.S.

From Figure 2.5, we observe that over the last 50 years, the United States has experienced four recessions. While these recessions may differ with respect to causes, three of them exhibit significant drops in both the consumer sentiment index and the housing spread shock variable. This observation suggests a connection between consumer sentiments and the housing spread shock, as households may be concerned about the value of their housing assets or their ability to purchase homes in the future. In contrast, the credit shock does not display a similar pattern of co-movement with consumer sentiment, especially during recessionary periods. This evidence supports the notion that our housing spread shock captures genuine variation in household expectations that contrib-

utes to explaining consumption fluctuations. Additionally, we examine the correlations between the time series of shocks and find consistent results, with no significant correlation between the credit shock and consumer sentiments.

However, a different pattern emerges for the housing spread shock, which exhibits a modest yet statistically significant correlation with the consumer sentiment index, considering the number of observations used. We replicate these analyses for other major economies, including Canada (Figure A.15), Germany (Figure A.16), France (Figure A.17), the United Kingdom (Figure A.18), Italy (Figure A.19), and Japan (Figure A.20), and find similar results. While the correlation between the credit shock and consumer sentiments appears somewhat stronger for some countries than for others, it generally remains weak. Conversely, the housing spread shock (household expectations about house prices) consistently exhibits a significant correlation with the consumer sentiment index for most of the analyzed economies. In summary, the housing spread shock often co-moves significantly with the consumer sentiment index, suggesting shared components, especially during recessions.

When examining our shocks, we observe variations in the correlation between the housing spread shock and the consumer sentiment index across different countries. To shed light on potential explanations for these differences, we turn our attention to the institutional setup within each country. As one alternative approach, we investigate the proportions of wealthy hand-to-mouth (HtM) households in each country, a concept inspired by Kaplan et al. (2014). This perspective is intriguing because wealthy HtM households play a pivotal role in our analysis. Wealthy HtM households typically possess substantial illiquid assets, such as housing, while facing constraints on their consumption. However, an increase in house prices enhances household wealth, enabling wealthy HtM households to utilize this newfound wealth to borrow and spend. Consequently, we anticipate that the correlation between the housing spread shock and the consumer sentiment index would be stronger in countries with a higher proportion of wealthy HtM households. Figure 2.6 illustrates this relationship by plotting countries based on their shares of wealthy HtM households and the correlations between

housing spread and credit shocks. Our findings from Figure 2.6 corroborate this expectation, revealing that the correlations between the housing spread shock (household expectations about house prices) and the consumer sentiment index are notably higher in countries with larger shares of wealthy HtM households. For instance, significantly higher correlations are evident in the United Kingdom and Germany, where the proportion of wealthy HtM households is relatively larger than in Spain or Italy.

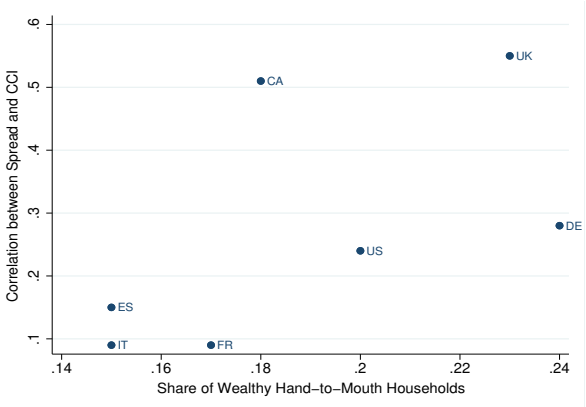


Figure 2.6: Shares of Wealthy Hand-to-Mouth households (Kaplan et al., 2014) and correlations between spread and consumer sentiment by countries. Correlations are estimated for the period between 1995 and 2020 to maintain consistent results between countries.

2.3.5 Shocks in the Regression Setup

After having identified shocks, we use them as explanatory variables in the fixed-effects panel local projections regressions (Jordà, 2005), thereby capturing responses of consumption changes to the housing spread (household expectations) and credit shocks. In order to stay in line with our theory, we start with a simple model in which the response variable is the quarterly household consumption expenditure changes observed for the 12 quarters and projected on the shocks and control variables, allowing for the horizon-specific parameters on all of them. More precisely, if we used a housing spread shock, then we control for the credit shock, and vice versa. For instance, if the housing spread shock

(household expectations) is our main interest, then we regress changes in household spending over the main shock (housing spread shock), also controlling for the change in credit shock and its lags. As the equations (2.22) and (2.23) show below, we run this procedure twice to capture separate household consumption responses over the housing spread and credit shocks:

$$\Delta \ln C_{i,t} = \beta_i + \sum_{h=0}^{1} \rho_{3,i,h} \mu_{i,t-h} + \sum_{h=0}^{1} \gamma_{3,i,h} \Delta \ln \varepsilon_{i,t-h} + \epsilon_{1,i,t}, \quad (2.22)$$

$$\Delta \ln C_{i,t} = \beta_i + \sum_{h=0}^{1} \rho_{4,i,h} \varepsilon_{i,t-h} + \sum_{h=0}^{1} \gamma_{4,i,h} \Delta \ln \mu_{i,t-h} + \epsilon_{2,i,t}, \quad (2.23)$$

where $C_{i,t}$, $\mu_{i,t}$ and $\varepsilon_{i,t}$ stand for the household consumption, house price-rent spread shock and credit shock variables, respectively.

It is of interest to compare the dynamics of the housing spread shock with its level. In the Appendix, we provide an account of how the identified housing spread shock behaves concerning the NBER crisis variable (refer to Figure A.3). We observe prolonged periods characterized by persistently positive shocks, marked by substantial volatility until the early 1990s and during the global financial crisis. These crisis periods are consistently linked to highly volatile episodes of the housing spread shock. Considering the persistence of the housing spread shock (as seen in Figure 2.4), we also investigate the potential non-stationarity of both the housing spread and credit shock variables. As detailed in Appendix Table A.7, the null hypothesis of a unit root in a panel setting is resoundingly rejected, providing empirical support for the subsequent analysis. We also conduct an extensive analysis on how our housing spread shock differs from what the literature has extensively used – a change in house prices – covering economic and statistical aspects in Appendix Section A.2.2.

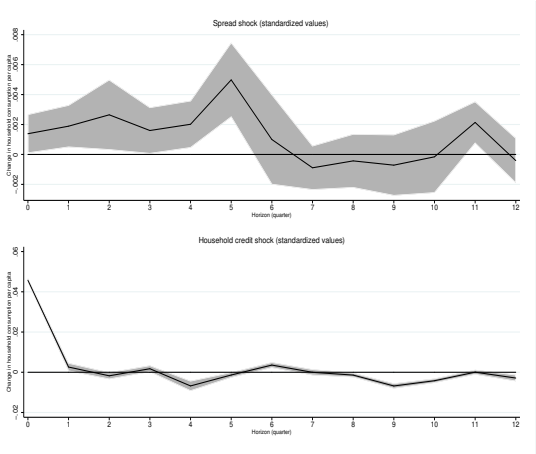
2.4 Baseline Results

We set out by summarizing the main empirical results. Our object

of interest is the theory-driven consumption equation (2.13), which decomposes consumption changes into household expectations regarding house prices (housing spread shock) and credit (borrowing) frictions. Since they are endogenously pinned down, we are dealing with orthogonalized shocks, described in Section 3.2 and depicted in Figure 2.7. It is of interest to explore whether there is sufficient explanatory power from each source after conditioning on the other. The upper graph demonstrates that an unexpected increase in household expectations concerning house prices, conditioned on the credit shock, significantly positively affects consumption, thereby making households more willing to consume and save less, reaching a peak in the fifth quarter, and almost entirely dissipating after six quarters. This effect comes from the fixed effects panel local projection with clustered standard errors at the country level (the shadowed area depicts 95% significance bounds).

The bottom graph of Figure 2.7 shows households' consumption responses to the credit shock. Compared to the household expectations about house prices, the main difference is that credit affects consumption instantaneously and the effect stays only for a quarter. It is clear that the two sources of consumption drivers are very different qualitatively: household expectations regarding house prices are more persistent and last longer, whereas changes in credit are significant, as shown in extensive literature (Aron et al., 2012; Mian et al., 2013; Mian and Sufi, 2018), but very short-lived.

Having seen that the housing spread shock displays a more persistent effect on consumption than the usual suspect, credit frictions, one may wonder what alternative interpretation one could attach to it. Since we control for rental rates (fundamentals) in constructing the housing spread variable, the orthogonal shocks collected in our empirical framework can be seen as household expectations about the future worthiness of housing assets. In other words, both the theory (see Propositions 1 and 2, and Corollary 4) as well as the shock identification strategy, allow us to interpret the housing spread shock as the possibly persistent component, driven by household expectations and leading to the formation of housing bubbles. To test this idea, we collect the consumer confidence index – a standard indicator for consumer expectations – and estimate



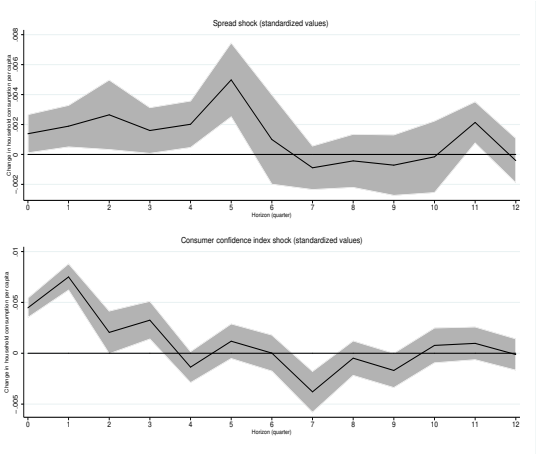
Note: A fixed effects panel regression with horizon-specific intercepts is used to estimate local projections. Standard errors are clustered by countries.

Figure 2.7: Impulse responses for aggregate household consumption spending

shocks, using the same identification strategy, given in equations (2.20) and (2.21). The only difference is that we are now using changes in the consumer confidence index instead of the house price-rent spread. We collect and visualize consumer confidence index-related results in Figure 2.8.

To ease the comparison, the upper graph of Figure 2.8 replicates the same housing spread shock (household expectations) effect on consumption as in Figure 2.7, whereas the lower graph depicts the impact of the consumer confidence index shock. Unlike the housing spread shock, a consumer expectations shock moves households' consumption earlier but, unlike the credit shock, the effect is more persistent and exerts a positive impact for at least three quarters. The magnitude of the effect due to the consumer confidence shock is smaller than that of the housing spread shock, but standard deviations also differ between these variables,[16] thereby somewhat complicating the comparison of effects. Nonetheless, the two variables cause a qualitatively comparable response in household consumption spending.

[16]Descriptive statistics in Table 2.1 shows 40.82 as the standard deviation for the housing index and 1.81 for the consumer confidence index.



Note: A fixed effects panel regression with horizon-specific intercepts is used to estimate local projections. Standard errors are clustered by countries. The consumer confidence index is used as the alternative and comparison to the house price-rent spread variable. Norway is missing in this estimation due to the lack of data on consumer sentiments.

Figure 2.8: Impulse responses for aggregate household consumption spending (consumer confidence index shock instead of the house price-rent spread)

After showing similarities between consumer sentiments and housing spread shocks, it becomes easier to interpret the local projection results given in Figure 2.7. Consumer sentiments usually behave as a variable that grows persistently and the same is expected from household expectations regarding house price. It takes 4-5 periods to build household expectations that affect household consumption. To put this in context with real data, the gap between house prices and rental rates was growing for some time and it started moving in the opposite direction just before the financial crisis (see Figure 2.4), indicating a potential downturn in household consumption. Moreover, as consumer sentiments do not switch immediately, they took 4-5 quarters to adjust in this case.

It is also important to mention that the consumer confidence index captures expectations that can be driven by many different factors – income, wealth, general economic conditions, and others. In contrast, the house price-rent spread shock captures household expectations that are closely driven by their housing wealth, yet are orthogonal to credit

and consumption changes. Though the spread variable is an indirect measure of expectations, it is cleaner than other alternatives due to orthogonalization and, unlike sentiment or confidence indexes, is easy to construct for a larger number of economies.

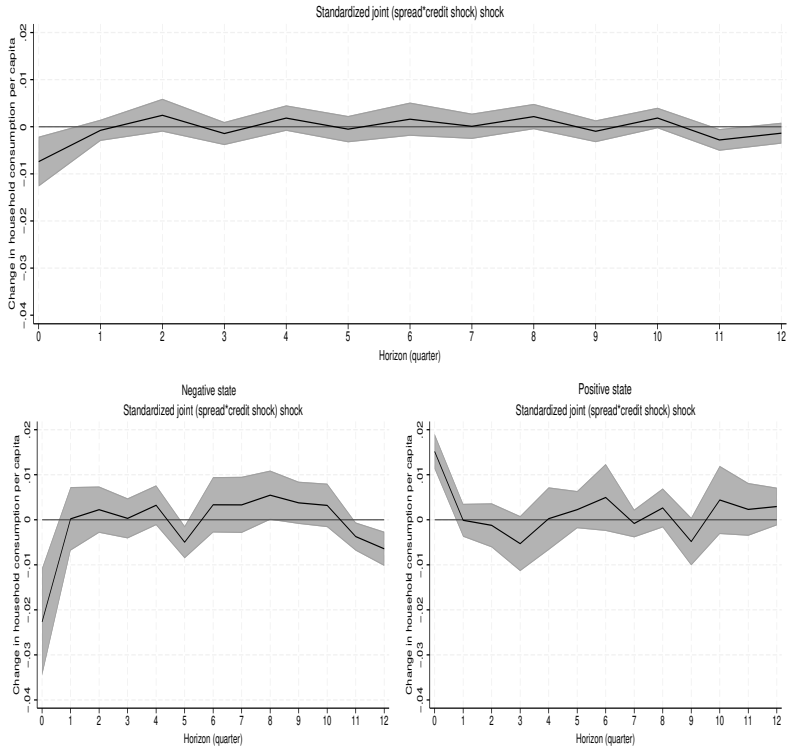
2.4.1 Joint Effect and State Dependence

To identify joint and state-dependent effects, we divide consumption reactions into periods of growth and decline. To achieve this, we establish criteria for defining 'positive' and 'negative' states. A 'positive state' is identified if two conditions are met. First, household credit should increase (credit growth should be higher than zero). Second, house price growth should surpass the rental rates in the same quarter. In essence, house prices should grow at a faster rate than rental rates, moving away from the rental rate's trend. Conversely, 'negative states' are identified when the opposite of these two conditions holds true. Household credit should decrease, and the change in rental rates should exceed the growth in house prices. Having established these states, we can then examine whether household expectations, credit, and their joint effect (housing spread shock * credit shock) yield different reactions across these states.

Figure 2.9 visualizes the results. The top graph shows the outcome over all time periods, the left column summarizes effects over the 'negative state,' while the right column depicts results for the 'positive state.' Since the housing spread and credit shocks can have different scales in their values, simple interaction between variables will be hard to interpret in terms of magnitudes. We therefore standardize housing spread and credit shocks to have a mean of zero and the standard deviation of 1. In this case, an interaction variable will also be standardized and comparable with the individual shock results.[17].

Hence, when shocks happen simultaneously, controlling for individual (housing spread and credit) shock results, we find no additional amplification effect that the joint shock variable brings when looking at the top graph, which visualizes the joint effect over all time periods. However, we find evidence for asymmetric effects over different states of the

[17]Results of replicated Figure 2.7 without standardized housing spread and credit shocks, and without credit shock modelled in moving averages are given in Appendix Figure A.4 and Figure A.5. They show much the same dynamics as in Figure 2.7



Note: Fixed effects panel regression with horizon-specific intercepts is used to estimate local projections. Standard errors are clustered by countries. Interaction variable is given as a product of standardized housing spread and credit shocks. First column shows local projections identified for the period when the housing index grows more slowly than the rental rate index. Alternatively, second column displays results over the positive time periods when the housing index grows faster than the rental rate index.

Figure 2.9: Household consumption responses by states (with standardized shocks)

economy, as presented in the bottom graphs of Figure 2.9. The graph on the left summarizes the results for the negative state. When household credit growth is negative and rental prices grow more than house prices, an immediate drop in consumption due to both shocks acting together is documented in the first quarter. Additionally, a smaller drop is also captured in the fifth quarter.

In the positive state of the economy, the joint effect also materializes

and brings the opposite dynamics. This means that positive expectations about house price growth and growing household credit increase consumption in the first periods. However, it is important to highlight that the magnitudes of joint effects happening in 'positive' or 'negative' states are different and generate asymmetries across the states. Moreover, we empirically demonstrate asymmetry in reactions to positive and negative shocks. Finally, we show that household expectations and credit frictions simultaneously explain an important part of the consumption dynamics.

2.5 Extensions and Discussion

2.5.1 Determinants of Borrowing Frictions

As we discussed briefly in Section 2.2, the drivers of borrowing frictions can include interest rates, driven by domestic as well foreign financial markets and monetary policies. It all depends on the development of the local financial markets and the importance of the global component (U.S. monetary policy) on the local financial conditions (e.g., Miranda-Agrippino and Rey, 2020).

To see the role of home and foreign interest rate shocks, we will explore long-term rates. To analyze the interest rate channel, we employ the same procedure we used in (2.20) and (2.21), and identify housing spread and credit shocks. As an additional control, we include four lags of changes in domestic long-term interest rate ($i_{i,t}$) and re-estimate housing spread (2.5.1) and credit (2.5.1) shocks. Moreover, we identify a domestic interest rate (monetary policy) shock by regressing its change on four lags of itself, on four lags of household credit change, four lags of house price-rent spread, and four lags of the change in quarterly household consumption (2.5.1). Finally, we repeat the same procedure twice to account for the domestic and US interest rate shocks separately.

$$\mathcal{S}_{i,t} = \alpha_i + \sum_{h=1}^{4} \rho_{1,i,h}\mathcal{S}_{i,t-h} + \sum_{h=1}^{4} \gamma_{1,i,h}\Delta \ln Cr_{i,t-h} + \sum_{h=1}^{4} \omega_{1,i,h}\Delta \ln C_{i,t-h} +$$

$$\sum_{h=1}^{4} \eta_{1,i,h}\Delta i_{i,t-h} + \mu_{i,t}, \quad (2.24)$$

$$\Delta \ln Cr_{i,t-h} = \beta_i + \sum_{h=1}^{4} \rho_{2,i,h}\mathcal{S}_{i,t-h} + \sum_{h=1}^{4} \gamma_{2,i,h}\Delta \ln Cr_{i,t-h} + \sum_{h=1}^{4} \omega_{2,i,h}\Delta \ln C_{i,t-h} +$$

$$\sum_{h=1}^{4} \eta_{2,i,h}\Delta i_{i,t-h} + \varepsilon_{i,t}, \quad (2.25)$$

$$\Delta i_{i,t-h} = \nu_i + \sum_{h=1}^{4} \rho_{3,i,h}\mathcal{S}_{i,t-h} + \sum_{h=1}^{4} \gamma_{3,i,h}\Delta \ln Cr_{i,t-h} + \sum_{h=1}^{4} \omega_{3,i,h}\Delta \ln C_{i,t-h} +$$

$$\sum_{h=1}^{4} \eta_{3,i,h}\Delta i_{i,t-h} + \epsilon_{i,t}. \quad (2.26)$$

We analyze household consumption dynamics by including the domestic and US long-term interest rate shocks separately. The findings are documented in Appendix Figure 2.10. One may argue that the short-rates better capture borrowing conditions for the households who use the banking sector to take mortgages and extend shorter-term credit. Long-term rates, on the other hand, include a market-based forward-looking component, which is an important determinant for a long-term financial commitment such as a mortgage.

We find that consumption responds similarly to the housing spread and credit shock and supports the baseline results even after including changes in the interest rates. In addition, domestic and US long-term interest rates shocks deliver highly similar outcomes, at least indirectly confirming the prominent role of US monetary policy for international consumption dynamics. Viewed through the lenses of the domestic and US long-term rate's impact, the 'boom-bust' dynamics are preserved for both cases (see Appendix Figure 2.10).

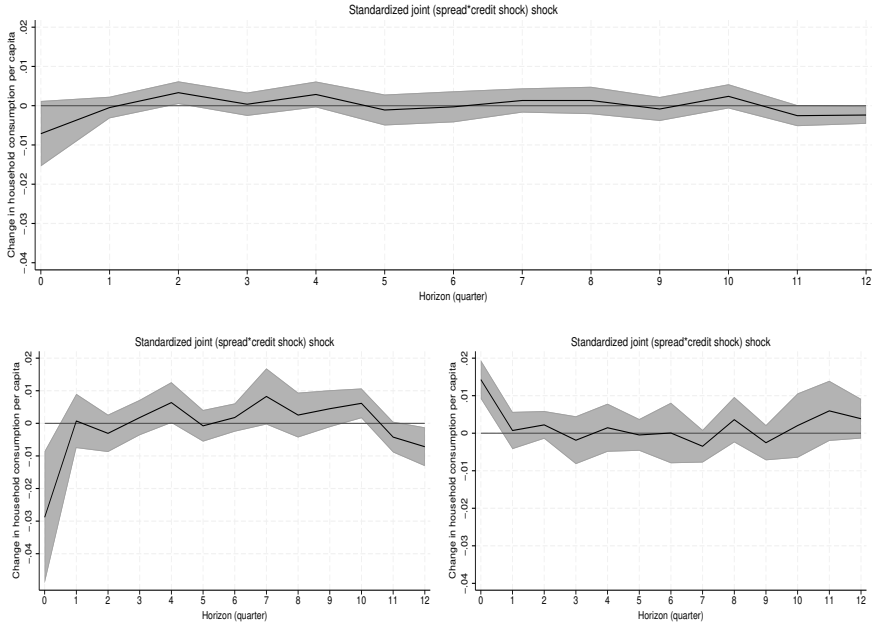
As is clear from the bottom graphs in Figure 2.10, consumption responds quickly, and the effect is not as short-lived as was the case for the household credit shock. More precisely, the interest rate shock

delivers a positive impact in the first three quarters, though it turns into a strong negative effect in the sixth quarter, resembling changes in the relative price of inter-temporal consumption smoothing. The same dynamics hold for both cases – either analyzing a domestic or US long-term interest rate shocks. In addition to the Euler-equation-driven explanation, changes in credit conditions amplify the effects of household expectations about the future value of house price. Similarly, Mian et al. (2017); Mian and Sufi (2018); Kaplan et al. (2020) explain the 'boom-bust' episodes over consumption by the credit market liberalization, credit expansion, larger debt, and sudden stops, leading to severe contractions. In other words, credit market liberalization and monetary policy changes, in terms of interest rates, stimulate household credit expansion, followed by an increase in household spending, which eventually reverses after some periods and creates a 'boom-bust' situation in the aggregate demand.

2.5.2 The Role of Uncertainty

Having shown that the household expectations is a useful measure to capture changes in consumption dynamics as well as the asymmetric effects that particularly happen during different states, we extend the baseline model to account for uncertainty. We base our empirical investigation on the theory extension, covered in Section 2.2.6 and summarized in the equation (2.18).

Instead of assuming exogenous processes for interest rates and house prices, we impose parametric restrictions on consumption and interest rates as well as consumption and house prices. Following Hansen and Singleton (1983), we assume conditional Normality which allows us to derive closed-form expressions that additionally feature measures of uncertainty. In other words, consumption growth, unlike standard applications with precautionary savings, depends on the difference between down-payment and rental rates, $\left|\chi Q_{i,t} - R^H_{i,t}\right|$, and thus also on the spread, $\mathcal{S}_{i,t}$, as well as a nonlinear function capturing long-term averages of house price growth rates and interest rates, the conditional variability of consumption growth rate, the house prices growth rate, and the interest rate. The latter ingredients capture uncertainty regarding all



Note: A fixed effects panel regression with horizon-specific intercepts is used to estimate local projections. Standard errors are clustered by countries. Before estimating shocks, household credit is estimated over the country-specific and U.S. long-term interest rate and the exchange rate to U.S. dollar. Therefore, only that part is collected and used as the long-term interest rates or the exchange rate-induced change in the credit shock. The left column identifies results based on country-specific long-term interest rates, the middle one is based on results from U.S. long-term interest rates and the right column is based on results from the regression with the exchange rate.

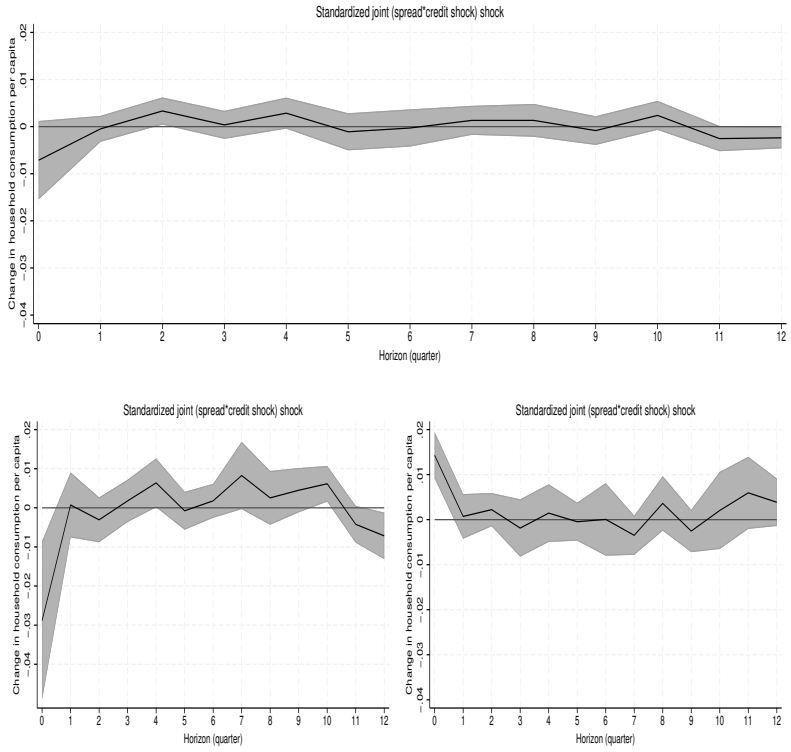
Figure 2.10: Impulse responses for aggregate household consumption spending (exchange rate, country-specific and U.S. long-term interest rates-induced changes in credit)

forward-looking variables. See Appendix A.2.5 for technical details.

When conducting the empirical analysis, we extend the baseline specification and include three new variables, namely macroeconomic uncertainty, monetary policy uncertainty, and housing uncertainty, proxying theoretical counterparts, i.e. variances of consumption, interest rates, and house prices.[18] Figure 2.11 replicates analysis of the joint shock across states, as was done in Figure 2.9.

[18]Table A.10 describes the variables and their sources.

The claim in Lemma 2.2.2 remains confirmed. We also find additional evidence that the negative state leads to stronger changes in consumption. It appears that once we control for uncertainty, the negative state (bottom left graph) exhibits a larger joint effect than before. Qualitatively, the impact of the joint effect remain similar and statistically significant in the positive state even after controlling for additional uncertainty measures.



Note: Fixed effects panel regression with horizon-specific intercepts is used to estimate local projections. Standard errors are clustered by countries. Interaction variable is given as a product of spread and credit shocks. First column shows local projections identified for the period when the housing index grows slower than the rental rate index. Alternatively, second column displays results over the positive time periods when the housing index grows faster than the rental rate index. Local projections are controlled for macroeconomic Jurado et al. (2015), monetary policy Baker et al. (2016) and housing Mack et al. (2011) uncertainty measures.

Figure 2.11: Household consumption responses by states (controlled for different uncertainty measures)

2.5.3 The Role of Heterogeneity

Further, we examine how the heterogeneity among countries may impact the results. To explore this, we categorize the countries into subgroups: advanced economies and catching-up economies. Additionally, and consistently with our focus on household consumption, we classify countries based on their levels of household consumption per capita. This approach allows us to analyze whether the economic dynamics observed in our baseline results vary across different levels of economic development and household consumption.

The findings, presented in the Appendix Figure A.26, reveal that the overall dynamics of the baseline results remain consistent across the different subgroups. This qualitative consistency suggests that the initial conclusions of our analysis are robust across varying economic contexts. Nonetheless, we observe some differences in the persistence and magnitude of effects between advanced and catching-up economies.

For advanced economies, the dynamics and effects of housing spread and credit shocks exhibit greater persistence over time. This stability could be attributed to well-developed institutions and better policy frameworks in these economies, which enhance their ability to absorb and mitigate economic shocks effectively. In contrast, catching-up economies display stronger ("spikier") and more immediate reactions in both directions in response to shocks.

These differences can arise due to the relative underdevelopment of institutions in catching-up economies, which may lead to more pronounced fluctuations in response to external shocks. Additionally, the lower economic resilience and adaptability level in these economies could contribute to the heightened sensitivity observed. From a practical perspective, our findings are qualitatively confirmed across different country groups, but the magnitude and persistence of effects vary depending on economic heterogeneity.

2.6 Robustness Checks

To evaluate the robustness of our baseline results, we investigate various dimensions. Firstly, we assess the stability of local projections while con-

sidering the influence of past consumption. To explore this, we include an additional four lags of change in consumption when calculating local projections. The results are presented in Appendix Figure A.6, demonstrating the consistency of our findings across different lag structures.

We also account for unobserved heterogeneity by including time fixed effects as additional controls in our baseline local projections. The summarized results are presented in Appendix Figure A.7, which further confirms the robustness of our baseline results. Importantly, the incorporation of additional time fixed effects does not substantially change the initial dynamics or the response of household consumption to household expectation and credit shocks.

Furthermore, we investigate the possibility of non-linearity by introducing an interaction variable, which is the joint product of house price-rent spread variable and credit changes, into our shock identifying equations 2.20 and 2.21. The results, as depicted in Appendix Figure A.8, offer further confirmation of the stability of our initial baseline findings. Importantly, the inclusion of this interaction variable does not significantly diverge from our original baseline results.

In addition, we also examine a possible endogeneity that could be considered among the variables of our estimation procedure. To support this, we perform additional robustness checks by including the US stock market, as a proxy for financial market expectations, and the principal component (as a proxy for the global component) between the changes in the consumption, credit and house price-rent spread variables in the baseline local projections. The results in Appendix Figure A.24 include controls for changes in the US stock market and support the baseline results by producing a very similar dynamic. Another set of results is shown in Appendix Figure **??** and controls for changes in the principal component between consumption, credit and household expectations. Hence, the baseline results hold, while the response of household consumption to the credit shock is found to be more persistent and negative, lasting between 1 and 6 quarters.

2.7 Concluding remarks

This chapter has continued to analyse the relationship between hous-

ing, household beliefs about future house prices and private consumption. Therefore, the analysis is based on the small theoretical model, which is also motivated by the following empirical estimates.

More precise, we build on the recent demand side and household balance sheets literature, which suggests housing as the essential factor in explaining household spending fluctuations. We developed a stylized model with the household sector, borrowing frictions, and the role of expectations regarding houses' future worthiness. Instead of merely looking at house prices or credit dynamics, we derive a theory-consistent housing spread shock variable, defined as an unexplained deviation between house prices and fundamentals (rental rates). The spread is allowed to vary over time and react to changes in house prices, rental rates, and credit conditions. The housing spread variable is forward-looking and resembles a measure of expectations about the future housing market.

However, unlike traditional sentiments' measures, which come in various forms, time frames and are rooted in different methodologies, this model enables us to explore household consumption dynamics in 28 OECD economies over the last 50 years. The housing spread shock causes a very similar response in household consumption spending to the consumer confidence index, reflecting similar phenomena behind both. Compared to the credit shock, the housing spread shock is a qualitatively different source of cyclical fluctuations and delivers considerably more persistent effects on household consumption, whereas the credit shock produces an immediate strong effect and the following 'boom-bust' episodes, as found in the earlier literature.

Another important finding comes from the joint effect of borrowing frictions and household expectations. We find a substantial and asymmetric joint effect when both shocks (housing spread and credit) occur simultaneously, particularly in extreme situations like a 'negative state' when credit contracts and house price growth is slower than that of rent. This result highlights the significance of policy recommendations. When standard tools, such as monetary policy, are less effective, perhaps due to the effective lower bound, addressing credit conditions should be accompanied by policies that target expectations about the future state of the economy. We underscore how the two are interlinked and can-

not be analyzed or tracked separately. We observe detrimental effects of binding borrowing frictions and poor future expectations, as well as evidence of asymmetric effects for both shocks happening at once, again emphasizing the importance of monitoring and utilizing both measures to stabilize the real economy.[19]

We leave many important questions for future research. Our emphasis has been on the household sector, but the production side seems as important too. Changes in credit conditions and household expectations affect consumption and labor supply; both are of crucial importance for employers and their decisions. Another reinforcing mechanism can come from income (unemployment) risk and at least partly explain households' expectations effect. Adding an additional layer of firm expectations on future demand conditions and prices would also help draw more robust policy implications, enhancing our understanding of interactions between credit frictions, agents' expectations, and their joint impacts on real activity.

As this chapter presents a theoretical and empirical investigation into the potential mechanism through which house price dynamics influence private consumption, it does not assess the actual impact of this phenomenon. Consequently, the following chapter of the thesis focuses on this topic and estimates the marginal propensity to consume from an increase in real estate value.

[19]Recently, Gilbukh et al. (2023) proposed integrating the price-to-rent ratio into macroprudential policy to establish countercyclical loan-to-value ratios. While we support this policy direction, our research reveals more complex dynamics in the interplay between housing spread and credit. These factors tend to amplify each other during downturns, suggesting the need for future research to disentangle their individual effects for more robust policymaking.

3 Homeownership Status and its Effect for Housing Wealth-Consumption Channel in Europe

This chapter is based on the paper entitled "Homeownership Status and its Effect for Housing Wealth Consumption Channel in Europe" which is my individual work that is published in the *Journal of Economics and Finance*.

3.1 Introduction

The recent global financial crisis re-emphasizes the important effects coming from the demand side, household balance and particularly housing, as essential determinants of the consumption and business cycles. It also highlighted the importance of housing, and its value in explaining dynamics of households and the demand side overall. Over the last decade, many different authors have analyzed the relationship between house price and consumption dynamics theoretically and empirically. Moreover, since authors have tried to evaluate the macroeconomic impact of housing wealth on consumption (see Muellbauer and Williams, 2011; Carroll et al., 2011; and Aron et al., 2012, among others), it is still very little known about heterogeneity of the marginal propensity to consume (MPC) out of wealth. From the theoretical point of view, there are different channels how changes in house prices can affect household expenditures, while empirically many questions still remain unanswered. One part of the literature shows that in a permanent income model with infinitely-lived households, house prices do not play a role and do not affect consumption, as the positive endowment effect of higher current wealth is offset by the negative effect from a higher cost of living in the future (Buiter, 2008). In contrast, in a life-cycle model, homeowners who are likely to sell housing in the future have positive wealth effects as rising home values increase their current wealth by more than their expected cost of living (Sinai and Souleles, 2005). Furthermore, in a model with collateralized lending, an increase in house prices can have substantial effects on consumption. Higher home values directly loosen borrowing constraints by raising borrowing capacity. Moreover,

households near the borrowing constraint are more impatient and have higher effective discount rates, causing them to react more sharply to the positive endowment effect of higher current home values relative to the negative income effect of a higher cost of living in the future (Berger et al., 2018). This shows that no clear relationship can be found from the theoretical point of view and more detailed empirical analyses are needed to bring some conclusions. Therefore, by using a detailed household-level dataset linking household spending, wealth, income and house prices, I attempt to empirically identify the MPC out of housing wealth, to highlight heterogeneities based on homeownership status, and discusses possible mechanism through which home values can affect household expenditure.

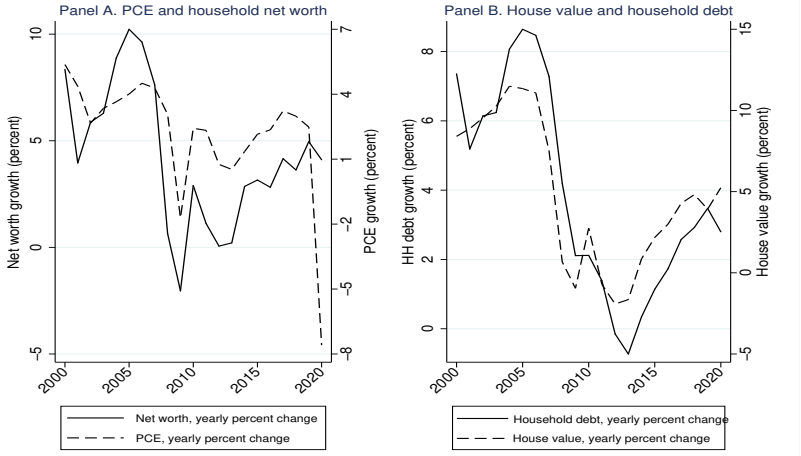
This paper is related to a broader theoretical literature studying the effects of housing wealth on aggregate spending, especially in the presence of collateralized lending. However, the advantage of my paper is the panel household-level dataset which allows me to capture personal changes in household consumption, income, social characteristics, homeownership status, and most importantly, housing value. These detail characteristics are important in order show heterogeneity between households and to capture specific mechanism. To support the need for detailed micro-level data, Barro (1976), Stiglitz and Weiss (1981), and Hart and Moore (1994) show that when borrowers are unable to commit to repayment, they can post collateral as insurance against default. Recent work by Berger et al. (2018) shows the channels through which the presence of collateralized lending amplifies the impact of housing wealth on consumption. In part, the larger consumption response in a model with collateralized lending reflects the direct effect of collateral constraints: higher house prices allow households at the constraint to borrow more. In addition, households near the constraint have higher effective discount factors, causing them to respond more sharply to the additional endowment of wealth today than the increase in the cost of living in the future. As I show at the end of the paper, a combination of the direct collateral effect and the larger endowment effect causes MPCs among households that are more likely to face borrowing constraints to be much higher, suggesting that aggregate effects are more in

line with those in a model including collateralized lending. Therefore, I contribute to the literature by i) creating new measure to estimate house price growth via the instrumental variable (IV) approach, ii) by estimating MPC out of housing wealth for European countries, and iii) by identifying heterogeneities and possible mechanisms among different households.

3.1.1 Literature

Many economists take housing markets as the best possible scenario for studying wealth and collateral effects on consumption. To support this and following Aladangady (2017), two main stylized facts on Europe are presented graphically. First, housing wealth is the largest part of household net worth, which moves closely with spending, as shown in panel A of Figure 3.1. As of 2019, the results from the Household Finance and Consumption Survey in Europe reported that household real estate wealth accounted for more than 50 percent of a household's net worth. More importantly, this statistic is more pivotal for younger households and those with less total wealth, as they often hold smaller amounts of financial wealth (Flavin and Yamashita, 2002; HFCS Network, 2020). Second, housing is one of the most commonly used sources of collateral available to households. Rising home values can loosen borrowing constraints for households near the collateral limit, allowing credit-constrained households to borrow against their homes in order to increase consumption (Aladangady, 2017). As shown by the right panel of Figure 3.1, rising home values in Europe are associated with increases in household debt. This relationship was crucial during the recent financial crisis, when substantial aggregate consumption losses during that time were related to the credit liberalization and expansion as well as overestimated expectations about house prices (Piazzesi and Schneider, 2016; Guerrieri and Uhlig, 2016).

Yet, separating causality from co-movements in the aggregate time series presented in Figure 3.1 is complicated and restricted by different situations that bring endogeneity. One of the examples can be that the household expectation about economic prospects is seen as the common factor which played a pivotal role during the recent financial crisis and



Notes: : Panel A shows co-movements between personal consumption expenditures and household net worth. Panel B shows similar co-movement between housing net wealth and loans to the household sector. *Sources:* National accounts, Main aggregates (Statistic Data Warehouse, ECB).

Figure 3.1: House Values, Spending and Household Balance Sheets in Euro Area

may jointly drive aggregate consumption and house prices at the same time. On the other hand, demographic trends as well as shifts in relative preferences for housing services may result in negative co-movement by capturing an increase in overall consumption, but also a drop in housing prices. Therefore, such a different scenarios and unobserved common factors make aggregate time-series correlations or even OLS regressions in microdata difficult to estimate and interpret (Aladangady (2017)).

The main idea of this paper is to estimate and identify the causal relationship between housing wealth, home value, and consumption. A number of researchers (Ludwig and Sløk, 2004; Case et al., 2005; Carroll et al., 2011), to mention a few, have found strong relationships between consumption and housing wealth in aggregate level, while the true nature of these relationships may be much more complicated due to different factors. For example, Attanasio and Weber (1994) argue that common factors such as income expectations may drive both housing and consumption demand. Similarly, in more recent work using microdata from the United Kingdom, Attanasio et al. (2009) finds a strong relationship between rising home values and spending of renters, evidence that com-

mon factors drive housing demand along with consumption of households with different kind of homeownership status. To catch other kind of heterogeneity, Campbell and Cocco (2007) use a synthetic panel approach to show that older homeowners have larger responses to changes in housing wealth relative to younger cohorts. They also show that predictable changes in national house prices drive predictable changes in consumption. This can be seen as an evidence that rising collateral values may loosen borrowing constraints. However, authors find this result for both renters and owners, suggesting that a common factor such as financial liberalization may be driving both spending and house prices. Therefore, it remains important to find new ways to use additional evaluation on housing as an instrument to estimate the robust and causal house price effect. This paper extends the existing literature by controlling better for common factors in order to better estimate and to identify the causal effect of house value on household spending.

After the recent financial crisis and sudden changes in values of household wealth, some of the literature took a better look and already tried to analyze MPC out of wealth in different countries. One part of the literature have tried to identify effects by modelling MPC and calibrating model by using results from the micro-level datasets. As an example, Caroll ant etc (2014) have studied European economies by calibrating their model with micro data from the Household Finance and Consumption Survey. Therefore, they estimated MPC out of wealth for 15 European economies and depending on the measure of wealth their model is matched, aggregate MPC tend to range from 0.1 to 0.4. In contrast to the modelling and calibration, other researchers have tried to find the robust ways to estimate MPC out of wealth by using different kind of instruments. In this case, Aladangady (2017) have estimated MPC out of wealth by using instrumental variable about the regional heterogeneity in housing markets and identified MPC at aroung 0.05 in U.S. Another research by Garbinti et al. (2020) also estimates MPC out of wealth in Europe by using instrument based on lagged price changes. Authors found that the estimated MPC out of wealth varies between 0.002 and 0.015 across 5 analyzed European countries (Belgium, Cyprus, Germany, Spain, and Italy). Therefore, as the following sections

will show, these results stand in line with the estimations I do in this paper. Additionally to these aggregated MPC results, many papers also identify heterogeneity between different groups of households, which is the case of this study as well.

While the administrative datasets used in the part of similar studies contain significantly larger samples, the household-level data used in this study offers some specific advantages that allow to improve understanding about the heterogeneity between households. One of the advantage is that household-level data allows me to compare households that vary in ownership status and exposure to borrowing constraints in order to better understand the mechanisms driving the relationship between housing wealth and spending. Secondly, while administrative data sources have lower reporting errors than surveys, they are not always designed to capture a complete picture of household spending. For example, credit card utilization is more cyclical than actual spending and may differ in areas with tighter borrowing constraints. Additionally, in contrast to the administrative datasets, household-level data offers the panel component which allows me to capture house price growth and consumption changes better. To complement the existing literature, Aladangady (2017) used a longer time-series, starting in 1986, to show a stable relationship between consumption and housing wealth over time. However, with this paper I contribute to the literature by concentrating on the post-financial crisis period and household level changes that occurred between 2010 and 2017. In this case, housing boom and bust periods are excluded to keep the focus on the questions of what households learned during this crisis, and whether or not housing wealth importance continued describing household behavior. Finally, differences in the specific instruments and sample used in this study may also help explain why some resulting MPC estimates differ or not from those found by other authors as Carroll et al. (2014), Garbinti et al. (2020), Mian et al. (2013) or Aladangady (2017).

This research enrich the current literature on the following manner. Firstly, it uses household level micro dataset and concentrates on the empirical results from the post financial crisis period. The richness of data and the panel component allows me to capture consumption,

income and housing wealth changes at the household level. Secondly, I use the additional information from interviewers to evaluate the dynamics and changes in housing values. Since the other studies have used geographically linked instrumental variables in U.S. (Saiz (2010), Aladangady (2017)) or lagged price changes as instruments in Europe (Garbinti et al. (2020)), there is still a lack of alternatives to estimate the robust MPC out of wealth in Europe. The instrumental variable suggested in this paper fills in this gap by providing robust MPC out of housing wealth in Europe, and that is discussed in detail in the later sections. Finally, the richness of dataset in this paper allows me to identify homeownership status as the source of heterogeneity between households. It also allows me to propose the possible channel between consumption and housing wealth primarily through the borrowing constrains and additional availability to borrow from the collateral.

The rest of this paper is structured in the following manner. Section II discusses the various datasets used in this study, including the HFCS, and an additional interviewers information about the housing valuation to create the instrumental variable. Section II also discusses empirical strategy and identifying assumptions that provide estimates of the MPC out of housing wealth. Section III discusses the main results and explores alternate mechanisms that may be driving the relationship between housing and consumption. Section IV concludes.

3.2 Data and Empirical Framework

3.2.1 Data

The *Household Finance and Consumption Survey* (HFCS). HFCS is based on a rotating panel of households, interviewed every three to four years. HFCS uses the household as the unit of observation, defined as a financially interdependent group of people living in the same home and making joint expenditure decisions. In reality, a home may contain different members of the household who make independent spending decisions on housing, food, and living expenses, though such occurrences are relatively rare and not included in the data. Currently, data from three HFCS waves is available to analyze and contains fragmented in-

formation from 2010, 2014 and 2017. In the first wave of HFCS, 15 countries participated, combining total responses from 68 627 households. In the next two waves, the number of countries and households increased slightly. The HFCS wave in 2014 included 20 countries and 84 611 households, while the latest HFCS wave from 2017 provides information about 21 country and 84 829 households. However, the core of this analysis is the panel component, thus limiting the pool of countries to those who provide the panel component. Therefore, the final sample shrinks to 13 countries and approximately 50 000 - 55 000 households in every HFCS wave. Finally, all the information on the household balance sheet, spending, income and wealth is in yearly measures (i.e. yearly expenditures, yearly income) and deflated by CPI. Table 3.1 provides summary statistics on the sample used.

HFCS data provides information about house values that are self-reported by the households. Additionally, yearly income values are adjusted to approximate taxation in different countries in order to get after-tax values. Finally, consumption measure is constructed using respondents' information about their monthly spending on food. To complete the picture, total expenditures are estimated by using additional information from the Household Budget Survey on the shares of food at home and outside expenditure by income quintiles. Detailed household-specific information (i.e. age, education, marital status, number of persons in household) is also available from HFCS data to analyze and control for side effects. The cross-section part of the data remains important to understand, as two different country pools are used in the the analysis. Generally, the analysis is focused on the 13 countries which provide the panel household component between different survey waves. The country pool includes Belgium, Cyprus, Germany, Estonia, Spain, Finland, France, Italy, Latvia, Malta, Netherlands, Poland and Slovakia. However, the instrumental variable estimation is limited to 6 countries (Belgium, Cyprus, Estonia, Italy, Latvia and Malta) due to the special information that is necessary for the estimation but is held confidential by most of the countries.[20] The variability and representation that

[20]These 6 countries are analyzed due to availability of information that is publicly unavailable but was kindly provided by the national institutions of particular countries. Other European countries are excluded from analysis because of issues with

comes with this subgroup of 6 countries is summarized in Appendix A.12, as it shows the percentage of homeowners in these countries and other household characteristics. Lastly, all the estimations clearly highlight which pool of countries is particularly used and robustness checks are run to show results being independent from the country selection.

Table 3.1: Household Finance and Consumption Survey Summary Statistics

	Panel countries	Panel countries (with IV variables)
After-tax income (annual)	37454.03	27628
Total expenditures (annual)	34250.42	29231.7
Home value (if owner)		
Self-reported	238066.1	218025.1
Percentage owners	52.48	58.27
Percentage owners w/mortgage	74.82	74.28
Age	56.15	57.43
Family size	2.48	2.53
Number of countries	13	6
Observations	79,363	28,157

All values are reported in 2015:I euros.

Table 3.1 shows that the average after-tax income was 37 454.03 EUR among the panel set of 13 European countries. At the same time, average total expenditures reached the average value of 34 250.42 EUR. However, values remain lower if we are looking only at the pool of 6 countries that are used for IV estimation. The average after-tax income was 27 628 EUR among these countries, while the total expenditures reached as high as 29 231.7 EUR on average and exceeded the average income. It is possible that this signifies an increase in values of household consumption loans, to compensate for exceeding consumption. On the other hand, it is hard to draw such a conclusion due to a higher standard deviation for income than expenditures that is also captured in the data. Taking standard deviations into consideration, household annual income and expenditures stand on a similar level, but leave very little space for

panel dimension or too strict restrictions on providing publicly unavailable data.

savings on average. Calculations of the after-tax income can also slightly affect the precision of the income measure and create this unbalance with the value of average expenditures. Additionally, Table 3.1 indicates that the average house value between 2010 and 2017 was slightly higher than 238 000 EUR among the 13 panel countries and around 218 000 EUR if we consider only the pool of 6 countries that are used for IV estimation. Moreover, 52 to 58 percent of households tend to be owners without any mortgage, depending on the pool of countries, but the proportion of home owners reaches close to 75 percent in both situations if owners with mortgages are included. On top of these numbers, the following paragraphs provide a more detailed view of each segment - household *income*, *spending* and *housing wealth*.

Household Income. The household income measure is built from self-reported household information delivered in HFCS. It covers information about income from employment, self-employment, renting or financial investment, as well as from pensions, regular social and private transfers. Moreover, the sum of all household income is deflated by CPI and adjusted for the taxing system used in each country. Income tax is adjusted by using experimental statistics from Eurostat on distribution of direct and indirect taxes paid by households as a percentage of their gross income by income quintile. Using this measure allows me to use different income tax rates not only between countries but also within them, by using income quintiles. Finally, income changes for the same household between different survey waves is used for the final estimation to capture income effect on consumption. Results in Appendix A.11 provide an additional picture of household income dynamics over the analyzing period between 2010 and 2017. They show that in both pools of countries (either 13 panel or 6 IV estimation countries), after-tax income increased more than household expenditures or housing values. However, some heterogeneities are also identified from Appendix A.13, where results show some countries with significant increases in income during the period, while others even faced some decrease in household after tax income.

Household Spending. The household spending measure is estimated from the self-reported household members' information given in HFCS.

Every new wave of HFCS includes additional consumption questions, giving a better overall understanding of spending. However, to remain consistent throughout all three survey waves, I stick with the information that is provided since the first wave of HFCS. Therefore, total household consumption is estimated by using information about values of spending on food and drinks at home and adjusting it for the share of the consumption basket that is related to food and beverages by income quintiles[21]. With this exercise, I account for income-based differences, as a poorer household usually spends a higher share of its income on food than a richer one, and estimate total household spending based on information about food and beverage consumption at home. Like household income, spending is also deflated by CPI. Therefore, changes in total household consumption are captured for the panel households between different waves and only these households are used for the final estimation. From Appendix A.11, we can see that household expenditures were increasing in the period between 2010 and 2017, but at a lower pace than the average income. Finally, Appendix A.13 also shows heterogeneous household spending among different countries. There were countries like Cyprus that were strongly affected by the recent financial crisis and their household spending was slow to recover. However, a majority of the other countries faced an increase and at least partially recovered their pre-financial crisis numbers in consumption.

Housing Wealth. Housing wealth is measured as the household's self-reporting of the housing as the main residence (HMR) value. HMR values are taken from the HFCS. On the one hand, these values represent how owners evaluate their residences but do not necessary reflect the similar values detected in the market at the time. On the other hand, these values are captured at the household level, their changes can be tracked via panel households, and they represent information necessary to understand individuals' consumption behavior. Like the previous measures, housing wealth is also deflated by CPI and changes in its values among panel households are used for the final estimations. Appendix A.11 shows that self-reported house values were increasing

[21] Shares of the consumption basket are taken from the results of the Household Budget Survey (HBS).

after the recent financial crisis, but also at a slower pace than household income. On top of this, Appendix A.13 also suggests heterogeneity in home value dynamics across different European countries, similarly to what was found for income or household consumption.

Instrumental Variable on Housing Value. However, housing values are likely to result in a biased estimate of the causal effect of housing wealth on consumption due to the endogeneity problem. In order to solve this, instrumental variable (IV) is used, as explained in more detail in the following chapters. Therefore, the key to the IV method is to find a variable that will be correlated with housing values but does not directly affect consumption growth. The HFCS dataset provides the possibility of generating a variable that fulfills all the above-mentioned requirements. In this paper, interviewers' external evaluation of housing is used as an IV variable. To explain in detail, after each survey, interviewers are asked to answer some questions about respondents' housing. This means that interviewers make their first-impression evaluations about the housing belonging to the respondents. Such an evaluation is exogenous from any household (respondent) expectations about its future consumption changes. The questions that are used to create the IV variable are listed in Appendix A.15. As we can see from Appendix A.15, interviewers' answers can be ranked and used as a categorical variable. In every question, a lower rank is associated with a higher value of the housing. Therefore, the sum of these answers is used as the IV variable for later calculations. In other words, all the answers are added up and their sum is taken as the synthetic variable representing the interviewers' evaluation of housing. Distribution of this synthetic instrumental variable is shown in Appendix A.27 and is close to the normal distribution. Moreover, from Appendix A.28 we can also see how values of IV are connected to the average housing wealth among households. It shows that the lowest sum of the synthetic IV is associated with the highest value of the housing and vice versa. What is more, such a synthetic variable does not allow me to estimate the exact values of housing, but it captures the variation of it, which is the main purpose of a good IV (Stock, 2001). Finally, IV estimation is limited to 6 countries (Belgium, Cyprus, Estonia, Italy, Latvia, and Malta) as only they were able to

share non-publicly available information about interviewers' post-survey evaluations of housing. Moreover, only panel households are used in the estimation in order to capture changes between time periods for the same households. This limits the number of observations but also raises some questions about whether the used sample remains representative or not. To answer this, I looked at the household level sub-sample (used for IV estimation) and checked the distribution by income and wealth quintiles. Appendix A.29 shows that the distributions of households either by wealth or income quintiles in the country are close to normal quintile distributions. There is only a minor shift in favor of the wealthier quintiles. This means that the sub-sample used for the IV variable is a good representation of results country-wise. To summarize, I also show distributions of households by wealth and income quintiles in the euro area. Appendix A.30 shows the distribution by income quintiles in Europe and suggests that the IV sub-sample is representative from the euro area perspective. However, household distribution by wealth quintiles in the euro area is much more concentrated on the wealthier side and makes the final conclusions more tentative from the euro area perspective.

3.2.2 Identifying the Effects of Housing Wealth on Consumption

Theoretical Background

Researchers have long been interested in the questions of the size of the housing wealth effect and how it affects household spending behavior, but a definitive answer has remained elusive. To study these questions, I follow the approach of Aladangady (2017) and consider a simple linearized relationship between growth in a household's real consumption, $\Delta c_{i,t+1} = \ln(C_{i,t+1}) - \ln(C_{i,t})$, and the growth rate of real housing wealth, $\Delta w_{i,t+1} = \ln(W_{i,t+1}) - \ln(W_{i,t})$, controlling for changes in household characteristics and after-tax income, captured by a vector $\Delta x_{i,t+1}$:

$$\Delta c_{i,t+1} = \alpha_1 \Delta w_{i,t+1} + \alpha_2 \Delta x_{i,t+1} + \epsilon_{i,t+1}, \tag{3.1}$$

where households represent the cross-section dimension, HFCS waves capture the time-series dimension, α_1 and α_2 stand for the estimated parameters, and $\epsilon_{i,t+1}$ is built from the normal distribution.

Since we are interested in α_1 as the MPC effect from the housing wealth, literature could suggest different expected outcome on it. Standard models of consumer behavior suggest that rising permanent wealth causes an increase in household spending (Friedman, 1957; Hall, 1978), but the relationship between housing service costs and home values complicates this result in the case of housing wealth, stemming from the differences between homeowners and renters. By living in his or her own apartment, a homeowner forgoes rental income on the property but at the same time saves on housing service payments, implicitly acting as both the landlord and tenant. If we consider house price to be determined by the present value of rental income, then increases in the home value that accrue to the landlord are met with a corresponding increase in the present value of rental costs to the tenant. The infinitely-lived owner-occupier is therefore perfectly hedged against fluctuations in home values over time (Buiter, 2008), and such a model would predict that the coefficient α_1 in (3.1) is zero.

This naturally raises the question of whether housing has a causal effect on spending. Planned changes in home size, due to life-cycle effects or other changes in preference for homeownership, may drive a wedge between the positive endowment effect of higher home values and the negative effect of higher future cost of living (Sinai and Souleles, 2005). For example, an older household planning to sell their home and downsize will have a net positive wealth effect since the value of their current home has risen by more than the cost of living in their future smaller home. This would result in $\alpha_1 > 0$ for these households. The opposite is true for younger renters who are likely net buyers of housing in the future and would be expected to have negative wealth effects resulting in $\alpha_1 < 0$ (Campbell and Cocco, 2007). However, unless there is a wedge between the MPCs of natural buyers and natural sellers, the wealth effect from rising home values is simply a transfer from buyers to sellers with little impact on aggregate spending.

Alternatively, collateralized lending may cause housing wealth to

have much larger effects on aggregate spending. Incomplete markets that limit a borrower's commitment to repay debt can give rise to collateralized lending (Barro, 1976; Stiglitz and Weiss, 1981; Hart and Moore, 1994). In such models, borrowers insure their lenders against default by pledging their homes as collateral, which can be seized in the event that the borrower fails to repay. Borrowing capacity is determined by the value of the home minus the liquidation costs for the lender, so rising home values may increase borrowing capacity and loosen borrowing constraints for households near a borrowing limit. Moreover, households near the borrowing constraint have higher effective discount rates, causing the positive endowment effect of current housing wealth to outweigh the negative effect on spending due to a higher future cost of living (Berger et al., 2018). Thus, such households are likely to have high MPCs and borrow against their homes to finance spending. In the aggregate, this collateral effect can have large impacts on spending, driven primarily by constrained households.

It is crucial to note that in this simple model in which housing wealth shocks affect spending, heterogeneous agents are unable to fully share idiosyncratic risk. Constantinides and Duffie (1996) and Cochrane (1991) show that in a model with a sufficiently rich class of assets, agents would be able to self-insure against idiosyncratic shocks to wealth, implying $\alpha_1 = 0$. The results of this paper, discussed in the following section, point to a positive impact of housing wealth on homeowner spending. One possible explanation for this breakdown in full risk sharing is that households are often unable to hold housing outside of their immediate locality and are generally unable to take short positions in housing. Furthermore, down payment constraints and search frictions may further limit a household's ability to own housing. Such barriers to participation likely limit cross-sectional sharing of housing market risk (Aladangady, 2017).

Transforming the Model to Estimate MPCs

Before discussing identification of consumption wealth effects, I first transform the model given by equation (3.1) to allow estimated coefficients to be interpreted as MPCs. Additionally, I also discuss the con-

struction of hypothetical housing wealth variables for renters that could be used as an alternative to better understand how renters respond to changes in house prices.

Firstly, the coefficient α_1 in equation (3.1) provides an estimate of the elasticity of consumption with respect to housing wealth. To make results easier to interpret and more comparable to much of the literature, I instead estimate the MPC out of housing by multiplying the growth rate of housing by the ratio of housing wealth to consumption for each household individually. This puts both the change in consumption and change in wealth in common units, allowing the coefficient between them to be interpreted as an MPC. Specifically, I follow the approach suggested by Aladangady (2017) and define $\Delta w^{MPC}_{i,t+1} \equiv \Delta \ln(w_{i,t+1}) \frac{median\_price_{i,t}}{C_{i,t}}$ where $w_{i,t+1}$ is the individual household-level housing value, $median\_price_{i,t}$ is the median housing wealth in every country by income quintiles in the previous period, and $C_{i,t}$, is the household's real expenditure in the previous period. Making this transformation ex ante for each observation prevents biases that may result from converting the estimated elasticity to an MPC ex post (Hall, 2009; Owyang et al., 2013; Ramey and Zubairy, 2014).

Defining $\Delta w_{i,t+1}$ in this manner also enables me to explore the effect of rising home values on renters who do not self-report the value of their homes. Specifically, renters are assigned the median housing wealth increase in their country and by their quintile of income. As will be discussed in Section III, renters are unlikely to have positive spending effects due to an increase in home values, and a positive coefficient on housing wealth for this subgroup would imply that common factors may be driving up both housing wealth and spending. By linking renters to a "placebo" housing wealth increase, I can test the sign of the coefficient in both the OLS and IV cases to better understand if the presence of common factors is being addressed by the IV strategy.

Given these adjustments, the transformed model is given as

$$\Delta c_{i,t+1} = \beta_1 \Delta w^{MPC}_{i,t+1} + \beta_2 \Delta x_{i,t+1} + \upsilon_{i,t+1} \tag{3.2}$$

Empirical Strategy and IV Estimation

Estimating equation (3.2) by simple OLS is likely to result in a biased estimate of the causal effect of housing wealth on consumption. For example, common factors, such as expectations about future productivity, may drive up aggregate demand, resulting in both increased consumption and higher house prices. Shifts in demographics or relative preferences for housing services and other consumption may lead to the opposite bias. Furthermore, causality may run in opposite as well: higher consumption of non-tradables may raise local employment and wages, leading to higher home values.

To address these sources of endogeneity, I follow Chaney et al. (2012), and Aladangady (2017) and instrument the growth in self-reported housing wealth using the synthetic variable constructed out of interviewers' answers about the respondents' houses, their condition and geographical position. My proposed instrument is different from the one used by Chaney et al. (2012), and Aladangady (2017) as similar housing supply elasticity variables[22] are not available for European countries. Moreover, the housing supply elasticity variable proposed by Saiz (2010) and interacted with the real 10-year Treasury rate could potentially lose its predictive power after the recent financial crisis due to the low interest rate environment during the last decade. The relevance of my instrument can be easily understood by thinking about an interviewer as an independent evaluator of the real estate. As discussed in Section 2, this IV variable is constructed from the questions that cover information about the geographical position in the country, house comparison between as well as within districts, evaluation of housing conditions inside and outside the building, and level of urbanization. This IV variable does not represent supply elasticity as the measure proposed by Saiz (2010), but it captures similar dynamics through the geographical position and urbanization level variables. House prices are expected to be higher in the city center in comparison to residential districts or villages. Housing value is also expected to be higher in highly urbanized places driven by demand side factors. Additional information about housing conditions also helps differentiate prices even within the same district. Finally, the

[22] Chaney et al. (2012), and Aladangady (2017) use geographic determinant-based housing supply variable proposed by Saiz (2010).

advantage of this IV variable comes from the fact that it is hard to argue that interviewers' evaluation of housing could be correlated with the dynamics of household expenditures. Therefore, following the instrumental variable approach, the magnitude of the house value response depends on the synthetic IV variable that I use.

The full model, including the first stage, can be described by the following equations and exclusion restrictions:

$$\Delta c_{i,t+1} = \beta_1 \Delta w_{i,t+1}^{MPC} + \beta_2 \Delta x_{i,t+1} + \upsilon_{i,t+1} \tag{3.3}$$

$$\Delta w_{i,t+1}^{MPC} = \gamma_1 IV_{i,t} + \gamma_2 \Delta x_{i,t+1} + \nu_{i,t+1} \tag{3.4}$$

$$cov(IV_{i,t}, \upsilon_{i,t+1}) = 0 \tag{3.5}$$

where $\Delta c_{i,t+1}$ is growth in household spending, $\Delta w_{i,t+1}^{MPC}$ is growth in house values adjusted as discussed previously, and $\Delta x_{i,t+1}$ includes a polynomial which takes into account the age of the household head, change in family size, growth in family income, real 10-year Government bond rate, and fixed country effects. Since the model is specified in growth rates, it allows for heterogeneity in consumption levels that may be driven by unobserved differences in household preferences or other factors (Aladangady, 2017).

The identifying assumption (5) is that $IV_{i,t}$, the synthetic instrumental variable, does not directly affect spending growth and hence has zero covariance with the error term, $\upsilon_{i,t+1}$, in equation (3.3). Intuitively, this implies that there is no systematic variation between household spending growth and interviewers' evaluation of respondent housing conditional on $\Delta x_{i,t+1}$.

Most of the literature criticises this approach, arguing that various determinants of consumption can be significantly correlated with the instrument. However, it is hard to argue that interviewers' opinions regarding housing conditions, its value and geographical location has an impact on household consumption behavior. It should remain as a good instrument by representing house value differences within households and staying absolutely independent from household consumption

behavior. However, the strength of the instrumental variable will still be tested in the following section.

Strength of the Instrumental Variable

In addition to exogeneity assumptions on instruments used, another important assumption is that the excluded instruments are sufficiently strong predictors of $\Delta w_{i,t+1}$. If the synthetic instrumental variable does not affect real house value, identification may be weak, resulting in non-normal asymptotic distributions of the 2SLS estimator and poor coverage probabilities of confidence intervals (Aladangady, 2017). Table 3.2 provides estimates from the first-stage regression of equation (3.4) using all homeowners in the baseline CES sample. The first line shows that the instrument – the synthetic variable – has a significant impact on changes in housing wealth if the sample is full or if only homeowners are analysed. In addition, the F-test for the excluded instruments, robust to clustering at the country level, exceeds the Pflueger and Wang (2015) thresholds for relative size and bias at the 5 percent level. To conclude, results in Table 3.2 suggest the instrument is both relevant and strong.

3.3 Results and Discussion

3.3.1 Consumption Response to House Value Changes

Considering the assumption that the exclusion restriction given by equation (3.5) is not violated, IV estimates of coefficient β_1 from equation (3.3) can be interpreted as MPCs out of changes in housing wealth. Furthermore, using external housing evaluation as an IV, I can estimate consumption responses across households with different exposures to credit constraints. These results provide me a valuable insight into the various mechanisms that drive the co-movement between housing wealth and consumption.

Baseline results shown in Table 3.3 describe the estimated consumption responses for different kind of homeownership - owners (with mortgage and without) and renters - using a simple OLS regression. Therefore, the results suggest that even if common factors may play a role in jointly driving housing wealth and consumption, there is a causal effect

Table 3.2: Effect of Excluded Instruments on Country-level Variables

	Housing wealth change	Housing wealth change
Synthetic Instrumental Variable	.017***	.023***
	(.003)	(.004)
Change in After-tax Income	.042**	.057**
	(.015)	(.019)
10-year Government Bond Rate	-.015	-.016*
	(.008)	(.007)
First Stage F-test (Montiel-Pflueger, 5 percent bias)	43.84	37.92
Sample	All sample	Homeowners
Estimation	OLS	OLS
Observations	13,173	10,321

Excluded instruments are household controls from baseline model (age, change in household members) and country fixed effects. Standard errors in parentheses are clustered at country level. The critical value for 5 percent Montiel-Pflueger test bias is 37.418.

of growing housing value on the consumption of homeowners, especially those with mortgages.

Results from OLS estimates suggest an MPC of 0.039 for the full sample (column 1). From columns 2-5 we can see that results do not significantly differ between owners and renters; the quantitative difference is minor. At the same time, MPC from income changes remains significant for all but differs between groups and suggests a higher consumption effect for owners compared to renters or owners with mortgage. This result, echoed in the literature, suggests that common factors can jointly drive housing demand and consumption of both owners and renters (Campbell and Cocco, 2007; Attanasio et al., 2009). An additional robustness check comes from the fact that results could be driven by different changes in credit standards across periods or by different income or wealth quintiles. Appendix A.17 shows that the baseline results remain similar and mostly driven by income and housing effects.

However, a possible endogeneity problem could bias the results. To deal with it, I used an IV variable which will be explained in more detail below. Therefore, the instrumental variable also placed restrictions on the sample, as it was not available by all countries. To be more precise, the subsample used for IV estimation includes Belgium, Cyprus, Estonia, Italy, Latvia and Malta. To make results comparable, the same estimation as in Table 3.3 was used based on the previously mentioned subsample. Results in Table 3.4 show a bit higher MPC out of housing which remains consistent between different homeownership groups.

By comparison, using the assumption that the exclusion restriction is not violated, the IV results address this source of endogeneity and provide an accurate estimate of the causal effect of changes in house prices on consumption. Results from the IV estimation, shown in Table 3.5, suggest a significant positive causal effect of house price changes on the spending behavior of both homeowners and renters. Specifically, homeowners without mortgages (column 4) have a positive and statistically significant MPC of 0.114. Moreover, the estimated MPC out of housing value stands in line with most of similar literature. The forthcoming paper by Graham and Makridis, ming estimated MPC out of housing wealth between 0.09 and 0.11 in U.S., Carroll et al., 2011

Table 3.3: Effects of Housing on Consumption: Baseline

	Baseline	Renters	Homeowners		
				Owners	Mortgage owners
	(1)	(2)	(3)	(4)	(5)
House value change	.039*	.041***	.038	.039	.041
	(.019)	(.011)	(.034)	(.037)	(.025)
Income change	.175***	.157***	.181***	.192***	.150***
	(.036)	(.050)	(.032)	(.036)	(.026)
Household controls	+	+	+	+	+
10 year government bonds	+	+	+	+	+
Sample	Pooled	Renters	All owners	Owners	Mortgage owners
Estimation	OLS	OLS	OLS	OLS	OLS
Observations	31,288	7,396	23,892	16,793	7,099
Clusters	13	13	13	13	13

Each row represents a separate regression of the variable on the real 10-year Government bond rate, country-level housing supply variable interacted with real 10-year Government bond rate, and country fixed effects. Median housing value is captured at the country level based on individual household answers about the values of housing that they live in.

Table 3.4: Effects of Housing on Consumption: Subsample

	Baseline	Renters	Homeowners		
				Owners	Mortgage owners
	(1)	(2)	(3)	(4)	(5)
House value change	.069*	.089	.065**	.069**	.057**
	(.026)	(.063)	(.021)	(.023)	(.019)
Income change	.249***	.250**	.249***	.266***	.196***
	(.051)	(.066)	(.048)	(.044)	(.040)
Household controls	+	+	+	+	+
10 year government bonds	+	+	+	+	+
Sample	Pooled	Renters	All owners	Owners	Mortgage owners
Estimation	OLS	OLS	OLS	OLS	OLS
Observations	13,173	2,852	10,321	7,816	2,505
Clusters	6	6	6	6	6

Each row represents a separate regression of the variable on the real 10-year Government bond rate, country-level housing supply variable interacted with real 10-year Government bond rate, and country fixed effects. Median housing value is captured at the country level based on individual household answers about the values of housing that they live in.

identified long-term MPC effect of 0.09 while Caroll and etc (2014) also estimated aggregate MPC out of wealth in Europe between 0.1 and 0.4 based on the measure of wealth that was used. Other authors also pulls into the similar range of results. Similarly, renters also enjoy the benefits of rising home values that are brought by the common factors in the economy. However, results are significantly higher for homeowners with mortgages, suggesting an MPC out of housing wealth equal to 0.185 for them. These results show that the response of homeowners with mortgages is significantly higher than that of renters or owners without mortgages. While ownership decisions may be correlated with unobserved determinants of consumption, results in Table 3.5 suggest that this IV strategy appropriately addresses the endogeneity introduced by common factors that bias the OLS models. Heterogeneous effects, especially in a form of homeownership status, remain the significant part of MPC analysis across households. Therefore, I run an additional robustness check to see if similar IV estimation results hold and how the differ across different subgroups. Appendix A.18 shows the IV estimation results based on different income quintiles. Results identify a clear heterogeneity and suggest higher MPC out of housing across higher income households.

A statistically significant response for renters should also not be puzzling. If renters plan to buy homes in the future, one may expect a negative wealth effect for this group (Flavin and Yamashita, 2002; Campbell and Cocco, 2007). This may also reflect the fact that renters are able to adjust their behavior on other margins – delaying home buying or purchasing a smaller home – in response to a house price shock. It could also depend on the interaction between housing and rental costs. If rental costs become relatively lower due to a house price shock, it could create an advantage for renters, allowing them to increase their spending. However, this is highly dependent on a household's future plans to buy their own house or continue renting. This idea is partially checked and supported by using available HFCS information. Appendix A.19 shows summary statistics for cases when house prices increased more than rental expenditure and vice versa. Therefore, the results indicate that over the analyzed period, between 2010 and 2017, consumption

Table 3.5: Effects of Housing on Consumption: Instrumental Variable Approach

	Baseline	Renters	Homeowners		
				Owners	Mortgage owners
	(1)	(2)	(3)	(4)	(5)
House value change	.121***	.116**	.127***	.114***	.185***
	(.047)	(.050)	(.043)	(.037)	(.038)
Income change	.239***	.244***	.237***	.260***	.159***
	(.056)	(.065)	(.053)	(.044)	(.050)
Household controls	+	+	+	+	+
10 year government bonds	+	+	+	+	+
Sample	Pooled	Renters	All owners	Owners	Mortgage owners
Estimation	IV	IV	IV	IV	IV
Observations	13,173	2,852	10,321	7,816	2,505
Clusters	6	6	6	6	6

Each row represents a separate regression of the variable on the real 10-year Government bond rate, country-level housing supply variable interacted with real 10-year Government bond rate, and country fixed effects. Median housing value is captured at the country level based on individual household answers about the values of housing that they live in. A subsample of Belgium, Cyprus, Estonia, Italy, Latvia and Malta is used for regressions.

expenditures were increasing much more among households for whom house prices were growing faster than rental costs. This suggests that renters were taking advantage of the current situation and increasing their spending when house prices were growing faster than their rental expenditures.

3.3.2 Possible Channels

Results from the previous subsection indicate higher consumption in response to higher home values. These results appear robust to potential endogeneity concerns, suggesting that the strategy appropriately adjusts for the impact of common factors that may be driving a correlation between housing and consumption in the raw data. Exploiting heterogeneity across households in the data, I explore the relative importance of the mechanisms driving the causal relationship between housing and consumption. Specifically, I evaluate whether rising home values simply drive up spending through wealth effects or primarily loosen borrowing constraints by providing additional collateral. The relative importance of these mechanisms has important policy implications for the aggregate impacts of house prices on consumption and the groups of households most affected by rising home values.

As slightly discussed in previous sections, in order for homeowners' consumption to respond to a change in house values, there must be a wedge between the endowment effect from higher current wealth and the negative income effect from a higher cost of living. Such a wedge may arise due to life-cycle effects, as households tend to buy and sell housing at various points in their life cycle (Sinai and Souleles, 2005). This stands in line with the finding in Table 3.5 that homeowners (with a mortgage) have higher MPCs relative to renters, who are often younger and more likely to purchase homes in the future. However, this alone does not guarantee aggregate effects on consumption since fluctuations in house prices are simply transfers between buyers and sellers. In a model with limited commitment, however, rising home values may loosen borrowing constraints by providing homeowners with additional collateral (Barro, 1976; Stiglitz and Weiss, 1981; Hart and Moore, 1994). For homeowners at or near a borrowing limit who value their current endowment of

housing more than the future increase in their cost of living, the increase in collateral values loosens borrowing constraints and can have a significant effect on spending Berger et al. (2018). Homeowners with large borrowing capacity ex ante (including homeowners without mortgages) and renters who do not own any housing collateral are unaffected by this channel and behave much like their counterparts in a standard model. Appendix A.20 supports this idea by showing that mortgage owners with a large borrowing capacity has a higher MPC out of housing than the baseline results. As a result, higher home values can bring a higher aggregate spending effects due to borrowers near a borrowing limit.

In theory and with the ideal dataset, it will simply involve comparing MPCs across households with differing exposure to borrowing constraints. In reality, this brings at least two general problems. First, in the presence of uncertainty, households near a borrowing limit may behave much like those at the limit out of fear that the constraint will bind them in the future. This precautionary savings motive blurs the line between constrained and unconstrained households. Moreover, it leads to a continuum of households that behave increasingly like constrained households as they approach the borrowing limit (Carroll and Kimball, 1996). Second, identifying constrained households can be difficult in practice since the borrowing limit may not be observable and household choice of net wealth holdings is determined by historical consumption decisions.

One possible problem is that the shadow value of the borrowing constraint is not directly observable. Therefore, in this paper I follow the approach suggested in the literature of comparing spending responses across households who are likely to be impacted by the change in borrowing limits based on observed balance sheet and debt payment variables (Zeldes, 1989; Cooper, 2009; Johnson and Li, 2010). In other words, I discuss results comparing MPCs out of wealth based on households ownership status, debt-service ratios (DSRs), and leverage. One thing is that this does not provide a quantitative breakdown of how pure housing wealth and collateral effects determine the MPC out of housing. However, it provides a qualitative assessment of which households drive the aggregate MPC and provides insight into the relative importance of

the two mechanisms.

The theoretical approach discussed before naturally raises the question if the MPC of homeowners driven primarily by households that are more exposed to the borrowing constraint or not? To answer this question I first compare homeowners with different debt-service ratios, a common ratio used by banks to assess credit quality, defined as the ratio between debt service payments and after-tax income. This ratio is the preferred measure of credit constraints in this study for a few reasons. First, DSRs have been shown to predict the likelihood of being denied credit and are commonly used by both academics and banks (Johnson and Li, 2010). Secondly, households are more likely to recall periodic payments made on a debt rather than the outstanding balance (Aladangady, 2017).

Table 3.6: Effects of Housing on Consumption: Possible Channels

	Baseline	DSR>.40	DSR<.40
	(1)	(2)	(3)
House value change	.185***	.103**	.189***
	(.038)	(.048)	(.050)
Income change	.159***	.122***	.205***
	(.050)	(.021)	(.072)
Household controls	+	+	+
10 year government bonds	+	+	+
Sample	Mortgage owners	Mortgage owners	Mortgage owners
Estimation	IV	IV	IV
Observations	2,505	399	2,106
Clusters	6	6	6

Each row represents a separate regression of the variable on the real 10-year Government bond rate, country-level housing supply variable interacted with real 10-year Government bond rate, and country fixed effects. Median housing value is captured at the country level based on individual household answers about the values of housing that they live in. A subsample of Belgium, Cyprus, Estonia, Italy, Latvia and Malta is used for the regressions.

To run this exercise, I group households above and below the DSR threshold of 0.4 for each year in the sample to ensure that groupings reflect cross-sectional heterogeneity in DSRs rather than aggregate fluctuations in debt or income over time. Table 3.6 presents results allowing MPCs for homeowners to vary across DSR. The first column repeats the general specification with all controls, as shown in Table 3.5, column 1. The average response shown in the first column masks substantial heterogeneity between households above and below the DSR threshold. Column 2 and 3 solve this problem by splitting homeowners with mortgages into subgroups of having housing debt service to income ratio above and below 0.4. Such a threshold of 0.4 is the most common number used to identify financially vulnerable households across studies in Europe (Bankowska et al., 2015). Results in Table 3.6, column 2 and 3, show that MPC out of change in housing value is much higher between households that appeared below the threshold. They show that households with borrowing constraint cannot adjust their consumption due to limitations on increasing their loans. This finding appears consistent with a model in which rising home values loosen borrowing constraints, resulting in increased spending, especially for households who were previously constrained. These results may also partly reflect so-called wealthy hand-to-mouth consumers who have large amounts of illiquid wealth. Rising collateral values allow these households to extract liquidity from additional home equity (Kaplan et al., 2014). This means that many households in Europe remain with a limited amount of liquid assets and adjust their consumption behavior mostly by extracting their increased housing value instead of using savings.

Table 3.7 shows another part of results splitting households based on mortgage use and loan-to-value (LTV) ratios. For convenience, the first column once again repeats the preferred specification, pooling all homeowners. Turning to the second and third columns, I split households based on LTV of 0.75, the common measure in similar studies about household financial vulnerability in Europe (Bankowska et al., 2015). The high MPCs for these households with high LTVs suggest that their discount rates are high due to credit constraints. Moreover, the results in column 2 and 3 suggest that these credit constrained house-

holds use their homes as collateral to finance spending as house prices rise. Specifically, the high MPC among high-LTV homeowners is largely driven by households who recently refinanced up to a higher outstanding balance (column 2) as opposed to those that did not extract equity in the last 3 years (column 3).

To sum up, latest results suggest that rising home values have a direct impact on homeowners' spending via loosening borrowing constraint. As discussed previously, renters whose borrowing is not affected by changing home values have smaller MPCs consistent with relatively small negative income effects from higher costs of living. On the other hand, mortgage owners have higher MPCs. The overall response for homeowners with mortgages appears to be driven by households with higher exposure to borrowing constraints. Furthermore, this result is not driven simply by low or high income households, but instead more broadly by households who use debt more heavily. While these subgroups may differ in unobserved ways, the overall results appear to be consistent with an incomplete markets model where rising home values loosen collateral constraints on indebted homeowners. More importantly, these results suggest that house price fluctuations are not simply transfers between home buyers and sellers, but can have large aggregate impacts on real household spending, especially when a large fraction of households face borrowing constraints (Guerrieri and Iacoviello, 2017). These results also support the broader picture of literature saying that household heterogeneity matters and that wealthy hand-to-mouth households tend to have a higher MPC out of housing wealth (Kaplan et al., 2014).

3.4 Concluding remarks

This paper builds on the recent demand side and household balance sheets literature, which shows housing as the essential factor in explaining household spending fluctuations. It also utilizes interviewers' external evaluations of housing value and conditions to create an instrumental variable which enables establishment of a causal link between housing wealth and consumption behavior. Results suggest that common factors are partially responsible for the co-movement between house

Table 3.7: Effects of Housing on Consumption: Possible Channels

	Baseline	Loan to value HMR>.75	Loan to value HMR<.75
	(1)	(2)	(3)
House value change	.185***	.355***	.169***
	(.038)	(.097)	(.037)
Income change	.159***	.178***	.157***
	(.050)	(.047)	(.054)
Household controls	+	+	+
10 year government bonds	+	+	+
Sample	Mortgage owners	Mortgage owners	Mortgage owners
Estimation	OLS	OLS	OLS
Observations	2,505	390	2,115
Clusters	6	6	6

Each row represents a separate regression of the variable on the real 10-year Government bond rate, country-level housing supply variable interacted with real 10-year Government bond rate, and country fixed effects. Median housing value is captured at the country level based on individual household answers about the values of housing that they live in. A subsample of Belgium, Cyprus, Estonia, Italy, Latvia and Malta is used for regressions.

prices and consumption, but housing wealth also has an additional causal effect on the spending behavior of mortgage owners, especially those with larger exposure to borrowing constraints.

I estimate an MPC out of housing wealth of 0.121 for 6 European (Belgium, Cyprus, Estonia, Italy, Latvia, and Malta) countries with a significantly higher effect of 0.185 on mortgage owners. These estimates appear robust to different subsamples and variety of household-specific conditions. Importantly, estimated responses appear to be similar over the post-financial crisis period and are not driven exclusively by the specific countries. Furthermore, the average MPC across analyzed countries is driven largely by households with higher DSRs and leverage, suggesting that collateral constraints play a crucial role in driving the relationship between house prices and spending. Moreover, rising home values provide additional collateral to households at or near the borrowing constraint. Since these households value the current endowment of collateral wealth more than the increased cost of living associated with higher house prices, their spending responses are much larger and can drive significant fluctuations in consumption. This brings attention of policy makers to revise macroprudential requirements more careful, especially during the moment when the economy faces higher fluctuations in the housing market, as it can be used as an additional tool to suppress from an unexpected economic fluctuations.

Taken together, the results provide an empirical link between housing values and real outcomes, and suggest that household balance sheets play an important role in determining aggregate demand. The importance of collateral constraints in driving these results indicates that models with incomplete contracts and collateralized lending may better explain dynamics in household spending. The results are also useful for understanding the impacts of housing market policies that may affect housing wealth as well as the mechanisms through which monetary and macroprudential policies as well as interest rates impact household spending. Moreover, considering the monetary union, it remains important to think about individual macroprudential rules in European as countries face different distributions in terms of homeownership status that could cause different MPCs.

Overall Conclusion and Discussion

This dissertation aims to empirically analyze the interaction between the housing market and the real estate economy through the lens of the household. In the current literature, there is still a lack of empirical analysis on the importance of housing as a key determinant in explaining the economic behavior of households, especially in Europe. To address this issue, I have chosen to use a detailed micro-level HFCS dataset, and to apply different econometric techniques (the instrumental variables approach, local projections, panel regressions and others) to analyze it. More specifically, in Chapter One of this thesis, the main question was to determine the importance of housing in explaining households' beliefs and the subsequent behavior. Chapter One also introduced the HFCS dataset and empirically tested the importance of the housing variable. The result was that households' expectations about house prices are an important driver of their subsequent economic decisions, and that they tend to be heterogeneous across the household tenure status. The main objective of Chapter Two was to propose a theoretical link between the housing market, credit frictions and consumption. I also tested these links empirically and demonstrated their relevance. The result was to show that a proxy for household expectations about house prices is an important factor in explaining the household consumption dynamics. In Chapter Three, the main issue was to empirically estimate the impact of housing-related gains transmitted to the real economy via household consumption. To do this, I introduced a new empirical approach by using an instrumental variable to capture the endogenous effects of changes in house prices. This allowed me to estimate the marginal propensity to consume from housing gains. The results showed that a 1 EUR increase in the housing wealth was associated with a 0.121 EUR increase in household consumption over the period of 2010–2017. Overall, in this paper, I have conducted an empirical analysis of how housing affects the household behavior, what are the key factors explaining the heterogeneous effects across households, how it can be measured, and, most importantly, how much of the effect is then transmitted to the real economy in terms of household consumption. The broader conclusion is that house price expectations play a crucial role in explaining

the economic behavior of households. This is mainly due to the fact that housing accounts for more than 50 percent of household portfolios in Europe. In some countries, this share is as high as 80–90 percent, thereby underlining the importance of housing in explaining the household economic behavior. In my dissertation, I showed not only the importance of house price expectations, but also different possibilities to account for it. In Chapter One, I introduced the *Household Finance and Consumption Survey* (HFCS) which collects micro-level information about the household balance sheet, wealth, income, consumption, social and family characteristics, as well as many other individual variables. Therefore, the granularity of this dataset allowed me to analyze different kinds of determinants that could be important in understanding and explaining individual house price expectations. Since the literature summarizes extrapolation and personal experience as the key determinants, I add homeownership to this discussion and show its significance empirically.

From the theoretical point of view, differences in house price expectations between owners and renters can appear in two ways. One of them claims that individuals learn about the changes in house prices from signals and information. Renters face these signals constantly by paying the rent, while home owners can easily miss part of this information by simply consuming housing services and missing attention to the value of their consumption. Another way to explain different house price expectations between households comes from the endowment effect. It states that the asset (housing) owners tend to over-predict future values in response to positive signals about their assets. Therefore, my empirical results showed that the prior experience in the form of home ownership or position along with income and wealth distributions are important factors in explaining house price expectations among households. Additionally, households from the top income or wealth quintiles tend to have higher house price expectations than the rest of the distribution. Since Chapter One of my dissertation tried to analyze and explain house price expectations by using a micro-level dataset, Chapter Two concentrates on the identification of a proxy that allows the analysis of house price expectations from the country-level macro data. In Chapter Two, I in-

troduce the stylized theoretical model that helps us to link expectations about future house markets to the house price-rent spread variable that is taken as a proxy for the aggregated house price expectations. One of the benefits of this empirical approach is that the key measure, the house price-rent spread, is easily available for many advanced economies, unlike survey-based series capturing households' expectations, often coming in various forms and time frames, and, most importantly, rooted in different methodologies. By using our simple theoretical model, we demonstrate that the housing spread variable, once observed for a sufficiently long period, is an informative and persistent measure about expectations on future house prices.

Empirical results from a large panel of countries suggest that an unexpected increase in the housing price-rent spread yields an extra stimulus and increases the aggregate household spending. This effect is persistent and lasts longer than the credit shock, which impacts household consumption instantaneously only. It confirms qualitative differences between two drivers of consumption dynamics – the house price-rent spread and the credit shock. Finally, the empirical approach from Chapter Two also shows an asymmetric contribution of credit and house market conditions to the business cycle and allows policymakers to target stabilization policies better. The last part of my dissertation, Chapter Three, goes further from the house price expectations and concentrates on the real estate effects that changes in house prices create to the individual consumption. More precisely, I investigated the housing wealth – the consumption channel in Europe and its possible mechanisms. Since the global financial crisis, different authors have tried to evaluate the macroeconomic impact of the housing wealth on consumption. However, such analysis usually faces the endogeneity problem that appears between the house price changes and the aggregate consumption. Most commonly, different instrumental variables have been used to control for a possible endogeneity problem, while the majority of such estimations were based on the U.S. data. European countries were still facing an issue of a common instrumental variable that could be used for a similar analysis. In Chapter Three, I introduced an instrumental variable which uses additional information about the conditions of individual

houses and account for possible differences in the house price dynamics. However, the complexity of the instrumental variable and the limited information about the housing conditions in many countries left me with the new instrumental variable combined for 6 countries – Belgium, Cyprus, Estonia, Italy, Latvia, and Malta.

The empirical results from Chapter Three showed that some common factors are partially responsible for the co-movement between the house price dynamics and households' consumption. However, the housing-related wealth also has an additional effect on the consumption behavior, especially among the mortgage owners. Results suggest that, among the set of 6 countries used for the analysis, a 1 000 € increase in the house value was associated with a 121 € increase in spending for the home owners overall over the last decade. The effect tends to be even higher for the home owners with mortgage – at 185 € per 1000 € change in housing wealth. Moreover, Chapter Three also shows that such high and significantly different responses are mostly driven by the credit-constrained households which have a larger exposure to borrowing constraints. This could be explained by the fact that increased housing values provide an additional collateral to households and is extremely used by the ones which are at or near the borrowing constraint. Since these households value the current endowment of collateral wealth more than the increased cost of service for the housing, their spending responses are much larger and can drive significant fluctuations in the aggregate consumption. Therefore, it should bring policy makers' attention to keep constant monitoring of macroprudential requirements, as they can be used as an alternative tool to prevent uncontrolled fluctuations in the housing market as well as unexpected economic fluctuations.

Policy recommendations and limitations of results

Overall, my dissertation highlighted the importance of housing and house price expectations in explaining an individual's economic behavior. More importantly, it showed how particular conditions and individual decisions can cascade into significant fluctuations in the aggregate demand. The results captured in the dissertation are also important for understanding the impacts of the housing market policies that may affect

the housing wealth, as well as the mechanisms through which monetary and macroprudential policies impact household consumption. Finally, this analysis becomes even more important considering the fact of the monetary union in Europe. It remains crucial to think and consider individual macroprudential policies among different countries as they face different distributions in terms of the income, wealth, home ownership status; as also, those conditions lead to the different marginal propensities to consume.

Most of the results in the dissertation are estimated by making extensive use of the *Household Finance and Consumption Survey*. At the beginning of my dissertation, I highlight the key points as to why the HFCS survey is the best source of micro-level data to analyze household-level characteristics. However, it also suffers from some drawbacks that limit my analysis at some level. First of all, HFCS is a survey that provides a new wave of results every 3–4 years, and it only started after the global financial crisis. Therefore, there are currently only four waves of results available – 2010, 2014, 2017, and 2021. This gives a somewhat limited understanding of the trends in the household finances before the financial crisis and the characteristics that existed at that time. Secondly, the results of the 2021 wave were only published at the end of 2023 and were not included in the overall analysis of my dissertation. Third, the sample of the countries participating in the HFCS survey was also expanded during this period. In 2010, it started with 15 countries, while in 2021, 22 countries were participating, going beyond the borders of the Euro area, and including other European countries. All these facts bring some limitations and concerns on how to interpret the results and how to draw general conclusions.

Another shortcoming is also related to the HFCS data and is reflected in the empirical part of the third chapter - only 6 countries are included due to data limitations. As the empirical part of Chapter Three is based on the instrumental variable approach, the key to good and robust results is additional information that comes from a non-public part of the HFCS survey, but helps to create a synthetic variable which captures the dynamics of house prices. Therefore, although I contacted all countries participating in the HFCS survey, I was only able to obtain data from

6 of them due to data security issues. On the one hand, 6 countries are far from enough to represent more generalized results for the Euro area, even if only Italy is included from the pool of the largest European economies. On the other hand, these 6 countries (Belgium, Cyprus, Estonia, Italy, Latvia and Malta) are very different geographically, in terms of their housing markets, home ownership rates, and household balance sheets. They present a very colorful picture of countries and represent, at least in part, other countries that are more similar to them in specific aspects such as housing markets or household balance sheets.

Other limitations could be related to the fact that the HFCS data used for most of the results in my thesis is dated between 2010 and 2017. Therefore, the recent episodes of high inflation, pandemic, supply and energy shocks and war situations close to the European borders could have changed the fundamental understanding of households and the way they look at housing, as well as the expected later changes in the house prices. The HFCS data also covers a specific period of time, mostly related to the overall economic growth in Europe between 2010 and 2017. It does not allow for more general conclusions that could also be related to the downturn periods.

Even though this study focuses on historical data, including the global financial crisis and other previous global economic shocks, its findings remain relevant in drawing recommendations for future shocks. A recent IMF study (Dao et al., 2024) supports the importance of housing in explaining household consumption dynamics. It highlights that excess savings from the pandemic, substantial increases in the household wealth (particularly housing), and solid real income gains have strengthened consumption post-pandemic. Additionally, the marginal propensity to consume out of the housing wealth is significantly higher than pre-COVID estimates, making the housing wealth effect a key driver of the post-pandemic consumption growth (Dao et al., 2024). This more micro-level evidence coming from the US aligns with our OECD evidence, highlighting the need for policymakers to track household expectations about house prices (housing wealth) and credit conditions to prepare for and mitigate potential economic shocks.

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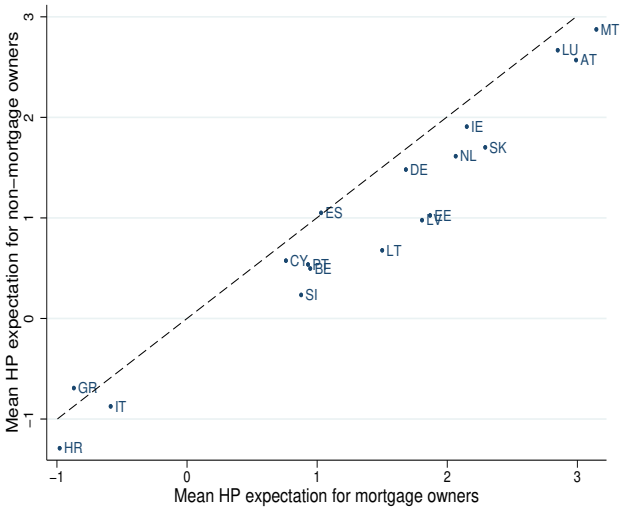
A Online Appendix

A.1 Appendix A

Table A.1: Descriptive statistics of house price expectations by wealth quintiles

House price expectations	Obs	Mean	Std. Dev.	Min	Max	Variance	Skewness
All	44,386	0.774	2.505	-6	6	6.275	-0.290
Q1	5,347	0.300	2.571	-6	6	6.969	-0.193
Q2	6,695	0.293	2.312	-6	6	6.608	-0.121
Q3	8,469	0.640	2.510	-6	6	6.301	-0.212
Q4	9,763	0.837	2.442	-6	6	5.963	-0.294
Q5	14,112	1.220	2.377	-6	6	5.649	-0.414

Calculations of house price expectations are based on HFCS 3rd wave results (from 2017). Wealth quintiles are derived separately for each country and based on HFCS wave 2017 results.



Notes: The dashed line represents the 45 degree line between analyzed variables. Calculations are based on HFCS 3rd wave (2017) results.

Figure A.1: Average house price expectations between owners with mortgages and owners without

Table A.2: Cross-sectional estimation for macro-aggregated variables (extended)

	(1)	(2)	(3)	(4)
g_HP	.0957***	.0984***	.0895***	.0887***
	(.0194)	(.0169)	(.0155)	(.0157)
g_income	-.0634*	-.0536	-.0645	-.0640
	(.0341)	(.0460)	(.0410)	(.0413)
risk attitude		-.0376	-.2526***	-.2475***
		(.0764)	(.0462)	(.0438)
age [bracket]			-.0038	-.0031
			(.0031)	(.0034)
education			.2215***	.2192***
			(.0399)	(.0371)
labour status (employee)			.5500	.3064
			(.3323)	(.2934)
labour status (self-employed)			.4936	.2429
			(.3142)	(.2970)
labour status (unemployed)			.2345	-.0227
			(.2888)	(.2556)
labour status (retired)			.5224	.2729
			(.3334)	(.2928)
labour status (other)			.4032	.1587
			(.2859)	(.2684)
exp_income_higher_than_price				.3693
				(.2198)
exp_income_lower_than_price				.2125
				(.2279)
exp_income_similar_as_price				.1714
				(.1987)
Number of obs	41,452	41,391	41,383	41,383
Number of countries	16	16	16	16
R^2	0.1986	0.1995	0.2238	0.2244

Standard errors are clustered for robustness. * corresponds to the 10% confidence interval, ** to the 5% confidence interval, and *** to the 1% confidence interval.

Table A.3: Cross-sectional (mean) estimation for micro-aggregated (HFCS) variables (extended)

	(1)	(2)	(3)	(4)
g_HP_mean	.0290**	.0290**	.0262**	.0258**
	(.0128)	(.0128)	(.0117)	(.0114)
g_income_mean	.0459**	.0450*	.0366	.0357
	(.0156)	(.0239)	(.0238)	(.0231)
risk attitude		.0041	-.1922***	-.1872***
		(.1138)	(.0590)	(.0577)
age [bracket]			-.0038	-.0024
			(.0038)	(.0042)
education			.2125***	.2061***
			(.0422)	(.0413)
labour status (employee)			.4446	-.3159
			(.7003)	(.4410)
labour status (self-employed)			.3716	-.4050
			(.6551)	(.3930)
labour status (unemployed)			.0720	-.6994*
			(.6182)	(.3664)
labour status (retired)			.4422	-.3292
			(.6880)	(.4351)
labour status (other)			.2121	-.5306
			(.6822)	(.4138)
exp_income_higher_than_price				1.0437***
				(.3312)
exp_income_lower_than_price				.6950*
				(.3440)
exp_income_similar_as_price				.6645*
				(.3426)
Number of obs	43,132	43,074	43,066	43,066
Number of countries	16	16	16	16
R^2	0.1731	0.1732	0.1963	0.1998

Standard errors are clustered for robustness. * corresponds to the 10% confidence interval, ** to the 5% confidence interval, and *** to the 1% confidence interval.

Table A.4: Personal house price expectations from micro-level HFCS data (extended)

	(1)	(2)	(3)	(4)
g_HP_personal	.0644***	.0299***	.0233**	.0232**
	(.0100)	(.0098)	(.0096)	(.0095)
g_income_personal	-.0003	-.0007*	-.0005	-.0004
	(.0004)	(.0004)	(.0004)	(.0004)
risk attitude		.1643***	-.1179***	-.1165***
		(.0055)	(.0324)	(.0323)
age [bracket]			-.0041**	-.0024
			(.0020)	(.0020)
education			.3202***	.3078***
			(.0143)	(.0143)
labour status (employee)			.2643	-1.0987
			(1.1430)	(.7511)
labour status (self-employed)			.3267	-1.0665
			(1.1567)	(.7592)
labour status (unemployed)			-.1194	-1.4928**
			(.9977)	(.5964)
labour status (retired)			.3290	-1.0443
			(1.1583)	(.7674)
labour status (other)			-.0779	-1.4086*
			(1.1121)	(.7000)
exp_income_higher_than_price				1.7543***
				(.3827)
exp_income_lower_than_price				1.2425**
				(.4678)
exp_income_similar_as_price				1.2977**
				(.4533)
Number of obs	15,223	15,209	15,207	15,207
Number of countries	12	12	12	12
R^2	0.0026	0.0581	0.1085	0.1172

The number of analyzed countries shrinks to 12, due to the lack of observations for panel variables in particular countries. Standard errors are clustered for robustness. * corresponds to the 10% confidence interval, ** to the 5% confidence interval, and *** to the 1% confidence interval.

Table A.5: Cross-sectional (median) estimation for micro-aggregated (HFCS) variables

	(1)	(2)	(3)	(4)
g_HP_median	.0243**	.0257**	.0230**	.0229**
	(.0103)	(.0101)	(.0094)	(.0091)
g_income_median	.0366	.0226	.0169	.0161
	(.0210)	(.0224)	(.0215)	(.0205)
risk attitude		.0767	-.1866***	-.1822***
		(.1034)	(.0563)	(.0558)
age [bracket]			-.0045	-.0029
			(.0038)	(.0042)
education			.1949***	.1892***
			(.0427)	(.0417)
labour status			+	+
exp_income_vs_price				+
Number of obs	43,132	43,074	43,066	43,066
Number of countries	16	16	16	16
R^2	0.1631	0.1687	0.1911	0.1955

Standard errors are clustered for robustness. * corresponds to the 10% confidence interval, ** to the 5% confidence interval, and *** to the 1% confidence interval.

Table A.6: Cross-sectional (mean) estimation for micro-aggregated (HFCS) variables for different homeownership subgroups

	(1) All	(2) Owners	(3) Owners with mortgage	(4) Renters
g_HP_mean	.0499*	.0480*	.0290	.0804
	(.0253)	(.0228)	(.0224)	(.0425)
g_HP_personal	.0005	.0022	.0359	-
	(.0156)	(.0140)	(.1022)	
g_income_mean	.0324*	.0278*	.0382***	.0422
	(.0144)	(.0127)	(.0115)	(.0265)
g_income_personal	-.0002	.0001	.0456***	-.0009
	(.0001)	(.0002)	(.0085)	(.0009)
risk attitude	-.2436***	-.2690***	-.1523**	-.2452*
	(.0586)	(.0618)	(.0589)	(.1157)
age [bracket]	.0035	.0044	.0105*	.0065
	(.0040)	(.0041)	(.0053)	(.0038)
education	.2005***	.2197**	.1438***	.1264
	(.0577)	(.0692)	(.0321)	(.0857)
labour status	+	+	+	+
exp_income_vs_price	+	+	+	+
Number of obs	15,207	9,147	2,849	3,211
Number of countries	9	9	9	9
R^2	0.1852	0.1683	0.2523	0.2083

Standard errors are clustered for robustness. * corresponds to the 10% confidence interval, ** to the 5% confidence interval, and *** to the 1% confidence interval. A subsample of 9 countries (Belgium, Cyprus, Germany, Estonia, Spain, Italy, Latvia, Malta, and Slovakia) is used due to missing observations on renters for certain countries.

A.2 Appendix B

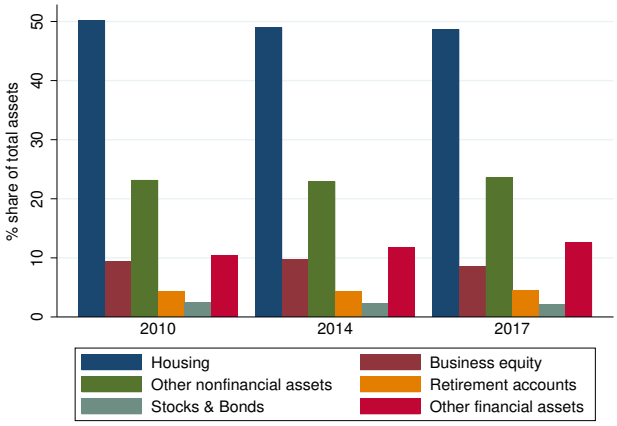


Figure A.2: Household asset shares by asset classes in the Euro area

A.2.1 Empirics

The House Price-Rent Spread Shock

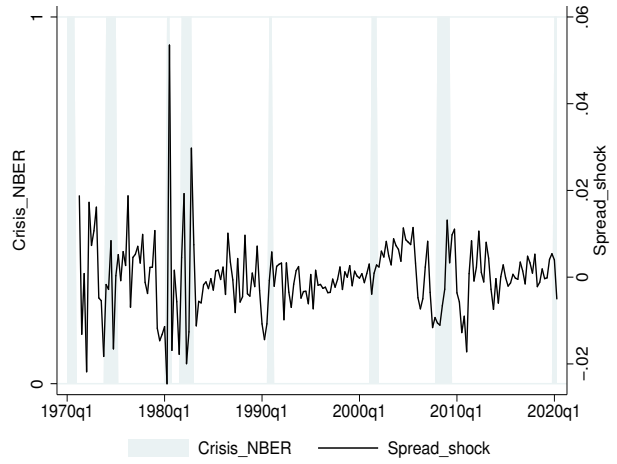


Figure A.3: Spread shock and NBER crisis variables for the United States

Table A.7: Panel unit root tests

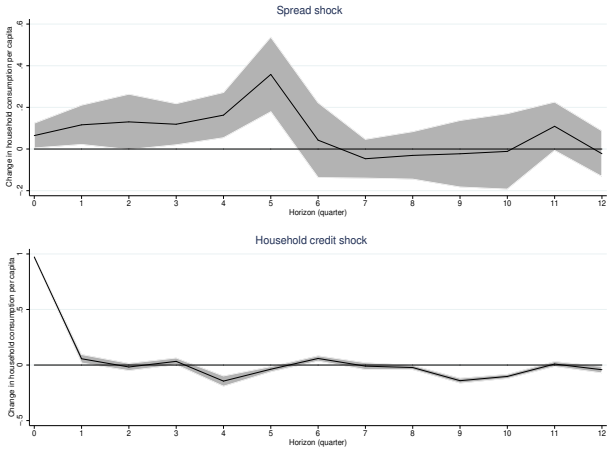
	IPS no trend	IPS with trend	Fisher-type no trend	Fisher-type with trend
Z-score	-34.7375	-34.8956	-39.6446	-37.9712
p-value	0.000	0.000	0.000	0.000
Number of panels	28	28	28	28
Av. number of periods	101.46	101.46	101.46	101.46

The first and second columns identify results for Im-Pesaran-Shin tests with and without time trend. The third and fourth columns summarize results from Fisher-type tests with and without time trends, respectively.

Table A.8: Panel Granger-cause test

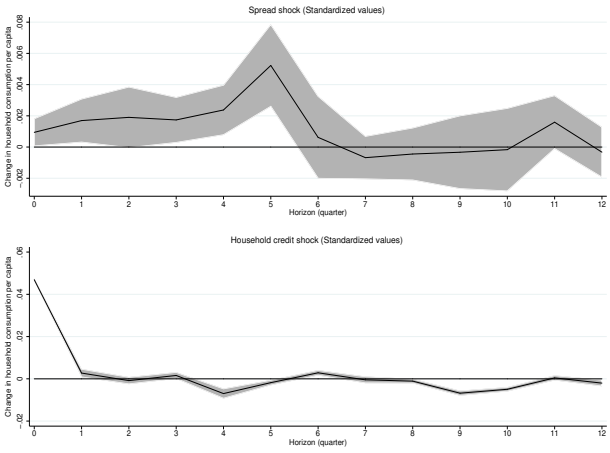
	Credit shock causes housing spread shock	Housing spread shock causes credit shock
HPJ Wald test	0.9318	10.6719
p-value	0.9200	0.0305

H0 claims that the first variable does not Granger-cause the second one. H1 claims that the first variable does Granger-cause the second one for at least one country. 4 lags are used for the Granger-cause.



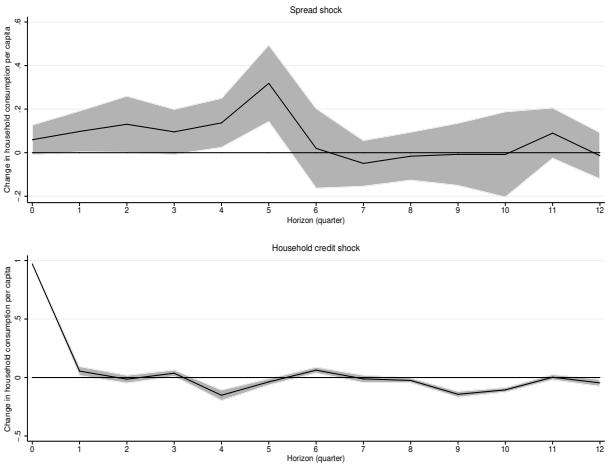
Note: Fixed effects panel regression with horizon-specific intercepts is used to estimate local projections. Non-smoothed credit change and non-standartized shocks are used to analyze impulse responses. Standard errors are clustered by countries.

Figure A.4: Impulse responses for the household consumption spending



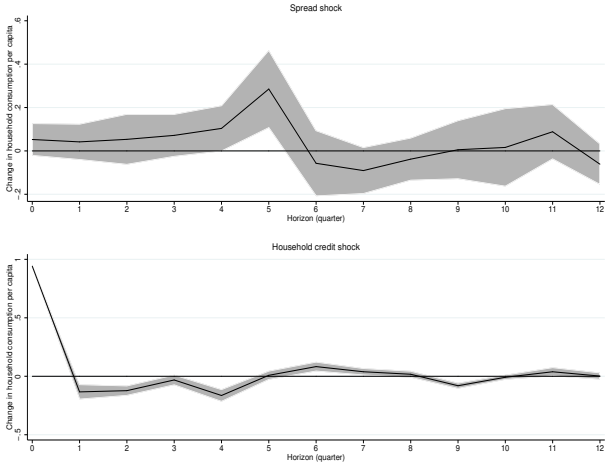
Note: Fixed effects panel regression with horizon-specific intercepts is used to estimate local projections. Non-smoothed credit change is used to analyze impulse responses. Standard errors are clustered by countries.

Figure A.5: Impulse responses for the household consumption spending (with standardized shocks)



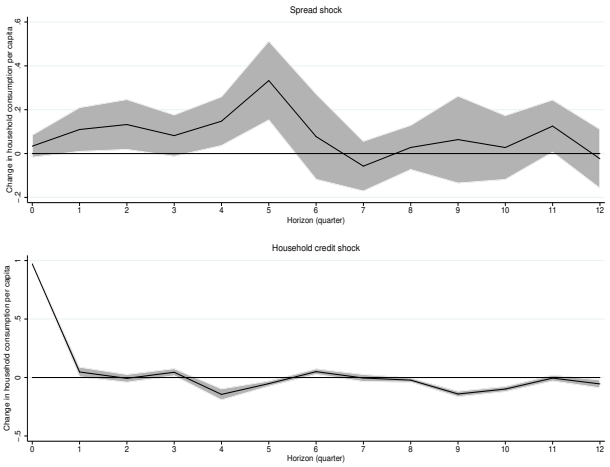
Note: Fixed effects panel regression with horizon-specific intercepts is used to estimate local projections. Additional 4 lags of consumption change are included to analyze impulse responses. Standard errors are clustered by countries.

Figure A.6: Impulse responses for the household consumption spending



Note: Fixed effects panel regression with horizon-specific intercepts is used to estimate local projections. Standard errors are clustered by countries. It also includes additional controls for the time fixed effects.

Figure A.7: Impulse responses for the household consumption spending



Note: Fixed effects panel regression with horizon-specific intercepts and interaction (housing spread and credit shocks) term is used to estimate local projections. Standard errors are clustered by countries.

Figure A.8: Impulse responses for the household consumption spending

A.2.2 House Price vs. Housing Spread Shocks

Since much of the existing literature has traditionally focused on analyzing house price shocks by modeling changes in house prices while neglecting the dynamics in the rental markets, we adopt a similar approach in this extension. We utilize our identification strategy to model changes in house prices, conducting this analysis twice: once for the United States, which has been the primary focus in many previous papers, and once for a panel of all countries. This dual approach enables us to compare the results for the US and the panel of countries, as well as to observe how our main variable differs from the alternative of using house prices alone.

It might be tempting to conclude that, since house prices are much more volatile than rental rates, there is no significant difference in using either variable in the empirical analysis. However, it's important to note that both variables are non-stationary, as illustrated in Figure 2.3. On the other hand, the spread (or ratio) variable is stationary (see Appendix Table A.7). Therefore, the appropriate comparison should be

made either with stationarized house prices (after removing the house price trend) or with the growth rate of housing prices (which becomes a stationary series after first-differencing). However, neither of these comparisons yields the same results as our price-rent spread variable.

The influential literature on housing and macroeconomics has made various choices when it comes to modeling house prices. For example, Attanasio et al. (2011) utilize real (deflated) house prices, which exhibit a permanent component due to a unit root in a VAR setting. On the other hand, Campbell and Cocco (2007) work with log price changes, inducing stationarity in their analysis. Muellbauer and Murphy (1997) incorporate house prices in an ARDL-type framework. More recent works, such as Berger et al. (2018), focus on the price-rent ratio but assume that the rental rate is proportional to house prices, effectively rendering the spread/ratio constant over time. Notably, Favilukis et al. (2017) undertake a careful analysis by considering the deviation of house prices from fundamentals as a key modeling device. However, their analysis is limited to calibration and simulation for the US economy alone, making it challenging for policymakers to apply their findings in a broader cross-country context with institutional differences.[23]

We begin by presenting the results for the United States separately to assess whether our identification strategy yields outcomes consistent with the existing literature. Figure A.9 employs the shock of house price changes and presents the local projections for the United States. Notably, Figure A.9 indicates that the results for the United States differ slightly from the panel projections. It demonstrates that a house price shock in the United States has an instantaneous impact on household consumption, but this effect lasts for only a quarter. These findings align with existing literature, which suggests that house price shocks in the United States typically do not have long-lasting effects (see, for example, Berger et al., 2018).

[23]It's important to note that one empirical reason why detrended real house prices or growth rates differ from our variable is that our trend represents the fundamental value, allowing us to interpret deviations as components related to bubbles, expectations, or risk premiums. None of the other series provide this interpretation, as they either remove or obscure some of these components, as both price trends and first differences capture all the forces affecting house prices, not only their fundamental value.

Appendix Figure A.11 illustrates house price, rental, and spread dynamics for different countries. These figures confirm the intuition that removing the 'trend' by considering the fundamentals delivers the ratio/spread variable with properties that differ from merely looking at house prices. When considering the growth rates, the growth rate of the spread/ratio is defined as the difference between the house and rental growth rates.

Figure A.13 presents results for four different countries: Norway, the US, the UK, and Germany. These countries have relatively long time series, and their institutional settings vary considerably (e.g., they have different home ownership ratios: in Norway, it is quite high; in the US and UK, it is in the middle; and in Germany, it is low). It is evident that the US's immediate reaction is not replicated in other countries (in the UK, it is insignificant at first), in Norway, it is delayed, whereas in Germany, it is negative. Similar to the above, Figure A.14 shows interaction for the same four countries. Hence, this adds another argument: in addition to differences in house price shocks to the ratio/spread variable, there is a clear cross-country heterogeneity aspect, almost necessarily ignored in the theoretical papers due to complexity but crucial for empirical studies and policy implications.

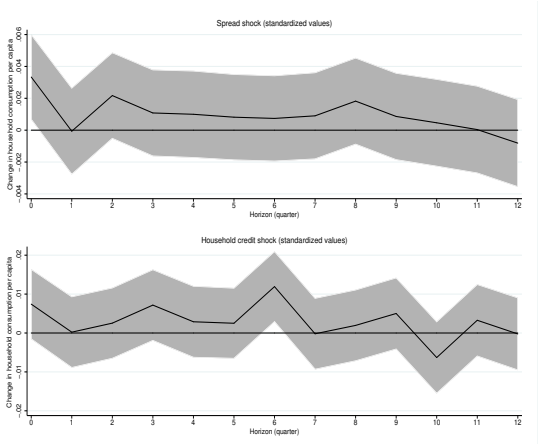
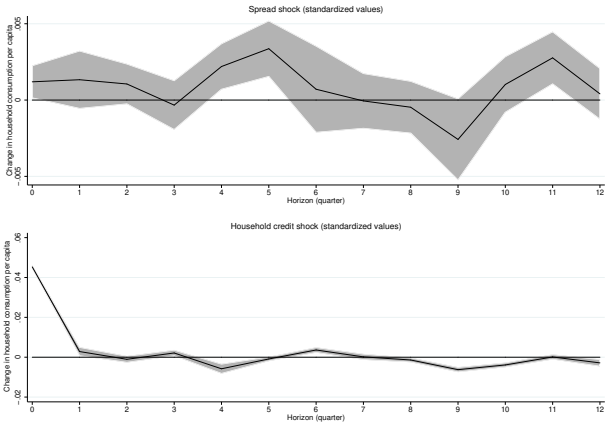


Figure A.9: Impulse responses for the household consumption spending in the United States

However, there is a notable difference in the response of household

consumption to the credit shock. As shown in Figure A.9, we observe a positive effect on consumption in the first quarter, followed by a decline, and then a resurgence in the sixth quarter. This pattern partially aligns with findings in the existing literature (Mian et al., 2017), which suggest an immediate impact of household credit on real economic activity. It's worth noting that the previous literature primarily examines annual data and emphasizes a negative medium-term effect of household credit on economic activity. In the case of the United States, as depicted in Figure A.9, this negative medium-term effect is not immediately evident. However, it's important to consider that the 12-quarter timeframe might not capture the full scope of medium-term effects. Conversely, the 'boom-bust' medium-term impact of household credit appears to be more pronounced when we analyze the panel results from multiple countries (Figure A.10).



Note: Fixed effects panel regression with horizon-specific intercepts is used to estimate local projections. Standard errors are clustered by countries.

Figure A.10: Impulse responses for the household consumption spending in a full panel of countries

Figure A.11: Growth of House Prices, Rental, and Housing Spread Across Selected Countries

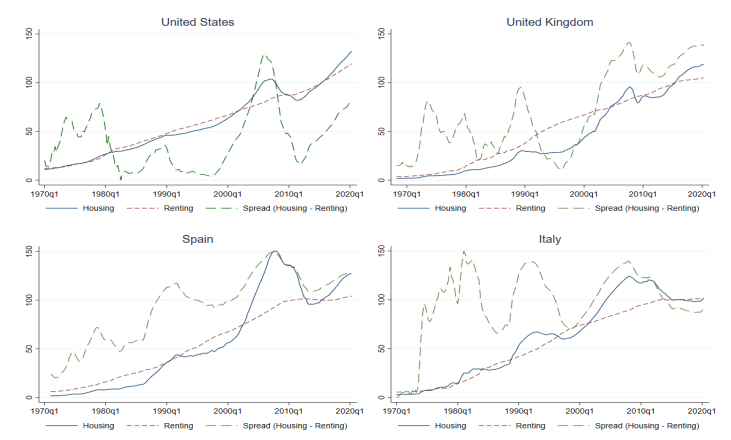


Figure A.12: House Prices, Rental, and Housing Spread Across Selected Countries

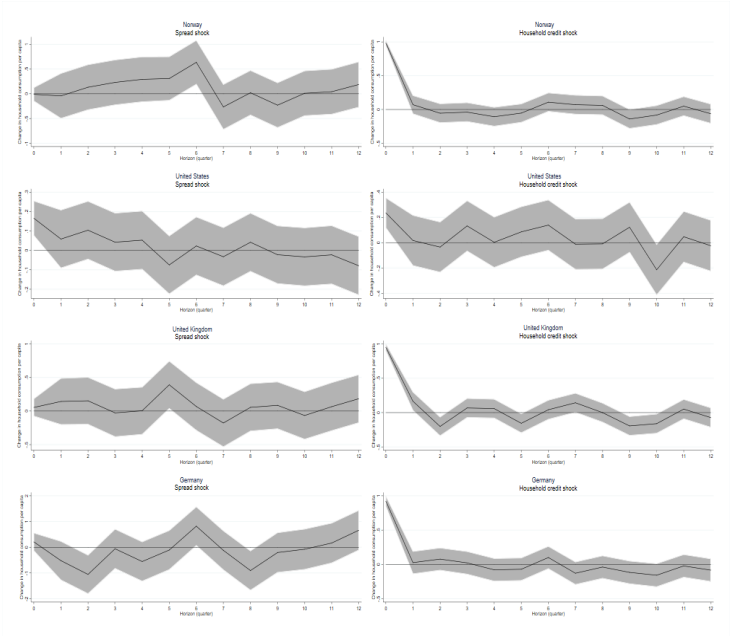


Figure A.13: Impulse responses for the household consumption spending in selected economies (housing spread shock in the left column and credit shock in the right column)

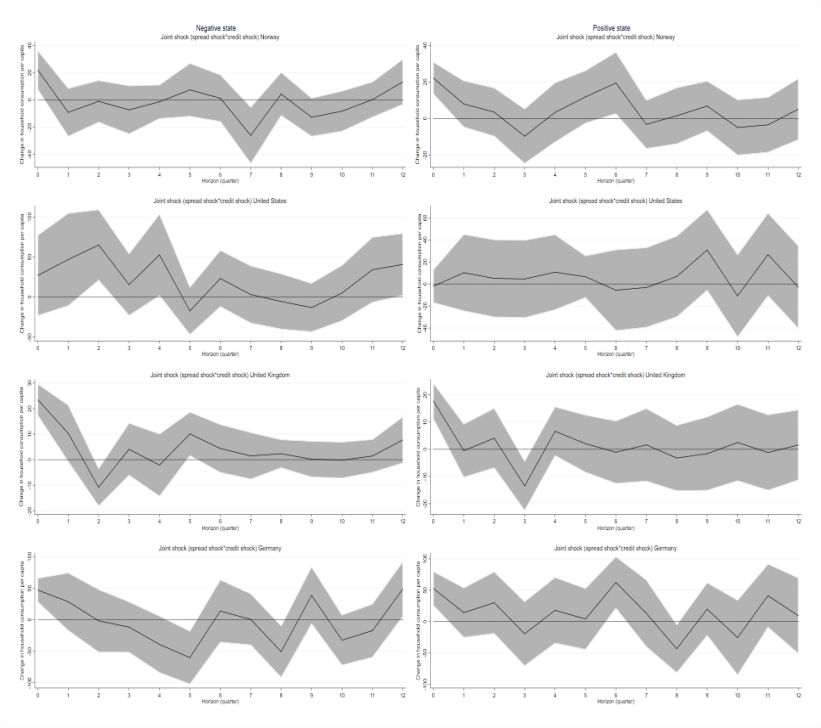


Figure A.14: Impulse responses for the household consumption spending in selected economies by states (a joint housing spread and credit shock)

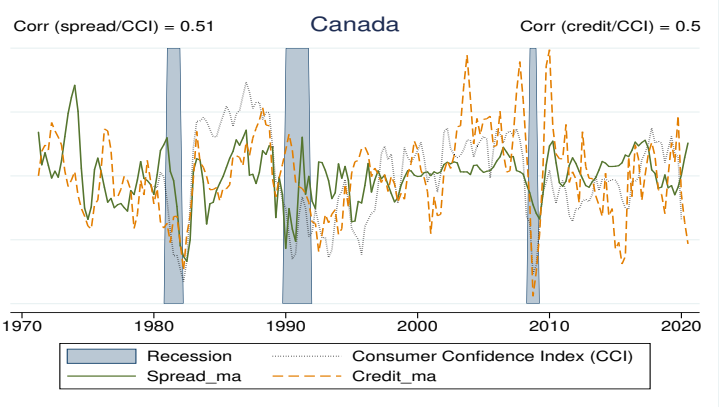


Figure A.15: Recession, Consumer Confidence Index, Spread, and Credit smoothed (by moving average) variables for Canada

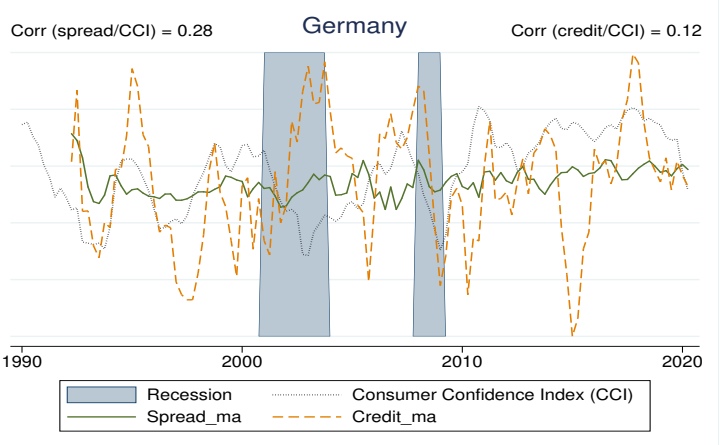


Figure A.16: Recession, Consumer Confidence Index, Spread, and Credit smoothed (by moving average) variables for Germany

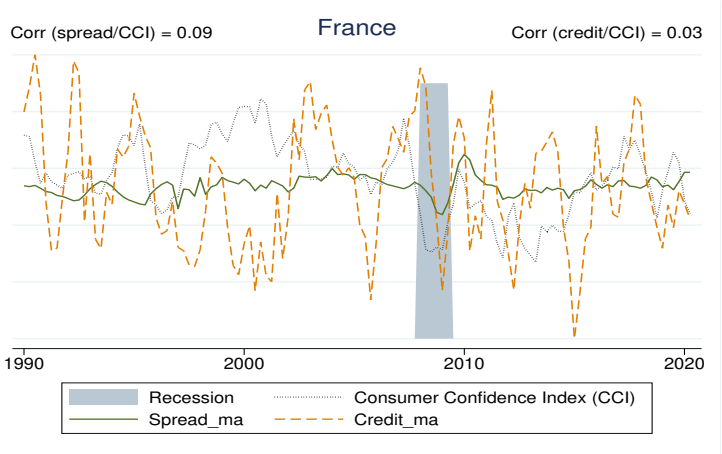


Figure A.17: Recession, Consumer Confidence Index, Spread, and Credit smoothed (by moving average) variables for France

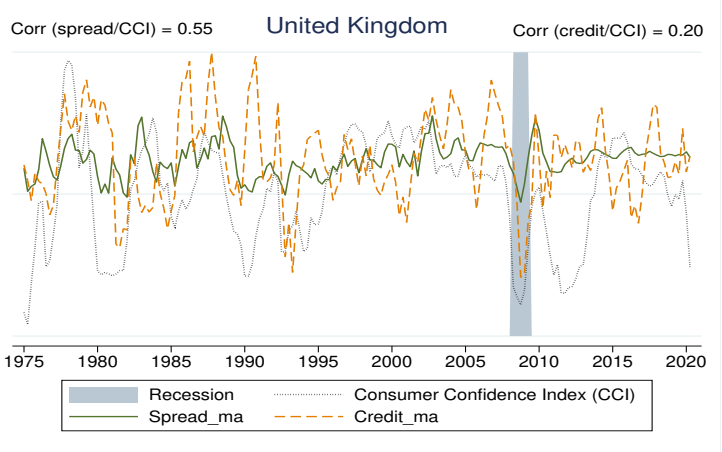


Figure A.18: Recession, Consumer Confidence Index, Spread, and Credit smoothed (by moving average) variables for UK

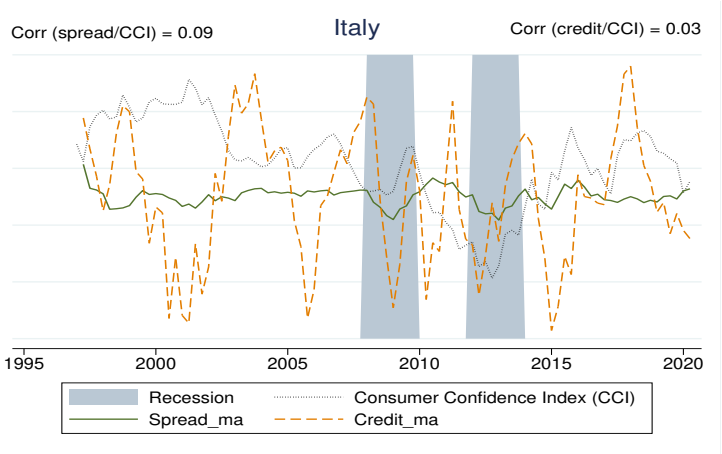


Figure A.19: Recession, Consumer Confidence Index, Spread, and Credit smoothed (by moving average) variables for Italy

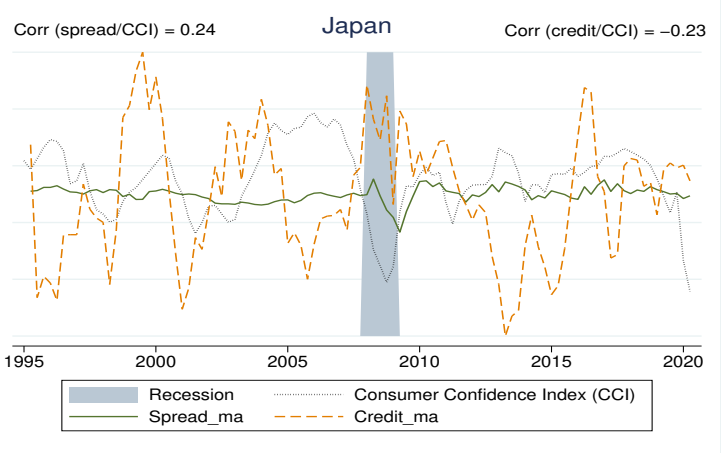
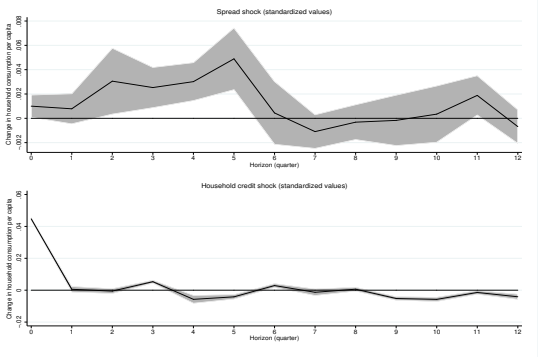


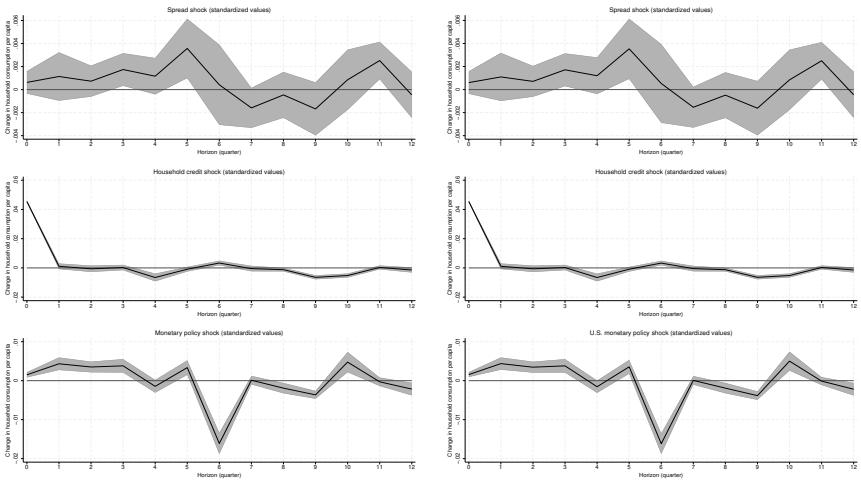
Figure A.20: Recession, Consumer Confidence Index, Spread, and Credit smoothed (by moving average) variables for Japan

A.2.3 Financial Crisis Effect



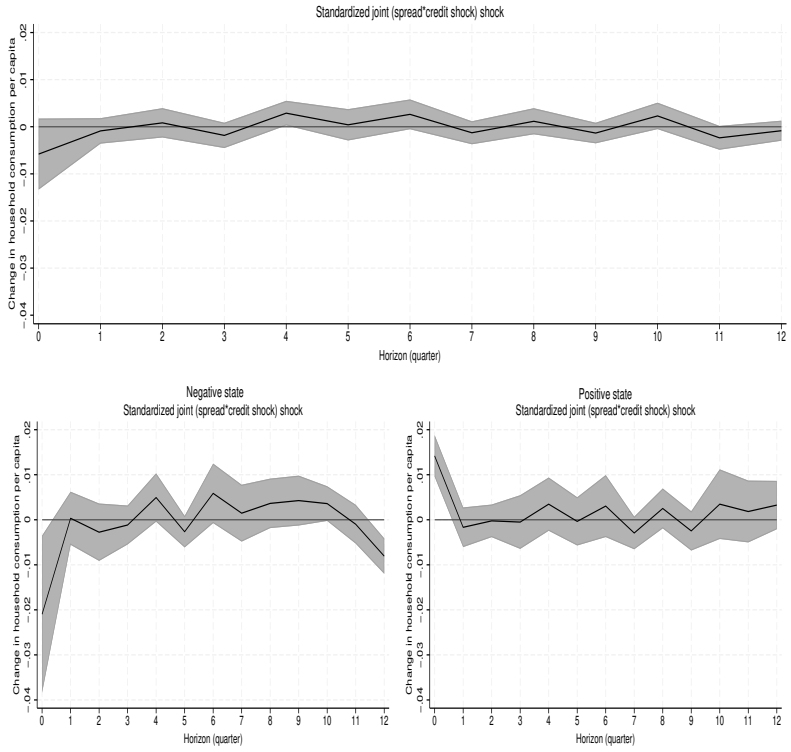
Note: A fixed effects panel regression with horizon-specific intercepts is used to estimate local projections. Standard errors are clustered by countries. Local projections are controlled for the recent financial crisis by excluding 2008 and 2009 year observations from estimation.

Figure A.21: Impulse responses for aggregate household consumption spending



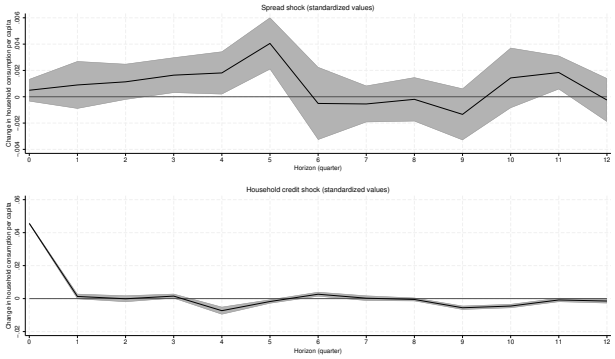
Note: Fixed effects panel regression with horizon-specific intercepts is used to estimate local projections. Standard errors are clustered by countries. The left column identifies results based on country specific long-term interest rates, the right one is built using results with the U.S. long-term interest rates.

Figure A.22: Impulse responses for the household consumption spending (including monetary policy shock)



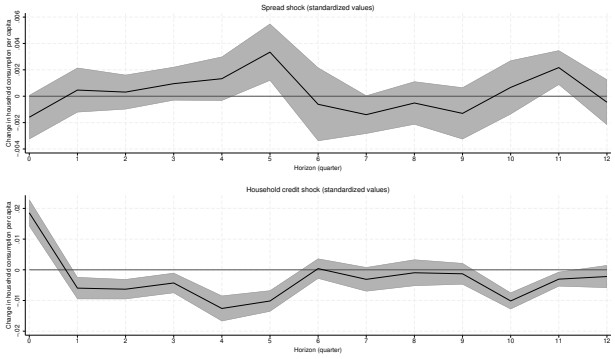
Note: Fixed effects panel regression with horizon-specific intercepts is used to estimate local projections. Standard errors are clustered by countries. Interaction variable is given as a product of spread and credit shocks. First column shows local projections identified for the period when the housing index grows slower than the rental rate index. Alternatively, second column displays results over the positive time periods when the housing index grows faster than the rental rate index. Local projections are controlled for recent financial crisis by excluding 2008 and 2009 year observations from estimation.

Figure A.23: Household consumption responses by states (controlled for financial crisis)



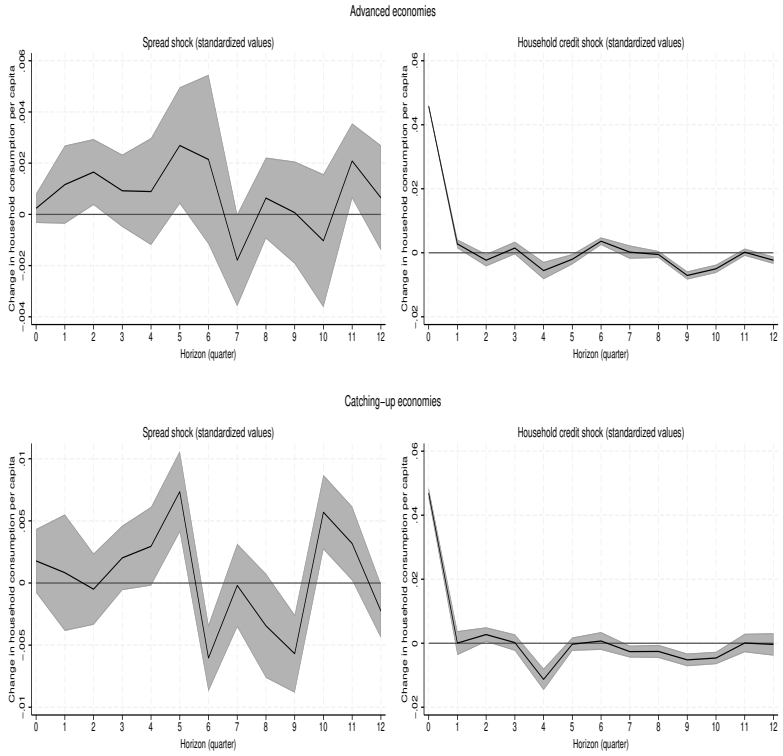
Note: Fixed effects panel regression with horizon-specific intercepts is used to estimate local projections. Standard errors are clustered by countries.

Figure A.24: Household consumption responses by controlling for changes US stock market (global component)



Note: Fixed effects panel regression with horizon-specific intercepts is used to estimate local projections. Standard errors are clustered by countries.

Figure A.25: Household consumption responses by controlling for changes in the principal component between consumption, credit and housing spread variables



Note: Fixed effects panel regression with horizon-specific intercepts is used to estimate local projections. Standard errors are clustered by countries. Countries are separated into subgroups of advanced and catching-up economies by comparing their averages on household consumption per capita. Therefore, we ended up in having 18 countries in the subgroup of advanced economies, and 10 in the subgroup of catching-up economies.

Figure A.26: Household consumption responses by country groups (advanced vs catching-up economies)

A.2.4 Data Description and Sources

Table A.9: Description of the variables

Variables	Description	Source
Housing index	Nominal house price covers the sale of newly-built and existing dwellings, following the recommendations from RPPI (Residential Property Prices Indices) manual. reference year = 2015	OECD (2020), Housing prices (indicator). doi: 10.1787/63008438-en (Accessed on 28 November 2020)
Renting index	Rent price, nominal value, reference year = 2015	OECD (2020), Housing prices (indicator). doi: 10.1787/63008438-en (Accessed on 28 November 2020)
Final consumption expenditure by households	Quarterly amount of final household consumption in national currency, chained volume estimates, national reference year, quarterly levels, seasonally adjusted (millions of national currency)	OECD (Quarterly National Accounts)
Total household credit	Households and NPISHs total credit in market value (USD), adjusted for breaks (billions of USD)	BIS (Bank of International Settlements), Statistics of Bank of Lithuania
Population	Number of people, in thousands	OECD (Quarterly National Accounts)

All variables are in real terms except for housing and rental indexes.

Table A.10: Description of the variables (continued)

Variables	Description	Source
Stock index	Country-by-country stock market index	Bloomberg
Short-term interest rate	Three-month money market rates	OECD (Main Economic Indicators)
Long-term interest rate	Government bonds maturing in ten years	OECD (Main Economic Indicators)
Consumer confidence index	Consumer confidence index, amplitude adjusted, long-term average = 100	OECD (Main Economic Indicators)
Exchange rate	Exchange Rates, National/Domestic Currency Per U.S. Dollar, End of Period, Rate	IMF (International Financial Statistics)
Macroeconomic uncertainty	Monthly index, linearly logarithmic	"Measuring Uncertainty" by K. Jurado, S. Ludvigson & S. NG
Monetary policy uncertainty	Monthly index, linearly logarithmic	"Measuring Economic Policy Uncertainty" by Baker, Bloom & Davis
Exuberance index	Constructed from house price index in absolute values, linearly logarithmic	International House Price Database (Dallas FED)

All variables are in real terms except for housing and rental indexes.

A.2.5 Theory

Household's Optimal Plan

The household's optimal plan can be represented as a solution to the following Lagrangian:

$$\begin{gathered}\max_{C_s,H_s,B_s} \mathcal{L}_t = \mathbb{E}_t \sum_{s=t}^{\infty} \beta^{s-t} \left\{ \frac{(C_s)^{1-\nu}}{1-\nu} + \phi \frac{H_s^{1-\nu}}{1-\nu} \right. \\ +\lambda_s \left(B_s + Y_s - C_s - Q_s \left(H_s - H_{s-1}\right) - i_s B_{s-1}\right) \\ \left. +\mu_s \left(\left(1-\chi_s\right) Q_s H_s - B_s\right)\right\} \\ \lambda_s,\, \mu_s \geq 0 \quad s \geq 0, \\ \mu_s \left(\left(1-\chi_s\right) Q_s H_s - B_s\right) = 0 \quad s \geq 0, \\ \mu_s \geq 0,\, \left(1-\chi_s\right) Q_s H_s \geq B_s \quad s \geq 0.\end{gathered}$$

Since the resource constraint binds in equilibrium for the locally non-satiated preferences, we imposed that from the outset, abstracting from the associated Kuhn-Tucker conditions. The first order conditions (FOCs) for the time period t yield

$$\begin{aligned}\tfrac{\partial \mathcal{L}_t}{\partial C_t} = 0 \Leftrightarrow & \quad (C_t)^{-\nu} = \lambda_t, \\ \tfrac{\partial \mathcal{L}_t}{\partial H_t} = 0 \Leftrightarrow & \quad \phi H_t^{-\nu} - \lambda_t Q_t + \mu_t \left(1-\chi\right) Q_t + \mathbb{E}_t \beta \lambda_{t+1} Q_{t+1} = 0, \\ \tfrac{\partial \mathcal{L}_t}{\partial B_t} = 0 \Leftrightarrow & \quad \lambda_t - \mathbb{E}_t \beta \lambda_{t+1} i_{t+1} - \mu_t = 0.\end{aligned}$$

Combining the first two FOCs delivers

$$H_t^{-\nu} = \tfrac{1}{\phi} \left\{ \left(C_t\right)^{-\nu} Q_t - \mu_t \left(1-\chi\right) Q_t - \mathbb{E}_t \beta \left(C_{t+1}\right)^{-\nu} Q_{t+1} \right\},$$

which is the equation (2.4), reported in the main text. The shadow price of credit frictions (borrowing constraint) is given by

$$\begin{aligned}\mu_t &= \lambda_t - \mathbb{E}_t \beta \lambda_{t+1} i_{t+1} \\ &= \left(C_t\right)^{-\nu} \left(1 - \mathbb{E}_t \beta \left(\tfrac{C_{t+1}}{C_t}\right)^{-\nu} i_{t+1}\right),\end{aligned}$$

which is the equation (2.5).

Transversality Condition

Under the no-Ponzi-game condition, we have:

$$\lim_{\ell \to \infty} \mathbb{E}_t \frac{B_{t+\ell}}{\prod_{\ell=1} i_{t+\ell}} \leq 0.$$

The condition tells that, in expected value terms, the debt position must grow at a lower rate than the interest rate in the long run. In other words, we exclude the possibility of the house price expectations being driven by having an opportunity to roll the debt into the future without bound. Also, as we are abstracting from the productive side of an economy, notice that the resource constraint can be written as $i_t B_{t-1} = B_t + Y_t - C_t - Q_t (H_t - H_{t-1}) = B_t + S_t$, where S_t stands for savings, income minus consumption (including housing consumption).

Abstracting from capital as in the main text, write the constraint $i_t B_{t-1} = B_t + Y_t - C_t - Q_t (H_t - H_{t-1}) = B_t + S_t$, where S_t is savings, income minus consumption (including housing consumption) and iterating forward yields

$$\begin{aligned} i_t B_{t-1} &= \tfrac{B_{t+1}}{i_{t+1}} + \tfrac{S_{t+1}}{i_{t+1}} + S_t = \tfrac{B_{t+2}+S_{t+2}}{i_{t+2} i_{t+1}} + \tfrac{S_{t+1}}{i_{t+1}} + S_t \\ &= \ldots = \tfrac{B_{t+\ell}}{\prod_{\ell=1} i_{t+\ell}} + \textstyle\sum_{\ell=1} \tfrac{S_{t+\ell}}{\prod_{\ell=1} i_{t+\ell}} + S_t. \end{aligned}$$

Under the transversality condition, i.e. when a no-Ponzi-game condition is no longer inequality but equality, $\lim_{\ell \to \infty} \mathbb{E}_t \frac{B_{t+\ell}}{\prod_{\ell=1} i_{t+\ell}} = 0$, the forward-iterated expression yields:

$$i_t B_{t-1} = \lim_{\ell \to \infty} \mathbb{E}_t \sum_{\ell=1} \frac{S_{t+\ell}}{\prod_{\ell=1} i_{t+\ell}} + S_t, \tag{A.1}$$

since the first term goes to zero. The initial household's debt position is equal to savings (the difference between income endowment and consumption, including adjustment in the housing consumption) and future expected stream of savings. If a household is initially indebted (so that $B_{t-1} > 0$), then there must be that at least one period with positive savings. Alternatively, if $B_{t-1} < 0$, then at least in principle a household could dissave in all periods. To see that a stock of debt is non-explosive for either, positive or negative, initial position, let us assume away binding borrowing constraint and, in such a case, rule out a possibility for consumption to grow absent stochastic shocks. The required condition is that the subjective discount factor β coincide with the interest rate, $1/i_{t+1}$, so that

$$\lambda_t = \mathbb{E}_t \lambda_{t+1},$$

when $\mu_t = 0$. Notice that credit (borrowing) frictions enable consumption growth even under $\beta i_{t+1} = 1$, if $\mu_t > 0$ (requiring reallocate consumption inter-temporally). Under this assumption, and along the balanced growth path, the equation (A.1) can be written as

$$\frac{1}{\beta}B = \frac{\beta}{1-\beta}S + S = \frac{1}{1-\beta}S,$$
$$B = \frac{\beta}{1-\beta}S < C,$$

where C is a finite scalar, $C < \infty$, and $\beta \in (0, 1)$. Steady state savings can be positive or negative. In other words, if the starting position for the household is that of net creditor, then it can sustain negative savings perpetually without violating the transversality condition. This result also holds in more general circumstances once the long-run real rate of interest is strictly non-negative.

To summarize, the initial debt position is equal to savings (the difference between income endowment and consumption, including adjustment in the housing consumption) and future expected stream of savings. If a household is initially indebted (so that $B_{t-1} > 0$), then there must be at least one period with positive savings. Alternatively, if $B_{t-1} < 0$, then at least in principle, a household could dissave in all periods. Aggregating into the macroeconomy and introducing investment, we would have obtained a standard result, where savings are adjusted for investment, which equals trade balance in the one-good economy. In other words, the aggregate net (foreign) debt position is equal to the present discounted value of current and future streams of trade surpluses (see, for instance, Uribe and Schmitt-Grohé, 2017). Despite the level of aggregation, we do not need varying preferences β to justify positive or negative savings, which do not violate the transversality condition. For this reason, we stick to the most transparent and succinct environment, which works with one type of households.

Parametric Assumptions

Suppose we assumed, along the lines of Hansen and Singleton (1983), parametric assumptions that interest rates and consumption growth as well as consumption growth and house prices growth were normally distributed, conditional on the information set Ω_t:

$$\left[\begin{array}{c} \triangle \ln C_{t+1} \\ \ln i_{t+1} \end{array}\right] \Bigg| \Omega_t \sim N \left[\left(\begin{array}{c} \mathbb{E}_t \triangle \ln C_{t+1} \\ \mathbb{E}_t \ln i_{t+1} \end{array} \right); \left(\begin{array}{cc} \sigma_c^2 & \sigma_{ci} \\ \sigma_{ci} & \sigma_i^2 \end{array} \right) \right] \quad \text{(A.2)}$$

and

$$\left[\begin{array}{c} \triangle \ln C_{t+1} \\ \triangle \ln Q_{t+1} \end{array}\right] \Bigg| \Omega_t \sim N \left[\left(\begin{array}{c} \mathbb{E}_t \triangle \ln C_{t+1} \\ \mathbb{E}_t \triangle \ln Q_{t+1} \end{array} \right); \left(\begin{array}{cc} \sigma_c^2 & \sigma_{cq} \\ \sigma_{cq} & \sigma_q^2 \end{array} \right) \right]. \quad \text{(A.3)}$$

One could also assume trivariate normal distribution, allowing for interest rates be correlated with the growth rate of house prices; we will stick to this simpler environment with two bivariate norma distributions. Let's start with the interest rate and consumption growth:

$$\mathbb{E}_t \left(\frac{C_{t+1}}{C_t}\right)^{-\nu} i_{t+1} = \mathbb{E}_t \exp\left(-\nu \triangle \ln C_{t+1} + \ln i_{t+1}\right),$$

where $\mu_c \equiv \mathbb{E}_t \triangle \ln C_{t+1}, \mu_i \equiv \mathbb{E}_t \ln i_{t+1}$. Using properties of the log-normal distribution, we find that

$$\mathbb{E}_t \exp\left(-\nu \triangle \ln C_{t+1} + \ln i_{t+1}\right) = \exp\left(-\nu\mu_c + \mu_i + \frac{1}{2}\nu^2\sigma_c^2 + \frac{1}{2}\sigma_i^2 - \nu\sigma_{ci}\right).$$

Using (2.13) and (2.5), we have

$$\begin{aligned} 1 - (1-\chi)^{-1}\left(1 - \left(\frac{R_t^H + \mathcal{S}_t}{Q_t}\right)\right) &= \beta \mathbb{E}_t \left(\frac{C_{t+1}}{C_t}\right)^{-\nu} i_{t+1}, \\ 1 - (1-\chi)^{-1}\left(1 - \frac{R_t^H}{Q_t} - \beta \mathbb{E}_t \left(\frac{C_{t+1}}{C_t}\right)^{-\nu} \frac{Q_{t+1}}{Q_t}\right) &= \beta \mathbb{E}_t \left(\frac{C_{t+1}}{C_t}\right)^{-\nu} i_{t+1}. \end{aligned} \quad \text{(A.4)}$$

Following the same logic for the house prices,

$$\mathbb{E}_t \left(\frac{C_{t+1}}{C_t}\right)^{-\nu} \frac{Q_{t+1}}{Q_t} = \mathbb{E}_t \exp\left(-\nu \triangle \ln C_{t+1} + \triangle \ln Q_{t+1}\right),$$

where $\mu_c \equiv \mathbb{E}_t \triangle \ln C_{t+1}, \mu_q \equiv \mathbb{E}_t \triangle \ln Q_{t+1}$. Using properties of the log-normal distribution, we find that

$$\mathbb{E}_t \exp\left(-\nu \triangle \ln C_{t+1} + \triangle \ln Q_{t+1}\right) = \exp\left(-\nu\mu_c + \mu_q + \frac{1}{2}\nu^2\sigma_c^2 + \frac{1}{2}\sigma_q^2 - \nu\sigma_{cq}\right).$$

Returning back to equations (A.4), we obtain

$$1-(1-\chi)^{-1}+(1-\chi)^{-1}\frac{R_t^H}{Q_t}=\beta\mathbb{E}_t\left(\frac{C_{t+1}}{C_t}\right)^{-\nu}(1-\chi)^{-1}\left((1-\chi)\,i_{t+1}-\frac{Q_{t+1}}{Q_t}\right),$$
$$\beta^{-1}\left(\frac{R_t^H}{Q_t}-\chi\right)=(1-\chi)\,\mathbb{E}_t\left(\frac{C_{t+1}}{C_t}\right)^{-\nu}i_{t+1}-\mathbb{E}_t\left(\frac{C_{t+1}}{C_t}\right)^{-\nu}\frac{Q_{t+1}}{Q_t}$$
$$=(1-\chi)\exp\left(-\nu\mu_c+\mu_i+\tfrac{1}{2}\nu^2\sigma_c^2+\tfrac{1}{2}\sigma_i^2-\nu\sigma_{ci}\right)-$$
$$\exp\left(-\nu\mu_c+\mu_Q+\tfrac{1}{2}\nu^2\sigma_c^2+\tfrac{1}{2}\sigma_Q^2-\nu\sigma_{cQ}\right)$$
$$=\exp\left(-\nu\mu_c+\tfrac{1}{2}\nu^2\sigma_c^2\right)\left((1-\chi)\,e\left(\mu_i+\tfrac{1}{2}\sigma_i^2-\nu\sigma_{ci}\right)-\exp\left(\mu_Q+\tfrac{1}{2}\sigma_Q^2-\nu\sigma_{cQ}\right)\right).$$

Taking logs and rearranging (when $\frac{R_t^H}{Q_t}-\chi>0$ and $((1-\chi)\,Q_t)\,\mathbb{E}_t\left(C_{t+1}\right)^{-\nu}i_{t+1}-\mathbb{E}_t\left(C_{t+1}\right)^{-\nu}Q_{t+1}>0$):

$$\nu\mathbb{E}_t\triangle\ln C_{t+1}=\ln\beta-\ln\left(\frac{R_t^H}{Q_t}-\chi\right)+\tfrac{1}{2}\nu^2\sigma_c^2$$
$$+\ln\left[(1-\chi)\exp\left(\mathbb{E}_t\ln i_{t+1}+\tfrac{1}{2}\sigma_i^2-\nu\sigma_{ci}\right)-\exp\left(\mathbb{E}_t\triangle\ln Q_{t+1}+\tfrac{1}{2}\sigma_Q^2-\nu\sigma_{cQ}\right)\right],$$
$$\nu\mathbb{E}_t\triangle\ln C_{t+1}=\ln\beta-\ln\left(\frac{R_t^H-\chi Q_t}{Q_t}\right)+\tfrac{1}{2}\nu^2\sigma_c^2$$
$$+\ln\left[(1-\chi)\exp\left(\mathbb{E}_t\ln i_{t+1}+\tfrac{1}{2}\sigma_i^2-\nu\sigma_{ci}+\tfrac{1}{2}\nu^2\sigma_c^2-\tfrac{1}{2}\nu^2\sigma_c^2\right)\right.$$
$$\left.-\exp\left(\mathbb{E}_t\triangle\ln Q_{t+1}+\tfrac{1}{2}\sigma_Q^2-\nu\sigma_{cQ}+\tfrac{1}{2}\nu^2\sigma_c^2-\tfrac{1}{2}\nu^2\sigma_c^2\right)\right]=$$
$$\ln\beta-\ln\left(\frac{R_t^H-\chi Q_t}{Q_t}\right)+\tfrac{1}{2}\nu^2\sigma_c^2$$
$$+\ln\left[\exp\left(-\tfrac{1}{2}\nu^2\sigma_c^2\right)\left[(1-\chi)\exp\left(\mathbb{E}_t\ln i_{t+1}+\tfrac{1}{2}\sigma_i^2-\nu\sigma_{ci}+\tfrac{1}{2}\nu^2\sigma_c^2\right)\right.\right.$$
$$\left.\left.-\exp\left(\mathbb{E}_t\triangle\ln Q_{t+1}+\tfrac{1}{2}\sigma_Q^2-\nu\sigma_{cQ}+\tfrac{1}{2}\nu^2\sigma_c^2\right)\right]\right]=\ln\beta-\ln\left(\frac{R_t^H-\chi Q_t}{Q_t}\right)$$
$$+\ln\left[(1-\chi)\exp\left(\mathbb{E}_t\ln i_{t+1}+\tfrac{\nu^2}{2}\mathrm{Var}_t\left(\triangle\ln C_{t+1}-\tfrac{1}{\nu}\ln i_{t+1}\right)\right)\right.$$
$$\left.-\exp\left(\mathbb{E}_t\triangle\ln Q_{t+1}+\tfrac{\nu^2}{2}\mathrm{Var}_t\left(\triangle\ln C_{t+1}-\tfrac{1}{\nu}\ln\triangle\ln Q_{t+1}\right)\right)\right].$$

Dividing both sides by ν:

$$\mathbb{E}_t\triangle\ln C_{t+1}=\nu^{-1}\ln\beta-\nu^{-1}\ln\left(\frac{R_t^H-\chi Q_t}{Q_t}\right)$$
$$+\nu^{-1}\ln\left[(1-\chi)\exp\left(\mathbb{E}_t\ln i_{t+1}+\tfrac{\nu^2}{2}\mathrm{Var}_t\left(\triangle\ln C_{t+1}-\tfrac{1}{\nu}\ln i_{t+1}\right)\right)\right.$$
$$\left.-\exp\left(\mathbb{E}_t\triangle\ln Q_{t+1}+\tfrac{\nu^2}{2}\mathrm{Var}_t\left(\triangle\ln C_{t+1}-\tfrac{1}{\nu}\ln\triangle\ln Q_{t+1}\right)\right)\right].$$

Once $\frac{R_t^H}{Q_t}-\chi<0$ and $((1-\chi)\,Q_t)\,\mathbb{E}_t\left(C_{t+1}\right)^{-\nu}i_{t+1}-\mathbb{E}_t\left(C_{t+1}\right)^{-\nu}Q_{t+1}<0$, then

$$\mathbb{E}_t\triangle\ln C_{t+1}=\nu^{-1}\ln\beta-\nu^{-1}\ln\left(\frac{\chi Q_t-R_t^H}{Q_t}\right)$$
$$+\nu^{-1}\ln\left[\exp\left(\mathbb{E}_t\triangle\ln Q_{t+1}+\tfrac{\nu^2}{2}\mathrm{Var}_t\left(\triangle\ln C_{t+1}-\tfrac{1}{\nu}\ln\triangle\ln Q_{t+1}\right)\right)\right.$$
$$\left.-(1-\chi)\exp\left(\mathbb{E}_t\ln i_{t+1}+\tfrac{\nu^2}{2}\mathrm{Var}_t\left(\triangle\ln C_{t+1}-\tfrac{1}{\nu}\ln i_{t+1}\right)\right)\right].$$

Therefore, consumption growth, unlike standard applications with precautionary savings, depends on the difference between down-payment and rental rates, $\left|\chi Q_t - R_t^H\right|$, and thus also on the spread, $\mathcal{S}_t$, as well as a nonlinear function, capturing long-term averages of house price growth rates and interest rates, the conditional variability of consumption growth rate, the house prices growth rate and the interest rate. The latter ingredients capture uncertainty regarding all forward-looking variables, which can be further extended to the uncertainty of the US interest rate and exchange rates, a path we took in the working paper version assuming uncovered interest rate parity. Refer to the main text (Section 2.5.2) for empirical results when uncertainty measures to capture macroeconomic (consumption), monetary policy (interest rate), and housing are included in the baseline model.

A.3 Appendix C

Table A.11: Household Finance and Consumption Survey Summary Statistics (changes)

	Panel countries	Panel countries (with IV variables)
After-tax income (annual)	.0419	.0543
Total expenditures (annual)	.0144	.0277
Home value (if owner)		
Self-reported	.0234	.0336
Number of countries	13	6

Changes are captured from log-linearized variables that are later used in the estimations. Also, all values are reported in 2015:I euros.

Table A.12: Cross-country Household Characteristics and Housing Statistics

	Belgium	Cyprus	Estonia	Italy	Latvia	Malta
Percentage owners	46.58	36.70	57.33	63.89	62.94	65.78
Percentage owners w/mortgage	73.71	79.62	80.46	71.89	80.63	77.54
Age	56.50	50.48	51.42	60.02	52.83	56.25
Family size	2.37	3.34	2.59	2.43	2.34	2.74
Observations	4,515	2,507	2,196	15,871	1,198	1,870

Table A.13: Household Finance and Consumption Survey Summary Statistics (changes)

	Belgium	Cyprus	Estonia	Italy	Latvia	Malta
After-tax income (annual)	.066732	-.060983	.285671	.0329512	.0317023	.102833
Total expenditures (annual)	.037415	-.200814	.1421583	.034523	.0445904	.1072518
Home value (if owner)						
Self-reported	.056777	-.079214	.1653895	.0010569	.2217552	.1057106

Changes are captured from log-linearized variables that are later used in the estimations. Also, all values are reported in 2015:I euros.

Table A.14: Questions for the Instrumental Variable

1) Type of dwelling:	1 - Individual house 2 - Semi-detached house 3 - Flat/apartment 4 - Other kind of dwelling 5 - Dwelling does not exist
2) Dwelling rating:	1 - Luxury 2 - Upscale 3 - Mid-range 4 - Modest 5 - Low-income
3) Dwelling location:	1 - Downtown 2 - Area between city centre and suburbs 3 - Town outskirts 4 - Isolated area, countryside

Table A.15: Questions for the Instrumental Variable (continued)

4) Dwelling - outward appearance:	1 - Generally clean and sound 2 - Some peeling paint or cracks in walls 3 - Needs substantial painting, refilling or repair 4 - Dilapidated
5) Dwelling - comparison to the neighbourhood:	1 - The dwelling is better than the neighbourhood 2 - The dwelling is as good as the neighbourhood 3 - The dwelling is worse than the neighbourhood 4 - There are no other buildings in view
6) Dwelling - rating of surrounding buildings:	1 - Luxury 2 - Upscale 3 - Mid-range 4 - Modest 5 - Low-income 6 - Very low income 7 - No surrounding buildings in view

Table A.16: Statistics for Instrumental Variable

IV value	Number of observations	Mean housing value
2	267	662264.2
3	398	300234.4
4	513	312924.4
5	686	292725.1
6	900	280652.2
7	1,721	200472.9
8	4,094	165410.5
9	5,637	156988.6
10	3,403	139336.2
11	2,611	133894.5
12	2,190	114188.6
13	1,415	95952.96
14	921	75570.2
15	511	60613.21
16	380	53049.6
17	292	43923.38
18	105	40669.06
19	62	29593.45
20	27	64189.17
21	14	11559.65
22	6	15362.91

The second column shows the number of observations associated with a particular value of IV. The third column gives the mean value of housing for the particular value of IV.

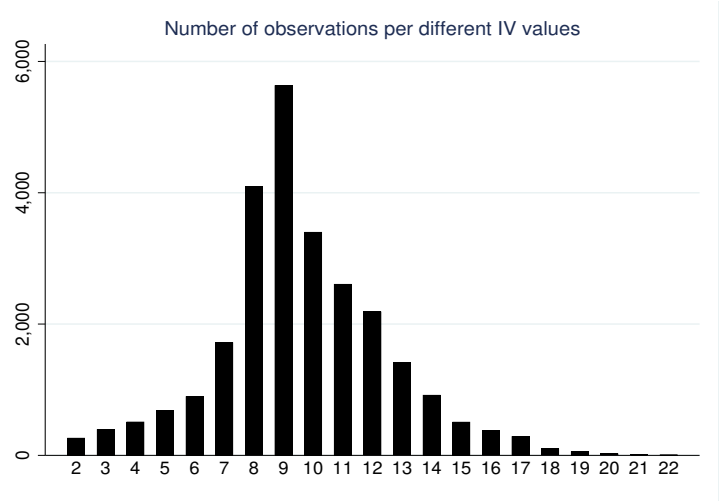


Figure A.27: Distribution of the Number of Observations Associated with Different IV Values

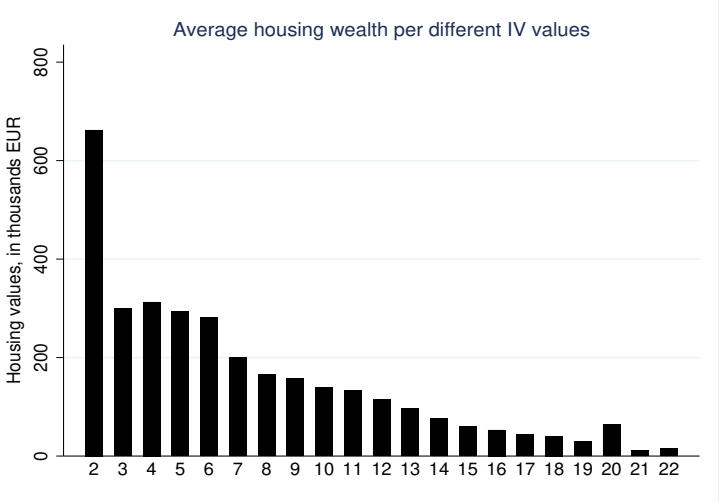


Figure A.28: Distribution of the Mean Housing Values Associated with Particular IV Values

Table A.17: Effects of Housing on Consumption: Robustness results including country-time fixed effects and income, and wealth quintiles as controls

	Baseline	Renters	Homeowners		
				Owners	Mortgage owners
	(1)	(2)	(3)	(4)	(5)
House value change	.038*	.041***	.036	.034	.038
	(.019)	(.011)	(.033)	(.037)	(.027)
Income change	.173***	.159***	.177***	.189***	.151***
	(.036)	(.051)	(.030)	(.036)	(.024)
Household controls	+	+	+	+	+
10 year government bonds	+	+	+	+	+
Country*time	+	+	+	+	+
Country income quintiles	+	+	+	+	+
Country wealth quintiles	+	+	+	+	+
Sample	Pooled	Renters	All owners	Owners	Mortgage owners
Estimation	OLS	OLS	OLS	OLS	OLS
Observations	31,298	7,398	23,900	16,801	7,099
Clusters	13	13	13	13	13

Each regression includes household controls on age and number of household members, on the real 10-year Government bond rate, on country*time and country fixed effects, on country income quintiles, and on country wealth quintiles. Median housing value is captured at the country level based on individual household answers about the values of housing that they live in.

Table A.18: Effects of Housing on Consumption: Income quintile-based results

	Baseline	Q1	Q2	Q3	Q4	Q5
	(1)	(2)	(3)	(4)	(5)	(6)
House value change	.121*	.038	.094**	.167*	.128	.175***
	(.052)	(.047)	(.035)	(.069)	(.082)	(.038)
Income change	.240***	.150***	.299**	.274**	.338**	.256***
	(.061)	(.036)	(.090)	(.073)	(.094)	(.054)
Household controls	+	+	+	+	+	+
10 year government bonds	+	+	+	+	+	+
Sample	Pooled	Pooled	Pooled	Pooled	Pooled	Pooled
Estimation	IV	IV	IV	IV	IV	IV
Observations	13,174	2,012	2,330	2,577	2,883	3,372
Clusters	6	6	6	6	6	6

Each regression includes household controls on age and number of household members, and on the real 10-year Government bond rate. Median housing value is captured at the country level based on individual household answers about the values of housing that they live in. Regressions 2-6 are based on cross-country gross income quintiles.

Table A.19: Summary of Household Consumption (changes in values)

	(1) mean	(2) mean
Consumption change	.02935	.00502
Number of observations	11,439	7,302

Column 1 shows the results when house price increases more than rental expenditure, while Column 2 represents results when rental spending grows faster than house prices. The table summarizes statistics only for the households that are identified as renters.

Table A.20: Summary of Household Consumption (changes in values)

	(1) Mortgage owners	(2) Mortgage owners
Consumption change	.141**	.256***
	(.051)	(.042)
Income change	.161	.164***
	(.086)	(.036)
Household controls	+	+
10 year government bonds	+	+
Sample	Pooled	Pooled
Estimation	IV	IV
Observations	1,232	1,273
Clusters	6	6

Column 1 shows the results when household loan to value ratio is lower than 0.3 (meaning households with a large borrowing capacity), while Column 2 represents results when the loan to value ratio is higher than 0.3.

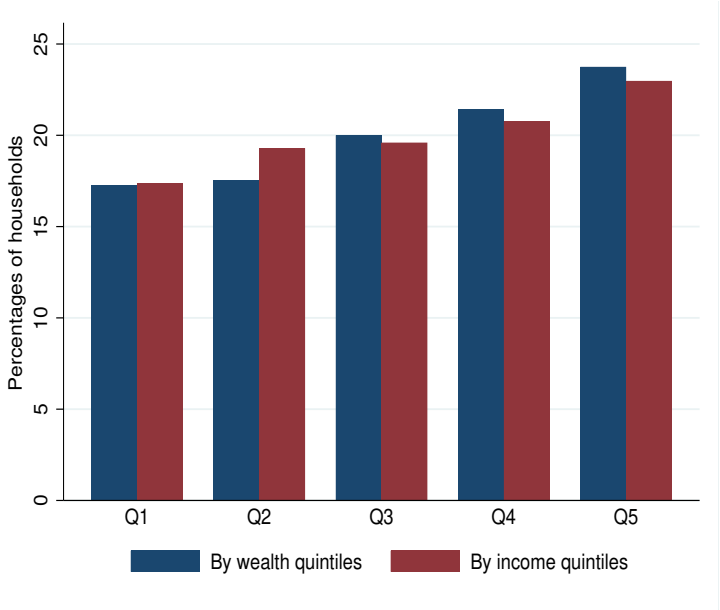


Figure A.29: Distribution of IV sub-sample Households by Income and Wealth Quintiles in Country

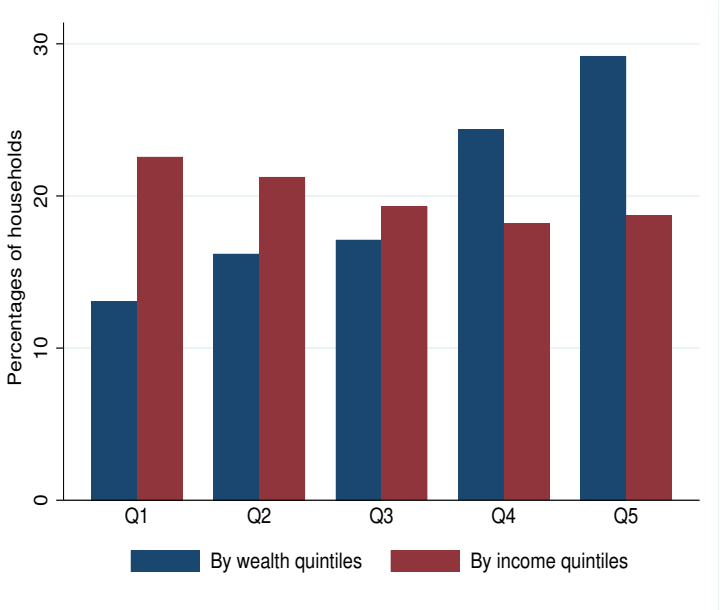


Figure A.30: Distribution of IV sub-sample Households by Income and Wealth Quintiles in Euro area

SANTRAUKA

Temos aktualumas ir problema

Pirmajame Makroekonomikos žinyne, išleistame 1999 m., beveik nėra nuorodų į su būstu susijusių temų aktualumą (Piazzesi and Schneider (2016)). Šis faktas rodo tuo metu vyravusią su būstu susijusių makroekonominių tyrimų situaciją. Didžioji dalis šios ankstyvosios su būstu (ar nekilnojamuoju turtu) susijusios makroekonominės literatūros buvo skirta nagrinėti balanso apribojimų poveikį nefinansinėms įmonėms. Anot Bernanke and Gertler (1995), tokie suvaržymai taip pat gali turėti svarbią reikšmę priimant namų ūkių ir finansų įmonių sprendimus. Įvykiai, vykę nuo 2000-ųjų pradžios, o ypač 2008 m. pasaulinė finansų krizė tai parodė Bernanke and Gertler (1995), nes finansinių sunkumų kilo visuose trijuose sektoriuose: namų ūkių, finansų ir ne finansų įmonių (Gertler and Gilchrist (2018)). Be to, ši krizė atgaivino tiek teorinius, tiek empirinius tyrimus, kurie atlikti per pastaruosius du dešimtmečius ir kuriais buvo siekiama ištirti galimus mechanizmus, kaip finansų krizė ir jos efektai persidavė į realųjį sektorių.

Ankstesnėje makroekonomikos literatūroje gerokai daugiau dėmesio buvo skirta finansų rinkoms, siekiant užfiksuoti finansų balanso poveikį nedarbo svyravimams. Pavyzdžiui, Phelps (1999) atkreipia dėmesį į akcijų rinkos ir nedarbo santykį, todėl empiriškai susieja 1990-ųjų akcijų rinkos bumą su reikšmingu nedarbo lygio sumažėjimu. Vėliau (Fitoussi et al. (2000)) pastebėtas panašus akcijų rinkos poveikis nedarbui įvairiose Europos šalyse. Apskritai ši literatūra parodo esamą ryšį tarp namų ūkių turto, finansų rinkų ir realios ekonominės veiklos. Todėl pastarieji dešimtmečiai buvo susiję su pasitikėjimo ir namų ūkių skolos krizėmis, kurios buvo siejamos su dideliais būsto kainų, finansų rinkų ir vartojimo svyravimais 2000-ųjų pradžioje.

Pastarąjį dešimtmetį įvairiose išsivysčiusiose pasaulio ekonomikose buvo pastebimi būsto kainų pokyčiai. Iki pasaulinės finansų krizės būsto kainos augo neįprastai greitai ir pasiekė aukštą lygį, kurio anksčiau tam tikrais atvejais nebuvo pastebėta. Vėliau 2006–2011 m. būsto kainos smuko, o paskui daugelyje šalių buvo matomas vėl padidėjęs kainų augimas. Šie labai sinchronizuoti būsto rinkų svyravimai iš pradžių sutapo

su didelio augimo laikotarpiu, tačiau vėliau prasidėjo dideli finansiniai sutrikimai ir gilus nuosmukis. Tai skatina kelti klausimą, kokie yra pagrindiniai sukrėtimai, lemiantys pasaulinių būsto kainų pokyčius, ir kaip šie svyravimai veikia realiąją ekonomiką.

Dėmesys būsto kainoms šioje disertacijoje aiškiai nulemtas paskutinių dešimtmečių ekonominių įvykių. Tačiau, atsižvelgiant į svarbų būsto vaidmenį šiuolaikinėje visuomenėje, yra ir svarbesnių bei paprastesnių priežasčių tirti būsto rinkų dinamiką. Visų pirma, būstas suteikia žmonėms esminę būtinybę: vietą gyventi. Antra, su būstu susijusi veikla sudaro didelę BVP ir namų ūkio išlaidų dalį. Trečia, būstas yra pagrindinis turtas, o hipotekos skola yra pagrindinis daugelio išsivysčiusių šalių namų ūkių įsipareigojimas. Todėl dideli būsto kainų svyravimai gali turėti reikšmingų makroekonominių padarinių, nes jie turi įtakos namų ūkių grynajam turtui ir jų galimybėms skolintis bei išleisti pinigus investicijoms į būstą (Hirata et al. (2013)). Teoriškai būsto kainų ir realiosios ekonomikos ryšys gali pablogėti, kai yra finansinių netobulumų. Šis pasikeitimas daugiausia susijęs su finansų akseleratoriumi ir kitais mechanizmais, veikiančiais įmones, namų ūkius ir šalių finansinius balansus. Pagal šiuos mechanizmus turto kainų padidėjimas (sumažėjimas) pagerina (pablogina) įmonės grynąją vertę, padidindamas (sumažindamas) jos galimybes skolintis, investuoti ir vartoti. Šis procesas savo ruožtu gali toliau didinti (mažinti) būsto kainas ir sukelti bendrąjį pusiausvyros efektą. Kitaip tariant, būsto rinkų sutrikimai gali virsti daug didesniais cikliniais realiosios ekonomikos svyravimais (Hirata et al. (2013)).

Nagrinėdamas finansų krizės priežastis Mian and Sufi (2014b) išryškino tai, kad turtingiausia visuomenės grupė buvo susijusi su akcijų rinka, o skurdesnieji savo turtus kaupė daugiausia per būsto vertę. Be to, autorius akcentuoja, kad dauguma namų ūkių skolų išsivysčiusiose šalyse yra užtikrintos būsto užstatu. Naujausi tyrimai rodo, kad būsto užstato vertės svyravimai daro įtaką daugumos namų ūkių skolinimosi suvaržymams ir vartojimo pasirinkimams (Hintermaier and Koeniger (2018)). Apskritai šie faktai pagrindžia idėjas, koks finansiškai trapus gali būti namų ūkio balansas, kaip turtas priklauso nuo realaus ir finansinio turto, ir pabrėžia būsto svarbą daugumai namų ūkių.

Bendra būsto svarbos namų ūkiams ir realiajam sektoriui tema taip

pat sudomino daugelį ekonomistų, paskatino juos tirtiveiksnius, galinčius paaiškinti būsto dinamiką įvairiose rinkose. Todėl netrukus po pasaulinės finansų krizės ekonomistai pasiūlė namų ūkių lūkesčius kaip vieną iš pagrindinių veiksnių, paaiškinančių būsto kainų dinamiką (Piazzesi and Schneider (2016); Guerrieri and Uhlig (2016); Kaplan et al. (2020)). Galima sakyti, kad lūkesčiai yra pagrindinis kintamasis, apibūdinantis bendrus rinkos rezultatus, atsižvelgiant į jų svarbų vaidmenį priimant tarplaikinius sprendimus neapibrėžtumo kontekste (Kuchler et al. (2022)). Daugeliui būsto rinkoje priimamų sprendimų, pavyzdžiui, renkantis pirkti ar parduoti turtą, turi įtakos asmenų lūkesčiai dėl būsimų rinkos sąlygų. Tokiais atvejais individualūs įsitikinimai gali turėti įtakos bendrai ekonomikai, paveikti rinkos lygio rezultatus. Kilus pasaulinei finansų krizei, daugybė tyrėjų atkreipė dėmesį į būsto rinkos lūkesčių formavimosi, šių lūkesčių vaidmens formuojant individualų elgesį ir tokių sprendimų įtakos platesnei ekonomikos aplinkai analizę (Kuchler et al. (2022)). Tačiau, nepaisant reikšmingų makroekonominių ir politikos padarinių, lūkesčių ir realiosios ekonomikos sąveika tebėra mažai ištirta, ypač tokiomis aplinkybėmis, kai įprastos priemonės, pvz., pinigų politika, negali visiškai palaikyti ekonomikos augimo.

Net jei namų ūkių lūkesčius dėl būsimų būsto rinkos pokyčių galima modeliuoti ir analizuoti teoriniu lygmeniu, norint empiriškai ištirti būsto rinkos lūkesčius lemiančius veiksnius ir jų poveikį, mokslininkai pirmiausia turi sugebėti patikimai išmatuoti lūkesčius. Kadangi žmonių lūkesčiai nėra tiesiogiai stebimi, tyrėjai dažniausiai remiasi apklausos rezultatais. Europos šalių lygmeniu buvo juntamas didžiulis trūkumas tokių rezultatų, todėl neseniai pradėti naudoti HFCS (*Household Finance and Consumption Survey*) rezultatai šią problemą iš dalies išsprendė ir leido mokslininkams išsamiau ištirti namų ūkius. Tai leidžia ne tik geriau suprasti namų ūkių finansinę ir turtinę padėtį Europoje, bet ir užfiksuoti nacionalinių būsto rinkų lūkesčius bei planuojamas investicijas į būstą. Šiame darbe apklausomis pagrįsta analizė taip pat papildoma namų ūkių lūkesčiais dėl būsimo būsto vertės. Tai įvertinta naudojant makroekonominius duomenis, kurie pateikia alternatyvų, lengvai prieinamą makroekonometrinį metodą, pagal kurį galima įvertinti namų ūkių lūkesčius dėl būsimo būsto vertės.

Taip pat svarbu atsižvelgti į dabartinę būsto nuosavybę, nes tai turi įtakos būsto kainų lūkesčių formavimuisi. Ryškus skirtumas tarp būsto ir kito turto yra tas, kad net tie, kurie nėra būsto savininkai būsto rinkoje (t. y. nuomininkai), turi didelę įžvalgą apie turto dividendų srautą, nes jie moka nuomą kas mėnesį. Tokia informacija gali suteikti naudingų signalų apie vidinę turto vertę, kurios savininkai kartais nežino. Naujausi tyrimai rodo, kad būsto bumo metu nuomininkai vidutiniškai tiksliau prognozuoja būsto kainas nei savininkai. Tačiau tai taip pat patvirtina, kad nuomininkų prognozės yra labiau išsklaidytos (Kuchler et al. (2022)). Nors kitų turto rinkų duomenys rodo, kad egzistuoja dovanojimo efektas, kai savininkai, gavę teigiamų signalų apie savo turtą, tampa optimistiškesni nei nesavininkai, o esami būsto rinkų duomenys rodo priešingą poveikį. Nors nuosavybės aspektas teoriniu lygmeniu buvo diskusijų ir analizės objektas, jis išlieka ribotas, kalbant apie reikšmingus tarpvalstybinius empirinius įrodymus ir kitus stilizuotus faktus, kurie galėtų padėti jį veiksmingiau išaiškinti. Siekiant išspręsti šią problemą disertacijoje remiamasi HFCS duomenų rinkiniu, kuris leidžia identifikuoti skirtingus namų ūkius – savininkus, hipotekos turėtojus ir nuomininkus. Be to, tai teikia galimybę nustatyti būsto savininkų ir nuomininkų statuso pokyčius, taip pat suteikia daugiau patikimumo ir galutiniams rezultatams.

Kadangi su būstu susiję tyrimai klesti pastaruosius du dešimtmečius, jie daugiausia buvo aptarti trijose skirtingose literatūros kryptys. Viena, kalbama apie suminius verslo ciklų svyravimus ir ekonomikos reakciją į fiskalinę ar pinigų politiką. Antra, būstas buvo netiesiogiai įtrauktas į turto kainodaros literatūrą, susijusį su vidutinės grąžos skirtumais ir turto kainų nepastovumu (Piazzesi and Schneider (2016)). Trečia, dirbama su nevienalyčiais namų ūkiais, kuriuose bandoma paaiškinti ekonominių trinčių ir nelygybės politikos vaidmenį, taip pat sukrėtimų paskirstymo poveikį. Šioje literatūroje būstas buvo įtrauktas kaip didžiausias numanomas namų ūkio turto komponentas ir reikšminga vartojimo dalis. Nors disertacijoje nagrinėjamos visos trys literatūros kryptys, joje daugiausia dėmesio skiriama ekonominių trinčių vaidmeniui ir sukrėtimų pasiskirstymo nevienodam poveikiui (trečioji grupė), kuris dažniausiai nustatomas bendroje euro zonoje. Todėl platus HFCS duomenų naudojimas leidžia analizuoti ir įvertinti šį nevienalytiškumą, nustatant skirtin-

gas namų ūkių charakteristikas. Be to, jis apima ne tik galutinį būsto kainų poveikį realiajai ekonomikai, bet ir pradinį veiksnių, lemiančių skirtingą būsto kainų dinamiką, etapą.

Nors naujoji literatūra apie būsto kainų ir namų ūkių skolinimosi užstatu sąveiką su verslo ciklais ir pinigų politika išaugo iš trijų aprašytų tyrimo krypčių, dėmesys jai išlieka didelis ir sulaukia vis didesnio mokslininkų bei politikos formuotojų susidomėjimo. Todėl dabartinė literatūros būklė rodo, kad sunku apibūdinti namų ūkių elgesį ignoruojant netikrumą dėl būsto kainų arba galvoti apie hipotekos skolas be nevienalyčių veiksnių. Kitas šios literatūros bruožas, apibūdinantis būsto rinką, yra daugybė skirtingų rinkų, kurios skiriasi pagal geografiją ir kitus požymius. Vadovaujantis šiomis idėjomis, disertacijoje siekiama išplėsti dabartinį supratimą apie būsto svarbą, apie jo vaidmenį dabartiniame ekonomikos etape, apie heterogeninio poveikio namų ūkiams svarbą ir, svarbiausia, ištirti šiuos klausimus Europos šalyse – lygiu, kuris anksčiau nebuvo plačiai analizuotas.

Darbo tikslas ir uždaviniai

Pagrindinis šio darbo tikslas – empiriškai išanalizuoti būsto rinkos ir realiosios ekonomikos sąveiką remiantis namų ūkio perspektyva. Naujausioje literatūroje vis dar trūksta empirinės būsto, kuris matomas kaip pagrindinis veiksnys, paaiškinantis namų ūkių ekonominę elgseną, svarbos analizės. Todėl šioje disertacijoje atliekama empirinė analizė, tiriamas *būsto rinkos* poveikis namų ūkio elgsenai, kokie pagrindiniai veiksniai paaiškina *nevienodą* poveikį namų ūkiams, kaip jį galima išmatuoti ir, svarbiausia, kokio dydžio yra poveikis, vėliau perduodamas realiajai ekonomikai namų ūkių vartojimo požiūriu.

Šioje disertacijoje daugiausia dėmesio skiriama dviem uždaviniams. Pirmasis – paaiškinti namų ūkio neapibrėžtumo ar įsitikinimų apie būstą ar būsto vertės pokyčius ir realiąją ekonomiką ryšį ir svarbą. Disertacijoje numatyti tokie šio uždavinio, įgyvendinimo žingsniai:

- Surinkti ir sutvarkyti duomenis apie būsto rinką ir namų ūkių finansus, reikalingus atsakant į disertacijoje tiriamus klausimus.

- Sukurti keletą stilizuotų rezultatų, susijusių su namų ūkių lūkesčiais dėl būsto kainų ir namų ūkių turto portfelio pokyčių per pastarąjį dešimtmetį.

- Naudoti mikrolygio namų ūkio duomenis siekiant nustatyti pagrindinius veiksnius, paaiškinančius namų ūkio lūkesčių dėl būsto kainų skirtumus.

- Išryškinti teorinį ryšį tarp namų ūkių reakcijos į būsto kainų pokyčius, kreditų trinties vaidmens ir jų persidavimo į realiąją ekonomiką per namų ūkių vartojimo pokyčius.

- Sukurti koncepcinę sistemą (šoko identifikavimo mechanizmą) ir įvertinti namų ūkių elgsenos, susijusios su būsto kainų pokyčiais, ir kreditų trinties poveikį jų vartojimui, naudojant lengvai prieinamus makrolygio duomenis.

Antrasis uždavinys – empiriškai įvertinti nevienalytį būsto kainų poveikį namų ūkių vartojimui. Konkrečiai, šioje disertacijoje empiriškai įvertinama būsto nuosavybės svarba ir kaip būsto statusas gali paaiškinti namų ūkių vartojimo dinamikos skirtumus. Norint pasiekti šiuos tikslus ir taip prisidėti prie esamos literatūros finansų ir būsto ekonomikos srityje, toliau būtina:

- Apžvelgti tarptautinę literatūrą apie būsto ekonomiką, kurioje analizuojami nevienalyčiai namų ūkiai ir paaiškinamas būsto vaidmuo, lemiantis skirtingą ekonominių šokų paskirstymo poveikį.

- Paaiškinti galimus kanalus, kaip būsto nuosavybės statusas gali būti susietas su skirtingais lūkesčiais dėl būsto kainų pokyčių. Be to, stebėti šiuos skirtumus realiai naudojant mikrolygio duomenis.

- Sukurti kitą konceptualią empirinę sistemą, kuri leistų sugeneruoti sintetinį instrumentinį kintamąjį, galintį paaiškinti namų vertės kitimą, bet likti nesusijusiu su kitais bendrais tačiau nepastebimais ekonominiais kintamaisiais (pvz., bendra ekonomine veikla, socialiniais ir demografiniais pokyčiais ir kt.).

- Empiriškai įvertinti ribinį polinkį vartoti iš būsto turto.

- Pasiūlyti ir empiriškai nustatyti kai kuriuos galimus kanalus, kaip ribinio polinkio vartoti iš turto lygį lemia skirtingas namų ūkių nuosavybės statusas.

Tyrimų metodologija

Skirtingi pagrindinio tikslo niuansai yra nagrinėjami trijuose disertacijoje aptartuose tyrimo skyriuose. Kiekviename iš šių skyrių pristatomi empiriniai tyrimai, kurie buvo publikuoti kaip straipsniai darbo dokumentų serijoje ir mokslo žurnaluose. Todėl kiekvienas skyrius turi savo struktūrą ir metodiką, kuri prisideda prie bendros disertacijos vertės. Vienas iš trijų straipsnių parašytas su bendraautoriumi, o kiti du yra individualus disertacijos autoriaus darbas. Šiuose trijuose skyriuose iškelti klausimai, atsakymai į juos ir naudojami metodai išsamiai aptariami toliau.

Pirmame disertacijos skyriuje, naudojant Europos Centrinio Banko namų ūkių finansų ir vartojimo tyrimo (HFCS) duomenis, nagrinėjama, kaip skiriasi būsto kainų lūkesčiai visoje Europoje, ir nustatomi pagrindiniai tokių lūkesčių veiksniai. Išsami informacija iš HFCS duomenų leidžia įvertinti turto portfelį namų ūkių lygmeniu ir pateikti keletą stilizuotų faktų apie jo dinamiką per pastarąjį dešimtmetį. Be to, parodyti, jog būsto turtas lėmė namų ūkių balansų raidą 2010–2017 m. ,naudojamos skerspjūvio regresijos. Taigi būsto kainų lūkesčiai Europos šalyse tebėra labai nevienodi, o pajamų ir būsto kainų pokyčiai buvo pagrindiniai būsto kainų lūkesčius lėmę veiksniai. Galiausiai antrajame skyriuje atlieku atskiras skerspjūvio regresijas, pagrįstas namų ūkio padėtimi (kvintiliu) remiantis turto pasiskirstyme arba nuosavybės statuso požiūriu. Tai leidžia pabrėžti keletą stilizuotų faktų apie nevienodą poveikį, kurį lemia namų ūkio padėtis turto pasiskirstymo arba būsto nuosavybės statuse.

Antrame baigiamojo darbo skyriuje dėmesys sutelkiamas į ekonomikos paklausą ir parodoma, kad namų ūkių balansas yra esminis visuminių svyravimų, ypač namų ūkių vartojimo išlaidų, variklis. Šiame pateikiamas disertacijos autoriaus sukurtas nedidelis teorinis modelis, kuris padeda suprasti vartojimo, kredito ir būsto ryšį. Be to, pristatoma nauja sistema, kuri naudoja būsto kainos ir nuomos skirtumo kintamąjį ir modeliuoja jį taip, kad būtų užfiksuoti (apytikriai) būsto vertės lūkesčiai

ateityje, ir naudoju jį į paprastą modelį su optimizuojančiu namų ūkio sektoriumi ir skolinimosi trintimis. Šiame skyriuje aš išbandau pagrindinio modelio prognozes, remdamasis pusės amžiaus duomenimis iš 28 išsivysčiusių EBPO šalių, naudodamas lokalias projekcijas Jordà (2005) ir patvirtinu esminės asimetrijos poveikio prognozę, kai kredito ir kainų skirtumo kintamieji šokai įvyksta vienu metu.

Paskutiniame disertacijos skyriuje remiantis namų ūkio finansų ir vartojimo tyrimo (HFCS) mikroduomenimis, įvertinamas ribinis polinkis vartoti iš būsto turto. Daugelyje tyrimų, kuriuose vertinamas ribinis polinkis vartoti, taip pat pabrėžiama būtinybė kontroliuoti galimą endogeniškumo problemą, nes būsto kainų dinamika linkusi koreliuoti su bendromis ekonominėmis tendencijomis, kurios matuojamos kaip ekonominis aktyvumas arba socialiniai ir demografiniai pokyčiai. Todėl, siekiant išvengti galimo endogeniškumo įvertinimo, naudojama papildoma pašnekovų informacija apie būsto sąlygas ir vertę. Ši asmeninio lygio informacija leidžia sukurti naują sintetinį instrumentinį kintamąjį, kuris fiksuoja namų verčių kitimą, bet nekoreliuoja su kitais nepastebimais bendrųjų ekonominių sąlygų kintamaisiais. Ši dviejų etapų vertinimo procedūra teikia galimybę nustatyti būsto kainų pokyčių priežastinį poveikį vartotojų išlaidoms.

Darbo naujumas

Šios disertacijos išvados yra naujos ir bent keliais aspektais prisideda prie finansų ir būsto ekonomikos literatūros plėtros.

Pirmiausia esamą literatūrą papildau tuo, kad disertacijoje analizuojami pagrindiniai namų ūkių lūkesčius dėl būsto kainų lemiantys veiksniai. Kadangi literatūroje jau buvo išnagrinėti ir išryškinti kai kurie pagrindiniai būsto kainų lūkesčius lemiantys veiksniai, tačiau mažai paaiškinti galimi namų ūkių skirtumai. Visų pirma, šiame darbas prisidedant prie naujausios literatūros pateikiama empirinių įrodymų apie individualius būsto kainų lūkesčius lemiančius veiksnius. Teoriniu lygmeniu pagrindiniai determinantai buvo analizuoti anksčiau, tačiau trūko empirinių įrodymų, ypač Europoje.. Todėl disertacijoje naudojami namų ūkio finansų ir vartojimo tyrimo (HFCS) duomenys, kad būtų galima

pateikti empirinius faktus apie būsto kainų lūkesčius Europoje lemiančius veiksnius. Šis duomenų rinkinys leidžia išanalizuoti konkrečius namų ūkio lūkesčius dėl namų vertės, taip pat namų ūkio turto sudėtį, pajamas ir kitas šeimos savybes, kurios gali turėti įtakos lūkesčiams. Be to, suteikia geresnį politinį supratimą apie namų ūkių nevienalytiškumą, kuris yra užfiksuotas Europos lygmeniu, o tai taip pat yra labai skirtinga būsto rinkų grupė. Todėl bendros politikos išvados yra svarbios, atsižvelgiant į bendrosios euro zonos (EA) šalių pinigų politiką. Galiausiai disertacijoje pasitelkiamas papildomas nuosavybės statuso aspektas, siekiant paaiškinti skirtingus namų ūkių lūkesčius ir taip papildyti esamą supratimą apie būsto poveikį namų ūkiams.

Kitas svarbus empirinis indėlis yra tai, kad nagrinėju namų ūkių reakciją ir vartojimą, susijusį su būsto kainų ir kredito pokyčiais. Be to, ji analizuojama naudojant lengvai prieinamus makroekonominius kintamuosius, todėl šią sistemą lengva pakartoti. Taip pat prisidedu prie literatūros, įvesdamas alternatyvų matą būsto kainos lūkesčiams iš ilgos ir agreguotos laiko eilutės. Kadangi pasaulinė finansų krizė atskleidė namų ūkių balanso ir būsto kainų lūkesčių svarbą, buvo naudojami įvairūs modeliavimo metodai. Tačiau literatūroje vis dar trūko alternatyvių kintamųjų, kuriuos būtų galima panaudoti analizuojant ilgalaikes makro laiko eilutes platesnėje šalių grupėje. Mano disertacijos naujovė – būsto kainos ir nuomos skirtumo kintamasis, kuris parodytas kaip alternatyva namų ūkių lūkesčiams dėl būsto kainų dinamikos atsižvelgti. Be to, paprasta ir aiški metodika leidžia įvertinti būsto kainos ir nuomos skirtumo kintamąjį įvairiose šalyse ir analizuoti būsto kainų lūkesčius laiko ir šalių atžvilgiu.

Taip pat esamą literatūrą ir su ja susijusias politines diskusijas papildau faktais, empiriškai patvirtindamas, kaip svarbu stebėti ne tik būsto kainas (Madsen (2012)), ar kredito sąlygas (Annicchiarico et al. (2019)), bet ir bendrą dinamiką, kuri padeda užfiksuoti lūkesčius dėl būsto kainų pokyčių, taip pat bendrą kredito trinties ir būsto sklaidos šoko poveikį, dėl kurio atsiranda asimetrinis poveikis, kai sukrėtimai veikia kartu, ypač krizės laikotarpiais („blogomis“ sąlygomis).

Galiausiai, esamą literatūrą papildau analizuodamas būsto turto – vartojimo kanalą Europoje ir ieškodamas konkrečių šio ryšio mechanizmų.

Kadangi literatūroje aptinkama, kad tarp bendrų būsto kainų ir vartojimo pokyčių egzistuoja reikšmingas endogeniškumas, disertacijoje pristatomas naujas instrumentinis kintamasis, kuris leidžia išspręsti endogeniškumo problemą. Šis siūlomas naujas sintetinis kintamasis leidžia kontroliuoti būsto kainų dinamiką, bet taip pat nekoreliuoja su vartojimo pokyčiais. Šis metodas taip pat leidžia nustatyti nevienodus skirtingų namų ūkių ribinio polinkio vartoti (MPC) įverčius. Todėl rezultatai rodo, kad skolinimosi suvaržymas yra vienas iš pagrindinių namų ūkių nevienodų MPC rezultatų veiksnių. Tokia išvada itin svarbi centriniams bankams stebint savo makroprudencinę politiką, ypač šiais laikais, kai būsto kainos sparčiai auga. Tai yra papildoma priemonė, skirta politikos formuotojams stebėti toliau nurodytus būsto kainų ir namų ūkių lūkesčių pokyčius ir greitai reaguoti, jei atsiranda reikšmingas (būsto) rinkos disbalansas.

Ginami disertacijos teiginiai

- Mikrolygio HFCS duomenų rinkinio rezultatai parodė, kad namų ūkių lūkesčiai dėl būsimos būsto kainų dinamikos įvairiose Europos šalyse yra labai nevienodi. Kai kurių šalių vidurkiai rodė neigiamus lūkesčius, kitos tikėjosi, kad būsto kainos per tą patį laikotarpį padidės daugiau nei 3 proc. Tai rodo vietinių veiksnių svarbą ir būsto rinkų skirtumus, kurie formuoja skirtingus namų ūkių lūkesčius.

- Rezultatai rodo, kad būsto kainų pokyčiai vaidina pagrindinį vaidmenį paaiškinant namų ūkių lūkesčių dėl būsto kainų dinamiką. Svarbu pabrėžti, kad tai vyksta dviem lygiais – vietine ir asmenine būsto kainų pokyčių patirtimi.

- Nuosavybės statusas yra vienas iš pagrindinių veiksnių, paaiškinančių skirtingus būsto kainų lūkesčius įvairiose Europos šalyse. Pagrindinis skirtumas tarp namų ūkių kyla dėl to, kad nuomininkai turi geresnę informaciją apie būsto dividendų srautą kaip turtą, nes jie moka nuomą kas mėnesį. Be to, būsto rinkų sudėtis taip pat labai skiriasi visoje Europoje, todėl svarbu tai turėti omenyje analizuojant namų elgseną teoriniu lygmeniu.

- Euro zonos šalių, kuriose vykdoma tokia pati pinigų politika, analizė rodo, kad būsto kainų lūkesčiams turi įtakos kiti instituciniai veiksniai ir jie labai nevienodi namų ūkiuose ir šalyse. Taip pat rezultatai rodo, kad nuosavybės statuso, pajamų ir turto pasiskirstymo poveikis yra stipresnis nuomininkams ir mažiausias pajamų ar turto turintiems namų ūkiams.

- Nuotaikos dėl būsto kainų pokyčių ateityje turi įtakos ir paaiškina dalį individualaus namų ūkių vartojimo dinamikos. Todėl politikos formuotojams tebėra svarbu atskirai stebėti ne tik būsto kainas ir kredito sąlygas, bet ir būsto kainų nuokrypis nuo pagrindinių rodiklių (kurie paaiškinami kaip alternatyva namų ūkių nuotaikai užfiksuoti). Be to, buvo užfiksuotas asimetrinis poveikis (kai sukrėtimai dėl kreditų trinties ir būsto kainos bei nuomos skirtumas atsiranda vienu metu) ir į jį taip pat reikėtų atsižvelgti priimant geresnius politinius sprendimus, kurie užkirstų kelią ekonomikos svyravimams.

- Būsto turto ir vartojimo kanalas yra svarbus veiksnys, paaiškinantis verslo ciklo svyravimus Europoje. Poveikis daugiausia fiksuojamas ribiniu polinkiu vartoti (MPC) iš turto (būsto) prieaugio, kuris užfiksuotas namų ūkių balanso analizėje. Rezultatai rodo, kad MPC Europoje yra apie 0,12–0,13 ir gana panašus į kitų šalių tyrimus.

- Ribinis polinkis vartoti iš turto yra didesnis būsto savininkų, turinčių hipoteką, nei nuomininkų. Tiksliau, MPC iš turto yra gerokai didesnis nei euro zonos vidurkis ir yra apytiksliai 0,18–0,19 būsto savininkams, kurie taip pat turi hipoteką. Be to, rezultatai rodo, kad kreditų turinčių namų ūkių reakcija į būsto kainos šoką yra didesnė. Tai pabrėžia politikos formuotojams, kaip svarbu suprasti namų ūkių ir būsto rinkų sudėtį ir pasiskirstymą šalyje, kad būtų galima įgyvendinti tinkamą fiskalinę, pinigų ar makroprudencinę politiką.

Darbo rezultatai

Darbo rezultatai pasiekti naudojant mikrolygio HFCS duomenų rinkinį ir jam analizuoti pritaikius įvairius ekonometrinius metodus (lokalias projekcijas, instrumentinių kintamųjų metodą, skydelio regresijas ir kt.). Konkrečiau, šio darbo pirmame skyriuje svarbiausia buvo įvertinti nustatyti būsto svarbą, paaiškinant namų ūkių įsitikinimus ir tolesnį elgesį. Šiame skyriuje taip pat buvo pristatytas HFCS duomenų rinkinys ir empiriškai patikrinta būsto kintamojo svarba. Rezultatai rodo, kad namų ūkių lūkesčiai dėl būsto kainų yra svarbus jų vėlesnių ekonominių sprendinių veiksnys ir jie dažniausiai būna nevienodi atsižvelgiant į namų ūkio nuosavybės statusą. Pagrindinis antro skyriaus tikslas buvo pagrįsti teorinį ryšį tarp būsto rinkos, kreditų trinties ir vartojimo. Taip pat parodyti jų svarbą ir empirinį ryšį. Nustatyta, kad namų ūkių lūkesčius dėl būsto kainų apibūdinantis rodiklis yra svarbus veiksnys, paaiškinantis namų ūkių vartojimo dinamiką. Trečio skyriaus pagrindinis uždavinys buvo empiriškai įvertinti su būstu susijusio pelno, perduodamo realiajai ekonomikai per namų ūkių vartojimą, poveikį. Tai padaryti pasiūlytas naujas empirinis metodas, naudojant instrumentinį kintamąjį, kad būtų užfiksuotas endogeninis būsto kainų pokyčių poveikis. Tai leido įvertinti ribinį polinkį vartoti iš būsto vertės prieaugio. Rezultatai parodė, kad 1 Eur būsto turto padidėjimas buvo susijęs su 0,121 Eur namų ūkių vartojimo padidėjimu 2010–2017 m. Apskritai šiame darbe atlikta empirinė būsto poveikio namų ūkių elgsenai analizė, nurodyti pagrindiniai veiksniai, paaiškinantys nevienodą poveikį namų ūkiams, kaip jį galima išmatuoti ir, svarbiausia, kiek poveikio perduodama namų ūkiams jų vartojimo požiūriu.

Viena iš disertacijoje pristatomų išvadų yra ta, kad būsto kainų lūkesčiai vaidina lemiamą vaidmenį paaiškinant namų ūkių ekonominę elgseną. Taip yra daugiausia dėl to, kad būstas sudaro daugiau nei 50 procentų namų ūkių turto portfelių Europoje. Kai kuriose šalyse ši dalis siekia net 80–90 procentų, o tai pabrėžia būsto svarbą, paaiškinant namų ūkių ekonominę elgseną.

Disertacijoje parodyta ne tik būsto kainos lūkesčių svarba, bet ir įvairios galimybės tai įvertinti empiriškai. Pirmame skyriuje pristatytas

namų ūkių finansų ir vartojimo tyrimas (HFCS), kurį atliekant renkama mikrolygio informacija apie namų ūkio balansą, turtą, pajamas, vartojimą, socialines ir šeimos charakteristikas bei daugelį kitų individualių kintamųjų. Todėl šio duomenų rinkinio detalumas leido išanalizuoti įvairius determinantus, kurie gali būti svarbūs norint suprasti ir paaiškinti individualių būsto kainų lūkesčius. Kadangi literatūroje apibendrinta ekstrapoliacija ir asmeninė patirtis pateikiami kaip pagrindiniai veiksniai, juos papildau įtraukdamas būsto nuosavybę ir parodydamas jos reikšmę empiriškai.

Teoriniu požiūriu savininkų ir nuomininkų būsto kainų lūkesčių skirtumai gali reikštis dvejopai. Viena vertus, apie būsto kainų pokyčius asmenys sužino iš signalų ir informacijos. Nuomininkai nuolat susiduria su šiais signalais mokėdami nuomą, o būsto savininkai gali nesunkiai praleisti dalį šios informacijos tiesiog teikdami būsto paslaugas ir nekreipdami dėmesio į savo vartojimo vertę. Antra vertus, kitas būdas paaiškinti namų ūkių skirtingus būsto kainų lūkesčius yra dotacijos efektas. Jis teigia, kad turto (būsto) savininkai linkę per daug nuspėti būsimas vertes, reaguodami į teigiamus signalus apie savo turtą. Empiriniai disertacijos tyrimo rezultatai parodė, kad ankstesnė patirtis, susijusi su būsto nuosavybe arba padėtimi pagal pajamų ir turto pasiskirstymą, yra svarbūs veiksniai, paaiškinantys namų ūkių kainų lūkesčius. Be to, namų ūkiai iš aukščiausių pajamų ar turto kvintilių paprastai turi didesnius būsto kainų lūkesčius nei likusi namų ūkių dalis.

Disertacijos pirmame skyriuje buvo bandoma išanalizuoti ir paaiškinti būsto kainų lūkesčius naudojant mikrolygmens duomenų rinkinį, o antrame skyriuje dėmesys buvo skiriamas tarpiniam rodikliui, leidžiančiam analizuoti būsto kainų lūkesčius iš šalies makroduomenų rinkinio. Antrame skyriuje supažindinama su stilizuotu teoriniu modeliu, kuris padeda susieti lūkesčius dėl būsimo būsto rinkų su būsto kainos ir nuomos skirtumo kintamuoju, kuris laikomas agreguotų būsto kainos lūkesčių pavyzdžiu. Vienas iš šio empirinio požiūrio pranašumų yra tas, kad pagrindinis matas, būsto kainos ir nuomos skirtumas, yra lengvai prieinamas daugeliui išsivysčiusių ekonomikų, kitaip nei apklausomis pagrįstos serijos, kuriose užfiksuoti namų ūkių lūkesčiai dažnai pateikiami įvairiomis formomis ir laiko tarpais, o dar svarbiau, kad jie būtų grindžiami skirtin-

gomis metodikomis. Naudojant paprastą teorinį modelį parodyta, kad būsto kainų skirtumo kintamasis, stebimas pakankamai ilgą laikotarpį, yra informatyvus ir stabilus būsimų būsto kainų lūkesčių matas.

Didelės šalių grupės empiriniai rezultatai leidžia teigti, kad netikėtas būsto kainų ir nuomos skirtumo padidėjimas lemia pajamingumą ir papildomą stimulą bei didina bendras namų ūkių išlaidas. Šis poveikis yra nuolatinis ir trunka ilgiau nei kredito šokas, kuris namų ūkių vartojimą paveikia tik akimirksniu. Tai patvirtina kokybinius skirtumus tarp dviejų vartojimo dinamiką lemiančių veiksnių – būsto kainos ir nuomos skirtumo bei kredito šoko. Galiausiai, empirinis metodas, pateiktas disertacijos antrame skyriuje, taip pat rodo asimetrinį kredito ir būsto rinkos sąlygų indėlį į verslo ciklą ir leidžia politikos formuotojams geriau formuoti ir tikslingiau nukreipti stabilizavimo politiką.

Disertacijos trečiame skyriuje, be būsto kainų lūkesčių, koncentruojamasi į tikrąjį poveikį, kurį būsto kainų pokyčiai daro individualiam vartojimui. Tiksliau, šiame skyriuje tirtas būsto turto – vartojimo kanalas Europoje ir galimi jo mechanizmai. Nuo pat pasaulinės finansų krizės įvairūs autoriai bandė įvertinti būsto turto makroekonominį poveikį vartojimui. Tačiau tokia analizė dažniausiai susiduria su endogeniškumo problema, atsirandančia tarp būsto kainų pokyčių ir bendro vartojimo. Dažniausiai galimai endogeniškumo problemai kontroliuoti buvo naudojami skirtingi instrumentiniai kintamieji, o dauguma tokių įvertinimų buvo pagrįsti JAV duomenimis. Europos šalys vis dar susidūrė su bendro instrumentinio kintamojo, kuris galėtų būti naudojamas panašiai analizei, problema. Trečiame disertacijos skyriuje pateikiamas instrumentinis kintamasis, kuris naudoja papildomą informaciją apie individualių namų būklę ir atsižvelgia į galimus būsto kainų dinamikos skirtumus. Tačiau dėl instrumentinio kintamojo sudėtingumo ir ribotos informacijos apie būsto sąlygas daugelyje šalių šis siūlomas naujas instrumentinis kintamasis apėmė tik šešias šalis – Belgiją, Kiprą, Estiją, Italiją, Latviją ir Maltą.

Empiriniai trečiojo skyriaus rezultatai parodė, kad kai kurie bendri veiksniai iš dalies lemia būsto kainų dinamikos ir namų ūkių vartojimo santykį. Tačiau su būstu susijęs turtas taip pat turi papildomą poveikį vartojimo elgsenai, ypač hipotekos savininkams. Rezultatai rodo, kad iš šešių šalių rinkinio, naudoto analizei, 1 000 eur būsto vertės pa-

didėjimas buvo susijęs su 121 eur išlaidų padidėjimu namų savininkams per pastarąjį dešimtmetį. Poveikis yra dar didesnis būsto savininkams, turintiems hipoteką – 185 eur už 1 000 eur būsto turto pasikeitimą. Be to, trečiame skyrius taip pat pagrindžiama, kad tokius didelius skirtumus dažniausiai lemia kreditų suvaržyti namų ūkiai, kuriems skolinimosi suvaržymai yra didesni. Tai galima paaiškinti tuo, kad išaugusi būsto vertė suteikia papildomą užstatą namų ūkiams ir juo itin naudojasi tie namų ūkiai, kuriems taikomas skolinimosi apribojimas arba kurie yra visai šalia jo. Kadangi šie namų ūkiai vertina dabartinį užstato turtą labiau nei padidėjusias būsto paslaugų kainas, jų išlaidų atsakas yra daug didesnis ir gali sukelti didelius bendro vartojimo svyravimus. Todėl ji turėtų atkreipti politikos formuotojų dėmesį į nuolatinę makroprudencinių reikalavimų stebėseną, nes jie gali būti naudojami kaip alternatyvi priemonė išvengti nekontroliuojamų būsto rinkos svyravimų ir netikėtų ekonomikos svyravimų.

Darbo praktinė reikšmė, rekomendacijos ir rezultatus ribojantys veiksniai

Apskritai teikiamoje disertacijoje akcentuojama būsto ir būsto kainų lūkesčių svarba aiškinant asmens ekonominį elgesį. Dar svarbiau, kad tai parodė, kaip tam tikros sąlygos ir individualūs sprendimai gali virsti dideliais bendros paklausos svyravimais. Disertacijoje užfiksuoti rezultatai taip pat svarbūs norint suprasti būsto rinkos politikos, galinčios turėti įtakos būsto turtui, poveikį, taip pat mechanizmus, per kuriuos pinigų ir makroprudencinė politika daro įtaką namų ūkių vartojimui. Galiausiai ši analizė tampa dar svarbesnė atsižvelgiant į Pinigų sąjungos Europoje faktą. Vis dar labai svarbu apgalvoti ir apsvarstyti individualią makroprudencinę politiką įvairiose šalyse, nes jos susiduria su skirtingu pajamų, turto, būsto nuosavybės statuso pasiskirstymu, taip pat dėl šių sąlygų skiriasi jų namų ūkių ribinis polinkis vartoti.

Dauguma disertacijos rezultatų įvertinti plačiai panaudojus namų ūkių finansų ir vartojimo apklausą. Disertacijos pradžioje pagrindžiama, kodėl HFCS tyrimas yra geriausias mikro-lygio duomenų šaltinis namų ūkių charakteristikoms analizuoti. Tačiau HFCS tyrimo rezultatai taip

pat turi tam tikrų trūkumų, kurie iš dalies riboja atliktą analizę. Visų pirma, HFCS yra tyrimas, kuris kas 3–4 metus pateikia naujų rezultatų ir pradedamas tik po pasaulinės finansų krizės. Todėl šiuo metu yra tik keturios rezultatų bangos – 2010, 2014, 2017, 2021 metų. Tai leidžia šiek tiek ribotai suprasti namų ūkių finansų tendencijas iki finansų krizės ir tuo metu egzistavusias ypatybes. Antra, 2021 metų bangos rezultatai buvo paskelbti tik 2023 metų pabaigoje ir nebuvo įtraukti į bendrą šios disertacijos analizę. Trečia, šiuo laikotarpiu taip pat buvo išplėsta HFCS tyrime dalyvaujančių šalių imtis. 2010 m. jame dalyvavo 15 šalių, o 2021 m. – 22 valstybės, peržengiančios euro zonos ribas ir apimančios kitas Europos šalis. Visi šie faktai kelia tam tikrų ribojimų, kaip interpretuoti rezultatus ir padaryti bendras išvadas.

Kitas trūkumas taip pat susijęs su HFCS duomenimis ir atsispindi empirinėje trečiojo skyriaus dalyje – įtrauktos tik šešios šalys dėl duomenų apribojimų. Kadangi empirinė trečiojo skyriaus dalis yra pagrįsta instrumentinio kintamojo metodu, reikalavimas geriems ir patikimiems rezultatams yra papildoma informacija, kuri gaunama iš neviešos HFCS tyrimo dalies, tačiau ji padeda sukurti sintetinį kintamąjį. Nors ir buvo susisiekta su visomis HFCS tyrime dalyvaujančiomis šalimis, dėl duomenų saugumo problemų pavyko gauti duomenis tik iš šešių iš jų. Viena vertus, šešių šalių nepakanka, kad būtų pateikti bendresni euro zonos rezultatai, nes tik Italija yra įtraukta iš didžiausiųjų Europos ekonomikų sąrašo. Kita vertus, šios šešios šalys (Belgija, Kipras, Estija, Italija, Latvija ir Malta) labai skiriasi geografiškai pagal būsto rinkas, būsto nuosavybės lygius ir namų ūkių balansus. Jie pateikia labai spalvingą šalių vaizdą ir bent iš dalies reprezentuoja kitas šalis, kurios yra panašesnės į jas konkrečiais aspektais, tokiais kaip būsto rinkos ar namų ūkių balansai.

Kiti ribojimai gali būti susiję su tuo, kad daugumai šio baigiamojo darbo rezultatų naudojami HFCS duomenys yra 2010–2017 metų. Todėl pastarieji didelės infliacijos, pandemijos, tiekimo ir energijos sukrėtimų bei karo situacijų epizodai netoli Europos galėjo turėti įtakos, pakeisti esminį supratimą apie namų ūkius ir jų požiūrį į būstą, taip pat tikėtinus vėlesnius būsto kainų pokyčius. HFCS duomenys taip pat apima konkretų laikotarpį, daugiausia susijusį su bendru Europos ekonomikos augimu

2010–2017 metais. Tai neleidžia daryti bendresnių išvadų, kurios taip pat galėtų būti susijusios su nuosmukio laikotarpiais.

Nors šiame tyrime daugiausia dėmesio skiriama istoriniams duomenims, įskaitant pasaulinę finansų krizę ir kitus ankstesnius pasaulinius ekonominius sukrėtimus, jo išvados išlieka svarbios rengiant rekomendacijas dėl būsimų sukrėtimų. Neseniai atliktas TVF tyrimas (Dao et al., 2024) patvirtina būsto svarbą aiškinant namų ūkių vartojimo dinamiką. Jame pabrėžiama, kad perteklinės santaupos dėl pandemijos, labai išaugęs namų ūkių turtas (ypač būsto) ir didelis realiųjų pajamų padidėjimas sustiprino vartojimą po pandemijos. Be to, ribinis polinkis vartoti būsto turtą yra gerokai didesnis, nei buvo apskaičiuota iki COVID-19, todėl būsto turto poveikis yra pagrindinė vartojimo augimo po pandemijos skatinamoji jėga (Dao et al., 2024). Šie labiau mikrolygio įrodymai iš JAV sutampa su mūsų EBPO įrodymais, leidžia pabrėžti, kad politikos formuotojai turi stebėti namų ūkių lūkesčius dėl būsto kainų (būsto turto) ir kreditavimo sąlygų, kad galėtų pasirengti galimiems ekonominiams sukrėtimams ir juos sušvelninti.

Trumpos žinios apie doktorantą

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Moksliniai interesai: taikomoji ekonometrija, mikroekonomika, monetarinė politika, namų ūkių finansai, makroprudencinė politika.

Acknowledgment of contributions

As part of work in this dissertation is based on research papers written together with co-authors. Therefore, I would like to acknowledge my contribution to each of the paper that is delivered as the separate sections in dissertation. In preparing the paper which formed the basis of the first chapter, I wrote the whole manuscript on my own. It included the literature analysis, data collection, and all the necessary calculations and estimations. I also individually was responding to the reviewers' comments and making all the changes in the paper. Therefore, all the possible mistakes left in the analysis are under my responsibility. The second chapter was co-authored with my supervisor dr. Povilas Lastauskas. In preparing the paper for the second chapter, I was responsible for the literature review as well as all the calculations, estimations and linear projections. The theoretical model for this paper was provided by my supervisor dr. Povilas Lastauskas. We also both contributed by writing conclusions and responding to the reviewers' comments. The third chapter of my dissertation is my individual work. I provided the literature review for it, econometric framework, all the necessary calculations, estimations and the final conclusions. I also responded individually to the reviewers' comments. Therefore, all the possible errors left in the third chapter are also under my responsibility.

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This dissertation is based on data from ECB, Household Finance and Consumption Survey. The responsibility for all conclusions drawn from the data lies entirely with me.

List of publications

1. Bielskis, K. and Lastauskas, P. (forthcoming). The Role of Housing Market and Credit on Household Consumption Dynamics: Evidence from the OECD Countries. Journal of Economic Behavior and Organization.

2. Bielskis, K. (2024). Homeownership status and its effect for housing wealth-consumption channel in Europe. Journal of Economics and Finance, 1-17.

3. Bielskis, K. (2023). The importance of portfolio composition and home ownership in wealth distribution in Europe. Organizations and markets in emerging economies., 14(3), 562-582.

List of conferences

1. Financial Engineering and Banking Society Conference, 2023 (research presented: *Household Spending Dynamics: The Impact of House Price-Rent Spread and Credit Constraints*).

2. 4th Baltic Economic Conference, 2022 (research presented: *Housing Value and Consumption in Europe: Micro-Findings from Post-Financial Crisis Data*).

3. HFCN&Covid TT research workshop in European Central Bank, 2022 (research presented: *Determinants of House Price Expectations in Europe*).

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