REGULAR ARTICLE

Heterogeneity in household consumption behavior: The role of inequality and financial instability

Juan Laborda[1] · Cristina Suárez[2]

Abstract

We analyze, using the micro data of the Household Financial Survey (HFS) of the Bank of Spain, the consumption consequences of the household balance sheets and debt accumulation during the real estate bubble of 2002–2005, the Great Recession (2008–2011) and the subsequent economic recovery phase (2014–2017). Using quantile regression models, we find heterogeneity in household consumption behavior with respect to income and net worth levels, and in response to changes in household net worth in the last two periods. During the considered real estate bubble period, this heterogeneity in behavior is diminished, and only occurs in relation to the level of net wealth, in line with Hyman Minsky's Paradox of Tranquility. These findings favor the post-Keynesian theory on consumption. The greater inequality leads to a higher propensity of certain households to consume in response to changes in housing and financial net worth. This is compatible with the relative income hypothesis extended in expenditure cascades models. Otherwise, households will be willing to take on more risk during economic boom periods associated with a real estate bubble, which translates into debt-financed consumption that virtually makes such heterogeneity practically disappear.

✉ Cristina Suárez
   cristina.suarez@uah.es

1   Universidad Politécnica de Madrid, Madrid, Madrid, Spain

2   Universidad de Alcalá, Alcalá de Henares, Madrid, Spain

🖄 Springer

1 Introduction

Since the 1990s, the Spanish economy, like most Western economies, experienced a substantial rise in private debt, including household debt, which contributed to the onset of the Great Recession. Private debt as a share of GDP increased from 88% of GDP in 1996 to 308% in 2008 and that of household debt from 32% to 83%. Post-Keynesian and other heterodox economists already assumed the role of the increase in private debt, as a main source of macroeconomic instability, before the Great Recession (Minsky 1986, 1992; Keen 1995; Godley 2012; Koo 2003; Dutt 2005, 2006a; Cynamon and Fazzari 2008). However, it was not only ignored by most orthodox economists but also by some who had even proclaimed that there were no more economic cycles, considering that the state of macroeconomic virtuosity was such that it already was at its best in history (Lucas 2003; Blanchard 2009). As Romer (2016) points out, that is the trouble with macroeconomics.

Academic orthodoxy, through traditional macroeconomic models that adopt a representative agent framework, implicitly assumes that individual households are protected against specific wealth crises that families eventually may suffer. However, if this assumption is seriously violated in the data, heterogeneity in such models should be adopted. An important source of it, highlighted in the literature on consumption under conditions of uncertainty, is that the marginal propensity to consume decreases with wealth (King 1994; Carroll and Kimball 1996; Mian et al. 2013). This heterogeneity in the marginal propensity to consume implies that the distribution of losses is important for the dynamics of consumption, especially when balance sheet recessions are considered (Koo 2009, 2015). It is worth noting that Mian et al. (2013) analyzed for the United States the consequences on household consumption of the collapse of housing prices during the 2006 and 2007 period using micro data, showing that the most leveraged households have higher marginal propensities for consumption.

Mian et al. (2013) must be included within Mian and Sufi's analysis (2009, 2010a, 2010b, 2011, 2012a, 2012b, 2013, 2014, 2015). This analysis, using micro data, is probably the most important empirical study in order to identify macro-level mechanisms regarding household debt accumulation, the effect of rising house prices on home equity-based borrowing, as well as household consumption consequences of the housing collapse. Mian and Sufi's empirical results emphasize that there is a heterogeneity of households' consumption behavior with respect to the unprecedented household debt accumulation during the Great Recession. Their results are inconsistent with Neoclassical theory of consumption (permanent income/life cycle theory) and are more compatible with the post-Keynesian theory of inequality and consumption; that is, the relative income hypothesis and the habit persistence theory (Duesenberry 1949; Marglin 1984, Cynamon and Fazzari 2008, 2015, 2016; Stockhammer and Wildauer 2016).

Mian and Sufi (2009, 2010a, b, 2015) contemplate that the Great Recession and the heterogeneity in households' consumption behavior concerning debt accumulation are due to exogenous shocks, unforeseen economic events, short

and medium-term effects, and credit supply constraints. In contrast, post-Keynesian economists adopt a longer-term perspective, viewing financial crises as endogenous phenomena, being income inequality an important reason for housing borrowing and debt accumulation (Brown 2008; Barba and Pivetti 2009; Dymski 2010; Palley 2011; van Treeck 2014; Medialdea García and Sanabria Martín 2022). Furthermore, while Mian and Sufi use micro-level data in their empirical analysis, post-Keynesian analyses that emphasize household heterogeneity tend to exclude such data.

The goal of this paper is to shed light on this debate. Through the analysis of micro data from the Bank of Spain, we will study the behavior of household consumption as a function of housing and financial net worth, controlling for levels of income, and wealth at three different times: during the real estate bubble of 2002–2005, the Great Recession (2008–2011), and its subsequent economic recovery from 2014 to 2017. The use of micro data will enable us to identify the channel and mechanism working at the macro level regarding the period of substantial private indebtedness, the Great Recession, and the ensuing expansion phase.

In the end, we look for evidence supporting the heterogeneity in the marginal propensity to consume according to changes in household housing and financial net worth. The aim is to analyze whether the empirical results are consistent with mainstream theory of consumption, or alternatively, provide evidence in favor of post-Keynesian theory, which emphasizes the linkage between income inequalities, debt-financed consumption, household debt accumulation, and household consumption spending, incorporating, in addition, Hyman Minsky's Financial Instability Hypothesis.

Using quantile regression models, we find heterogeneity in household consumption behavior with respect to income and net worth in response to changes in household net worth in the Great Recession and the ensuing expansion period. This is compatible with the relative income hypothesis of Duesenberry (1949) extended in expenditure cascades models (Frank et al. 2014; Belabed et al. 2018). Furthermore, during the real estate bubble period, this heterogeneity practically disappears, in line with Hyman Minsky's Paradox of Tranquility based on his Financial Instability Hypothesis (Minsky 1986, 1992). These findings eventually favor the post-Keynesian theory on consumption.

The rest of the paper is organized as follows. Section 2 discusses the two alternative theories about debt accumulation and the factors influencing household consumption, the Neoclassical and the post-Keynesian, detailing the latest and most relevant empirical research connected to each of these theories. Section 3 formulates the empirical model and details the description of the sample and the variables used. Section 4 discusses the empirical results obtained. Finally, Section 5 presents the conclusions and the implications of the findings.

2 Determinants of household debt accumulation and consumption

There are two conflicting theories about the determinants of consumption in the economic literature. On the one hand, there is the Neoclassical vision – the theory of the life cycle and permanent income – that assumes that household consumption growth

is completely insensitive to the idiosyncratic changes in wealth (Cochrane 1991; Constantinides and Duffie 1996; Telmer 1993; Heaton and Lucas 1992 1996; Campbell and Cocco 2007; and Sinai and Souleles 2005). On the other hand, there is the post-Keynesian theory, which applies and extends both Duesenberry's hypothesis of relative income (Duesenberry 1949; Marglin 1984; Cynamon and Fazzari 2008, 2015, 2016; Stockhammer and Wildauer 2016) and Minsky's hypothesis of financial instability (Minsky 1986, 1992; Galbraith 2008; Wray 2008, 2009, 2011; Dymski 2010; Palley 2011; Variato 2015) to explain household consumption behavior. Post-Keynesians assume that securitization (Dymski 2010), distressed households (Dymski 2010; Cynamon and Fazzari 2016), inequality (Cynamon and Fazzari 2015, 2016), and the Financial Instability Hypothesis (Minsky 1986, 1992) were central to the macroeconomic dynamics that affected household debt accumulation and consumption at the microeconomic level, before, during and after the Great Recession.

2.1 Consumption's neoclassical theory

Neoclassical consumption theory explores how individuals make consumption decisions based on their preferences and budget constraints. Within this framework, two initial significant concepts were the theory of the life cycle and the permanent income hypothesis (Friedman 1957, 1963; Hall 1978; Nelson 1987; Meghir 2004). The theory of the life cycle posits that individuals aim to maintain a relatively stable level of consumption throughout their lifetime, adjusting their savings and borrowing accordingly. Early in life, people typically consume a smaller portion of their income, saving for future needs such as retirement and unforeseen expenses. During their prime working years, consumption tends to rise as income increases. Finally, in retirement, consumption declines as individuals draw down their accumulated savings. The permanent income hypothesis, developed also by Milton Friedman, builds upon the theory of the life cycle. It suggests that individuals' consumption patterns are not solely based on their current income but rather on their expected future income. According to this hypothesis, individuals aim to smooth their consumption over time by considering their permanent or long-term income. Windfalls or temporary income fluctuations do not significantly affect consumption decisions because individuals focus on their anticipated income trajectory.

The Neoclassical theory, beneath these nascent underpinnings, under the standard representative agent model, assumes that households can perfectly insure each other against consumption risk. Hence, consumption growth for households is completely insensitive to the idiosyncratic changes in wealth. The representative-agent consumption risk insurance assumption implies an elasticity of consumption, with respect to wealth, of zero. This hypothesis has been derived under the assumption of complete markets (Cochrane 1991), or under less restrictive assumptions of incomplete ones and limited borrowing capacity (Constantinides and Duffie 1996; Telmer 1993; and Heaton and Lucas 1992, 1996). Moreover, in the context of housing wealth, Campbell and Cocco (2007) and Sinai and Souleles (2005) have shown that consumers are naturally hedged against negative housing wealth shocks since they must consume housing services going forward. However, the Great Recession

and its consequences on consumption invalidate this approach. Mian et al. (2013), using micro data, reject the consumption risk-sharing hypothesis. It is obvious that standard dynamic stochastic general equilibrium (DSGE) models of business cycles have ignored the role of private debt and financial sectors not only before but also even after the Great Recession (Goodhart 2009; Rogers 2018a, 2018b). Andrle et al. (2017) find DSGE models unable to explain the business cycle dynamics.

There are two main approaches from the orthodoxy theory to explain the rise of household debt and the Great Recession. On the one hand, Mian and Sufi's empirical analysis (2009, 2010a, 2010b, 2011, 2012a, 2012b, 2013, 2014, 2015) show, using micro data, that there is a heterogeneity of households' consumption behavior respect to the unprecedented household debt accumulation during the Great Recession. They concluded that securitization, unsustainable levels of credit expansion, distressed households, and the subsequent lack of aggregate demand were the most important drivers of household debt accumulation and consumption before and during the Great Recession. Under their theoretical framework, they only focused on the short term, considering financial crises as abnormal events driven by unexpected exogenous shocks, a consequence of the unsustainable level of credit expansion and debt accumulation encouraged by the government. They argue that political institutions are influenced by the financial industry, therefore credit-driven cycles can be recurrent.

On the other hand, other Neoclassical economists (Justiniano et al. 2010; Guerrieri and Lorenzoni 2017; He and Krishnamurthy 2013; Brunnermeier and Sannikov 2014; Gertler and Gilchrist 2018) extend Bernanke and Gertler's (1989) financial accelerator framework from nonfinancial firm's constraints to household's and bank's balance-sheet constraints. They emphasize that the financial system of credit intermediation was one of the main sources of the crisis, arguing that the Great Recession would have been much milder without the distress experienced by the financial system.

2.2 Post-Keynesian theory on household debt accumulation and consumption

Post-Keynesian consumption theory offers an alternative perspective to Neoclassical economics by focusing on the role of income distribution, relative income, and financial instability in shaping consumption behavior. Two prominent concepts within this framework are Duesenberry's relative income hypothesis and Minsky's Hypothesis of Financial Instability.

Duesenberry's relative income hypothesis suggests that individuals' consumption decisions are influenced not only by their absolute income but also by their income relative to others in society. He argued that people tend to engage in "conspicuous consumption" to maintain or improve their social status, even if it means saving less than they would if they were solely concerned with their absolute well-being (Duesenberry 1949). This concept challenges the Neoclassical assumption that consumption decisions are solely driven by utility maximization based on individual preferences and budget constraints. Frank et al. (2014) and Belabed et al. (2018) further extrapolate the relative income hypothesis, encompassing it within the

framework of expenditure cascades. Within this theoretical construct, predicated upon the presence of successive hierarchical strata of reference groups, individual consumption behavior is posited to be, in part, influenced by reference groups situated progressively higher in the income hierarchy along the cascade of reference groups. Consequently, this engenders an unsustainable cycle of borrowing and balance-sheet dynamics for financially strained households, ultimately exerting a discernible impact upon their consumption patterns.

Minsky's financial instability hypothesis delves into the role of financial markets and the business cycle in shaping consumption patterns. Hyman Minsky argued that financial markets go through cycles of boom and bust, and individuals' confidence in these markets greatly influences their consumption behavior (Minsky 1986, 1992). During periods of economic stability, when asset prices are rising and credit is readily available, individuals tend to become more optimistic about their financial prospects, leading to increased consumption and borrowing. However, this optimism can lead to financial bubbles and subsequent crashes, causing a sharp contraction in consumption and economic instability.

These post-Keynesian theories emphasize the dynamic and interconnected nature of consumption, income distribution, and financial markets, challenging the Neoclassical view that individuals make consumption decisions in isolation from external factors. By considering the relative income and financial instability, post-Keynesian consumption theory provides a more nuanced understanding of how economic and social dynamics influence individual and aggregate consumption patterns.

Minsky's financial instability hypothesis framework is used to forecast endogenous financial instability processes so that it can be applied for understanding household debt accumulation before the Great Recession and the subsequent collapse on consumption (Variato 2015). Different post-Keynesian economists have carried out extensions of Minsky's analysis. Wray (2008, 2009, 2011) concludes that the Great Recession was the consequence of the unsustainable increase in household debt given to a specific phase of capitalism, money manager capitalism. Palley (2011) translates the long-run FIH perspective to the household debt accumulation and the Great Recession, considering them as fundamental structural changes, which are a part of a super-cycle, as regulatory relaxation in the financial sector and more risk-taking behavior, finally translated into a financial crisis, which is a short cycle. Dymski (2010) underlies securitization and distressed households as the main sources of household debt accumulation as well as the Great Recession, respectively.

Other post-Keynesian research considers Minsky's extension to household debt accumulation is not explored enough in detail. Therefore, they incorporate and extend Duesenberry's hypothesis of relative income (Cynamon and Fazzari 2008, 2015, 2016; Stockhammer and Wildauer 2016) to explain household debt accumulation and consumption behavior. Cynamon and Fazzari (2016) relate income inequality, consumption as well as debt accumulation. They conclude that inequality is the main key to understanding macroeconomic dynamics of household debt accumulation and consumption before and during the Great Recession. They explain how borrowing allows the bottom 95% income-share households to maintain consumption behavior before the Great Recession. However, as the Great Recession began, the

bottom 95% consumption rate was forced to deleverage, producing a balance-sheet recession. Stockhammer and Wildauer (2016), for a panel of 18 OECD countries in 1980–2013, find strong effects of debt and property prices on aggregate demand, although, opposite to Cynamon and Fazzari (2016), they fail to find effects of personal inequality.

Summing-up, post-Keynesian economists' conclusions share common views with Mian and Sufi empirical results (Kim 2020). They concluded, like Mian and Sufi, that securitization, unsustainable levels of credit expansion, distressed households, and the subsequent lack of aggregate demand were the most important drivers for household debt accumulation and consumption before and during the Great Recession. However, opposite to Mian and Sufi's interpretation (Kim 2020), post-Keynesians focus on the long-term trend, considering financial crises as an endogenous phenomenon, where endogenous money and private debt play a key role, with inequality being a driver of credit demand compatible with the relative income hypothesis. However, as Kim (2020) points out, contrary to the Mian and Sufi approach, post-Keynesian researchers do not use micro data to highlight the effect of heterogeneous labor and households.

The difference in the exogeneity (for Mian and Sufi) or endogeneity (for the post-Keynesians) of financial crises may be highly relevant to the empirical analysis of the relationship between households' wealth and their consumption behavior. Mian and Sufi's framework treats financial crises as exogenous shocks to the economy. In their view, crises occur due to external factors such as asset price collapses or banking sector failures, and these crises subsequently affect households' wealth and consumption. Post-Keynesian economics, on the other hand, considers financial crises as endogenous to the economic system. According to this perspective, financial crises can emerge because of endogenous processes within the financial system, including speculative behavior, excessive credit creation, and income inequality. These crises then influence households' wealth and consumption decisions.

In empirical analyses related to the relationship between households' wealth and consumption behavior, the distinction between exogeneity and endogeneity of financial crises may profoundly influence the results and conclusions. If financial crises are viewed as exogenous, researchers may focus primarily on the direct impact of these external shocks on households' wealth and consumption. This approach may downplay the role of systemic vulnerabilities and behavioral factors leading up to the crisis. In contrast, the post-Keynesian perspective, with its emphasis on endogenous financial crises, encourages researchers to examine not only the immediate effects of a crisis but also the underlying causes and dynamics that contribute to the crisis. This broader analysis can provide a more comprehensive understanding of how households' wealth and consumption are intertwined with the financial system's functioning.

The distinction between exogeneity and endogeneity of financial crises also has implications for policy responses. If crises are seen as exogenous, policymakers may focus on mitigating the immediate consequences through measures like bailouts or stimulus packages. In the post-Keynesian view, recognizing the endogenous nature of financial crises suggests a need for more proactive regulatory measures to prevent or mitigate systemic risks and speculative behavior before crises occur. Such

policies can have a significant impact on households' financial stability and, consequently, their consumption behavior.

2.3 Divergences between Neoclassical consumption theory and post-Keynesian approach

The Neoclassical theory of consumption and the post-Keynesian approach to consumption differ significantly, beyond the existence of heterogeneity, in their foundational assumptions, perspectives on consumer behavior, income and wealth effects, expectations and uncertainty, and modeling techniques. In this section, we will outline some of the key distinctions with respect to consumption between these two schools of thought.

Neoclassical theory of consumption assumes that individuals are rational utility maximizers who make consumption decisions based on their preferences, budget constraints, and intertemporal optimization (Samuelson 1947; Hands 2021). The post-Keynesian approach to consumption acknowledges that consumers often do not behave in a strictly rational manner and are influenced by psychological factors, such as uncertainty, habit formation, and social comparisons (Davidson 2009; Skidelsky 2011).

With respect to the role of income and wealth, Neoclassical theory of consumption suggests that consumption decisions are primarily determined by current income and wealth, with individuals smoothing their consumption over time based on their lifetime income expectations (Friedman 1957, 1963; Hall 1978; Nelson 1987; Meghir 2004). Conversely, post-Keynesian economics emphasizes that factors like income distribution, wealth distribution, and access to credit play vital roles in shaping consumption patterns. These factors can lead to varying propensities to consume across different income groups (Dutt 2006b; Cynamon and Fazzari 2008, 2015, 2016; Stockhammer and Wildauer 2016; Lavoie 2022).

Focusing on expectations and uncertainty, Neoclassical models often assume that consumers have perfect foresight and make decisions based on complete and accurate information about future income and prices. However, post-Keynesian economics recognizes that consumers often face uncertainty about future income and economic conditions. These models incorporate the idea that consumers may have adaptive expectations and adjust their consumption in response to changing circumstances (Cynamon and Fazzari 2008, 2015, 2016; Stockhammer and Wildauer 2016; Lavoie 2022).

In terms of regard for modeling approaches, post-Keynesian macroeconomic models that focus on consumption often incorporate the following elements. First, they may include endogenous money creation by banks, recognizing that money creation is influenced by the demand for loans (Moore 1988; Palley 2013). Second, post-Keynesian models pay attention to income and wealth distribution, as they can influence both the level and composition of consumption in the economy. Changes in income and wealth distribution can have significant effects on aggregate demand (Dutt 2006b; Cynamon and Fazzari 2008, 2015, 2016; Stockhammer and Wildauer 2016; Lavoie 2022). Third, they often incorporate behavioral factors

like uncertainty, habit persistence, and bounded rationality in consumer decision-making, acknowledging that these factors can lead to deviations from strict rationality (Davidson 2009; Skidelsky 2011). Finally, post-Keynesian models emphasize the importance of aggregate demand and its components, including consumption, as determinants of output and employment levels. They often stress the need for government policies to manage effective demand and achieve full employment (Keynes 1936; Dutt 2006b; Lavoie 2022).

In summary, post-Keynesian consumption models incorporate endogenous money, income distribution, behavioral factors, and a focus on aggregate demand as key components of their analytical framework, reflecting a departure from the simplifying assumptions of Neoclassical economics.

3 Empirical model

3.1 Sample data and variables

We use for our analysis the Household Financial Survey (HFS), elaborated by the Bank of Spain every 3 years since 2002, which provides detailed information on the income, assets, debts and spending of Spanish households. The survey is based on 245 (on average) stylized questions about the following: demographics, real assets and their associated debts, other debts, financial assets, pensions and insurance, labor market situation and labor income, non-labor income, means of payment, and consumption and savings. Some of these questions are asked to the head of the household and others to every member of the household. Given the usefulness of the information provided by a survey of these characteristics, central banks in the euro area have been conducting the Household Finance and Consumption Survey (HFCS) since 2011. This is a harmonized survey of the financial situation and consumption of households that follows a methodology similar to that of the HFS.

HFS maintains two important features. On the one hand, it interviews a portion of households who collaborated in previous editions. The combination of the samples from the different editions allows us to observe a subset of households at various moments in time as well as, in some cases, over a period of almost 10 years. This longitudinal dimension is relevant for analyzing the behavior of income, wealth, and consumption throughout the life cycle of the households, as well as for exploring the transitions of them along the distributions of the variables under study.

On the other hand, the over-representation of households with a high level of wealth in the sample is maintained. This oversampling is fundamental for guaranteeing a sufficient number of households to allow the study of the financial behavior of them in the upper part of the distribution of wealth, as well as measuring the aggregate wealth of the economy in a precise manner. This is a crucial aspect in a survey of this type, given that the distribution of wealth is very asymmetric and that only a small fraction of the population invests in some asset classes, which is normally the case to a greater extent in households with a high level of wealth. HFS also contains replicate weights in order to take into account simple design features (more

information can be found in https://www.bde.es/bde/en/areas/estadis/estadisticas-por/encuestas-hogar/relacionados/Encuesta_Financi/).

The examination of household consumption spans three distinct time frames, each aligning with varied macroeconomic circumstances, taking into consideration the triennial schedule of the HFS. The initial period coincides with the development of the real estate bubble of 2002–2005, which would still extend until 2007. In order to accomplish this, we used the waves corresponding to 2005, the second edition, and 2002, the first edition. They provide us with a representative and updated image of the composition and distribution of the assets and debts of households for December of those years, as well as of household expenditure and its decomposition into different headings. During this period, the Spanish economy witnessed an economic boom underpinned by substantial borrowing within the private sector, encompassing both families and businesses, revolving around a real estate bubble. Consequently, the price of housing served as collateral for this massive debt. The households interviewed in 2005 and that participated in the 2002 survey totaled 1922. Secondly, in order to analyze household consumption during the Great Recession (2008–2011), we use the waves corresponding to 2008, third edition, and 2011, fourth edition. During this period, the Spanish economy experienced a sharp economic contraction because of the deleveraging of families and companies, following the global financial crisis of 2008 that led to the Great Recession. The households interviewed in 2011 and that participated in the 2008 survey totaled 2769. We analyze the spending behavior of these families in the period 2008–2011, according to the variation of their net real estate and financial wealth in that period, as well as certain idiosyncratic characteristics of the households at the end of 2008 (income and wealth levels). Finally, we study household consumption during the economic expansive phase after the Great Recession (2014–2017), using the waves corresponding to 2014, fifth edition, and 2017. The households interviewed in 2017 and that participated in the 2014 survey totaled 2692.

Table 1 describes the variables included in the study, one intending to explain changes in household spending, being our dependent variable, and the explanatory ones.

The coefficients of the housing and financial net worth growth are expected to be positive, i.e., an increase in both affect positively the variation in spending, while a decrease has a negative impact. With respect to the coefficient of the level of income per household, it is expected to be negative, i.e., families with more income register a lower variation in the level of expenditure as a result of increases or decreases in the price of housing and the shocks that variations in their housing net worth have on their spending behavior. Opposite to this, the coefficient of the level of net worth per household is expected to be positive and significant: the higher the level of net worth, the greater the sensitivity to register future variations in it and in the corresponding spending behavior.

Table 2 shows a summary of the most relevant statistics for the dependent variables and the independent ones for the first period of analysis, the real estate bubble of 2002–2005, the subsequent Great Recession (2008–2011), and for the third period of analysis, the expansive economic phase subsequent to the Great Recession (2014–2017). In addition to the mean, we incorporate the median. As there is an

Table 1 Description of variables included in the study

Variable	Name	Definition	Expected sign
Dependent variable			
Total Spending Growth	$\Delta ln(spending)$	Percentage change in total household expenditure defined as the sum of the expenditure on food, other non-durable goods, vehicles, and other durable goods, between two non-consecutive years, for each of the three sub-periods considered	
Independent variables			
Housing Net Worth Growth	$\Delta ln(hnetworth)$	Percentage change in the net housing wealth defined as the sum of the value of the main house and other real estate properties, minus the outstanding amount of debt intended to the main house and to the purchase of other real estate properties, between two non-consecutive years, for each of the three sub-periods considered	+
Financial Net Worth Growth	$\Delta ln(fnetworth)$	Percentage change in the net financial wealth defined as the value of financial assets minus the value of non-mortgage debt, secured loan debt, credit card debt and other debt, between two non-consecutive years, for each of the three sub-periods considered	+
Income per Household	$ln(income\_t0)$	Level of household income at initial year (t0) for each of the three sub-periods considered (in euros)	-
Net Worth per Household	$ln(networth\_t0)$	Level of net wealth at initial year (t0), for each of the three sub-periods considered (in euros)	+

Table 2 Summary statistics of the dependent and independent variables in the real estate bubble (2002–2005), in the Great Recession (2008–2011), and the expansive economic phase of 2014–2017

Variable	Time	N	Mean	Std Dev	Median	5th	95th	Min	Max
Total Spending Growth	2002–2005	1922	0.09	0.72	0.09	-1.07	1.31	-3.37	2.93
	2008–2011	2769	-0.02	0.65	-0.02	-1.13	1.05	-2.69	2.59
	2014–2017	2692	0.05	0.58	0.06	-0.91	1	-2.78	2.32
Housing Net Worth Growth	2002–2005	1922	0.52	0.71	0.49	-0.54	1.65	-3.78	4.12
	2008–2011	2769	-0.09	0.69	-0.09	-1.15	0.96	-4.67	3.78
	2014–2017	2692	0.08	0.69	0.03	-0.94	1.21	-3.65	4.52
Financial Net Worth Growth	2002–2005	1922	0.33	1.86	0.34	-2.77	3.4	-8.25	9.78
	2008–2011	2769	0.11	1.7	0.1	-2.71	2.88	-8.24	7.2
	2014–2017	2692	0.22	1.6	0.19	-2.31	2.89	-8.16	7.23
Income per Household	2002	1922	48584.94	92477.2	29535.5	6384	142708	90	3144000
	2008	2769	61887.26	195594.6	33132	7851.28	161142	560.23	8594441
	2014	2692	62351.17	103084.8	39196.08	9322.03	177138.4	718.45	3180575
Net Worth per Household	2002	1922	645661	6646387	204639	36350	1635557	3700	2.90E+08
	2008	2769	1326052	5366912	379945	73126.5	4053977	450	1.50E+08
	2014	2692	1866258	8806113	380852	48681	6610000	250	3.00E+08
Change in Total Spending	2002–2005	1922	1863.52	22089.86	787.5	-18600	26402	-605363	193000
	2008–2011	2769	-664.73	20324.33	-252	-25200	24040	-419400	192434
	2014–2017	2692	1501.37	22713.93	817.5	-24000	30000	-394800	287600
Change in Food Spending	2002–2005	1922	294.44	4314.64	0	-6000	6720	-25181.8	36000
	2008–2011	2769	-257.11	5258.06	0	-8256	7656	-37200	39600
	2014–2017	2692	631.15	5664.97	240	-6372	9600	-84000	42000
Change in Other Non–Durable Goods Spending	2002–2005	1922	696.11	11344.58	288	-10800	13800	-237600	93842.88
	2008–2011	2769	560.77	11772.88	240	-14160	15600	-269844	100800
	2014–2017	2692	-206.01	15425.89	0	-18000	16800	-349800	168000

Table 2 (continued)

Variable	Time	N	Mean	Std Dev	Median	5th	95th	Min	Max
Change in Vehicles Spending	2002–2005	1922	573.04	14881.85	0	−12000	18000	−480000	114192.3
	2008–2011	2769	−679.75	11149.02	0	−15500	9100	−192121	122200
	2014–2017	2692	698.15	12589.09	0	0	17000	−200000	150000
Change in Other Durable Goods Spending	2002–2005	1922	299.93	4556.05	0	−3000	4207.08	−47400	119002.4
	2008–2011	2769	−288.64	10867.39	0	−4500	3000	−435000	209954
	2014–2017	2692	378.07	8285.76	−3000	0	4300	−230000	200000

over-representation of the highest incomes and wealth, the average is very far from the median in both income and net household wealth, and the latter is then a more representative measure of the population. Specifically, we present the number of observations, households, the mean, standard deviation, median, 5th percentile, 95th percentile, minimum and maximum for the dependent and independent variables.

Table 2 for the period 2002–2005 reveals the most significant increase in both total spending and housing and financial net worth among the three analyzed periods, in both the mean and median. This period corresponds to the economic expansion phase that saw the real estate bubble develop that preceded the Great Recession. Regarding the composition of spending, the variation in euros shows a rise in both total spending and various categories, with notable increases in vehicle expenses and nondurable goods excluding food. This is in contrast to the subsequent economic recovery period we will examine (2014–2017), where spending on the latter declined while the increase in vehicle spending was more modest. There is significant heterogeneity in household behavior based on the results of the 5th and 95th percentiles. In households at the 5th percentile, both total consumption expenditure and housing and financial net worth decrease, while they increase in the mean and median. On the other hand, in households belonging to the 95th percentile, both consumption and the net worth of real estate and financial assets increase much more than in the mean and median.

The highlight of Table 2 for 2008–2011 is that both total spending and housing net worth fell in that period in both the average and the median. As for the composition of expenditure, the variation in thousands of euros in both total expenditure and the different items all fell except for the consumption of non-durable goods other than food. We can extrapolate from these data that spending is affected by the fall in real estate wealth. The fall in housing prices, in highly indebted households, led to a drop in their consumption; they had to pay off their mortgage debt to avoid foreclosures. In Spain, for non-payment of at least three monthly mortgage duties, in addition to applying interest on arrears from the first default, banks may require the collection of the debt through the sale of the property or the foreclosure of the mortgage guarantee. This entails a large number of families' evictions, mostly vulnerable, by means of forced foreclosure as a mortgage guarantee in the event of non-payment of it. If the property sale does not cover the entire debt, banks may try to collect all the assets of the people involved in the mortgage, both borrowers and guarantors. The dation in payment, consisting of the delivery of the habitual residence to cancel the entire debt, only exists in certain scenarios of social exclusion.

With respect to financial net worth, for the period 2008–2011, there was positive growth, as can be seen in both the average and the median. After the fall of Lehman Brothers, there was a collapse of the global risk markets, which reached minimums in February 2009. From this date on, most financial asset prices recovered strongly in 2011, even above the levels of the end of 2008.

One of the most important conclusions we can extrapolate from Table 2 for 2008–2011 is that there is an important heterogeneity in the household behavior according to the 5% and 95% percentiles results. While in households corresponding to the 5% percentile, both total consumption expenditure and net real estate and financial wealth fall more than in the mean and median. In households belonging to

the 95% percentile, both consumption and net real estate as well as financial worth rise. There are clear signs of inequality in the dynamics of consumption and net worth.

Table 2 for the period 2014–2017 signals a rise in both, total spending and housing and financial net worth, in the economic expansive phase subsequent to the Great Recession, both the mean and the median. Regarding the composition of spending, the variation in euros is exactly the opposite to the Great Recession – both total expenditure and the different items rise, with the exception of consumption of non-durable goods other than food. As for 2008–2011, there is an important heterogeneity in the household behavior according to the 5% and 95% percentiles results. In households corresponding to the 5% percentile, both total consumption expenditure and housing and financial net worth fall, while rising in the mean and median. On the other hand, in households belonging to the 95% percentile, both consumption and net real estate and financial worth rise much more than the mean and median.

The main conclusions from Tables 1 and 2 are on the one hand, that housing and financial net worth matter in order to explain household consumption; and, on the other, there is evidence of inequality in the dynamics of household consumption and net worth, and implicitly in household debt accumulation. Because these dynamics are kept in two different periods, the Great Recession, and that of the subsequent economic expansive phase, these data seem to be consistent with the post-Keynesian theory of consumption behavior. We are now going to empirically test all these initial tentative findings.

3.2 Empirical model

We want to analyze how household spending will respond to a shock in their housing net worth, during the real estate bubble of 2002–2005, the Great Recession (2008–2011) and the subsequent expansive economic phase of 2014–2017. For this purpose, we estimate the change in household spending during these periods as a function of the impact on housing net worth in the same periods, which includes the change in financial net worth. Additionally, we consider the income and net worth levels per household in 2005, representing the real estate bubble period, 2008, corresponding to the Great Recession, or 2014, representing the post-Great Recession economic recovery phase, all expressed in logarithmic terms. Therefore, the relationship between total spending growth and its main determinants can be formulated as follows:

$$\Delta ln(spending)_i = f(\Delta ln(hnetworth)_i, \Delta ln(fnetworth)_i, ln(income\_t0)_i, ln(networth\_t0)_i)$$
(1)

The classical regression model is specified according to the following linear formulation:

$$\Delta ln(spending)_i = \beta_0 + \beta_1 \Delta ln(hnetworth)_i + \beta_2 \Delta ln(fnetworth)_i + \beta_3 ln(income\_t0)_I + \beta_4 ln(networth\_t0)_i + \varepsilon_i \quad (2)$$

where i refers to the *i-th* household.

Also, in the case of the quantile regression models, we assume a linear relationship with respect to the set of explanatory variables:

$$Q_q(\Delta ln(spending)_{i|X_i}) = X_i' \beta_q + \nu_i \tag{3}$$

where q is the specific quantile considered, with $0 < q < 1$ and X the regressors matrix. The method used is simultaneous-quantile regression, which allows for different associations between independent variables and specific quantiles of the dependent variable. It is robust in the presence of outliers, not assuming any specific form for the error distribution. This method produces quantile regression estimates for several values of quantiles simultaneously, allowing for differences between coefficients for different quantiles to be tested.

Figure 1 shows the estimated coefficients from pooled simultaneous quantile regressions for the four regressors on total spending growth. This
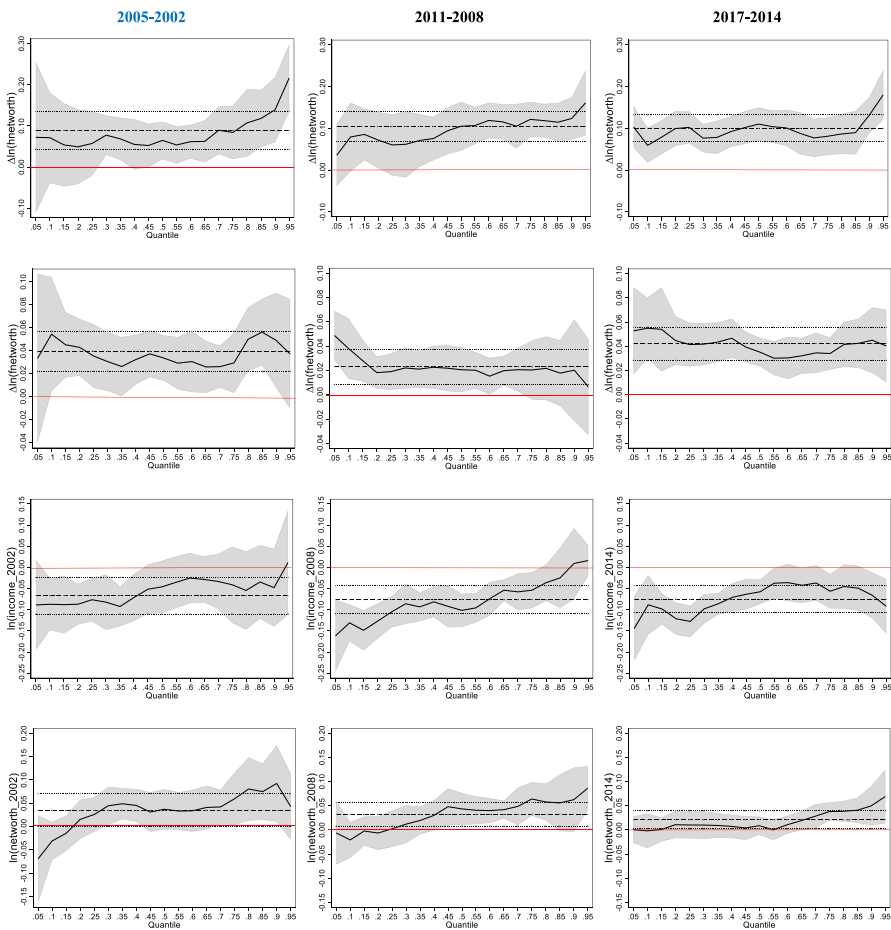
Fig. 1 Estimated coefficients from pooled simultaneous quantile regressions. *Note*: Δln(hnetworth) denotes housing net worth growth; Δln(fnetworth) denotes financial net worth growth; ln(income_t0) denotes income per household at initial year; ln(networth_t0) denotes net worth per household at initial year

estimation makes use of 1922 observations for 2002–2005, 2746 observations for 2008–2011, and 2692 observations for 2014–2017. Depending on the quantile, the pseudo-R^2 reaches values between 0.0067 and 0.0327, between 0.0115 and 0.0363, and between 0.0106 and 0.0354, respectively.

Each graph describes the effect of a specific regressor on total spending growth, including 19 quantile results plus one OLS result. For each (conditional) quantile, the vertical axis plots the estimated coefficients (marginal impacts in the form of log-log elasticities) of the specific regressor. The shaded areas indicate the corresponding 95% confidence intervals. If the confidence interval encompasses the horizontal zero axis, the corresponding estimate is not significantly different from zero. If the curve of estimated coefficients and the surrounding confidence intervals are located within the positive (negative) domain, the regressor represented by this graph has a significantly positive (negative) impact on total spending growth. The straight dashed lines indicate OLS estimates and their corresponding 95% confidence intervals. Thus, the figures contain the full numerical information obtained from the regressions.

Table 3 presents different F-test results for equality of coefficients at the different conditional quantiles. When discussing the quantile regression results, it is interesting to first compare the estimated coefficient for the median (q = 0.50) with those obtained for the mean on the base of the linear regression model. As the median estimator is robust to the existence of outliers, the mean vs. median comparison allows us to assess whether the linear model provides an adequate picture of the central tendencies featured in the data. This is revealed to be the case in our study, as the comparisons of the significant coefficients' estimates show no coefficients appear to be different in magnitude. However, different behaviors are detected for the tails of the distribution where heterogeneity is observed, which justifies the type of analysis carried out.

The coefficient of change in housing net worth, as expected, is a positive and increasing value, confirming the variation in the housing wealth is higher. In the real estate bubble period considered, 2002–2005, it is not significant for the lowest quantiles; that is, those tranches with the lowest variations in housing net worth, but it is significant for above 50th quantile, especially for the highest ones. In the Great Recession period 2008–2011, it is not significant for the lowest quantiles, while in the economic recovery phase (2014–2017) it is significant for all quantiles. When a test of differences is conducted within each period, significant differences are observed for the tails in the last two periods, 2008–2011 and 2014–2017. These differences are found between families in the 5th quantile (q05), representing the 5% of households with the lowest change in housing net worth, and those in the 95th quantile (q95), representing the 5% of households experiencing the highest variation in housing net worth. In the Great Recession, these significant differences extend to more quantiles, beyond q05 and q95, since there are also significant differences between the 25th quantile (q25 or 25% of households with lowest changes in their household net worth) with respect to the 75th quantile (q75, the quartile group with higher variations in its housing worth). However, such heterogeneity is not observed for the period of the real estate bubble of 2002–2005.

Table 3 Different *F*-test for equality of coefficients at the different conditional quantiles

Null hypothesis	2002–2005			2008–2011			2014–2017		
	q50 = mean	q25 = q75	q05 = q95	q50 = mean	q25 = q75	q05 = q95	q50 = mean	q25 = q75	q05 = q95
Δ*ln(hnetworth)*	1.30	0.33	2.55	0.00	3.76*	5.70**	0.41	0.49	2.98*
Δ*ln(fnetworth))*	0.53	0.15	0.01	0.07	0.01	4.42**	1.27	0.45	0.31
ln(income_t0)	0.64	0.95	1.92	1.42	3.85**	11.47***	1.37	8.03***	0.67
ln(networth_t0)	0.01	1.50	3.43*	0.34	10.37***	4.55**	1.72	3.48*	4.11**

*** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level. Δ*ln(hnetworth)* denotes housing net worth growth; Δ*ln(fnetworth)* denotes financial net worth growth; *ln(income_t0)* denotes income per household at initial year; *ln(networth_t0)* denotes net worth per household at initial year

Regarding the coefficient of variation of net financial worth, this is equally positive, although the mean elasticity of the change in consumption to the change in net real estate wealth is five times higher than for the net financial wealth one. The estimated quantile coefficients for the 2002–2005 and 2014–2017 periods are all within the OLS estimation bands (mean), so there would be no heterogeneity in consumption behavior with respect to the change in net financial worth. However, they are outside the bands in 2008–2011 for the extreme quantiles. Specifically for the lowest quantiles (q05), families with lower changes in financial wealth are above the mean (OLS) and (see the test of differences) statistically different with respect to the extreme value of the 5% with higher increase in financial wealth (q95). The heterogeneity of spending behavior in the face of variations in net financial wealth only occurs in the extreme cases during the Great Recession.

The interval of the 2008 family income level is negative up to the q75 quantile (those with the highest income), for which it has a zero effect. Moreover, by means of quantile difference tests, we observe that there are notable differences between the extremes (q05 with respect to q95, q25 with respect to q75) indicating a heterogeneity of consumption with respect to the level of family income at the beginning of the Great Recession. Regarding the coefficient of the 2014 household income level in the face of consumption changes in the 2014–2017 period, a more subdued pattern of heterogeneity is observed. This is confirmed by the test of differences. There are significant differences between the 25th quantile (q25 or 25% of households with lowest income) with respect to the 75th quantile (q75, the quartile group with higher income), but not between the tails (q05 with respect q95). During the real estate bubble period of 2002–2005, there was little to no impact on the majority of quantiles. Moreover, there is no variability observed in the *F*-tests for differences.

Regardless of the level of household net worth at the beginning of each period, in contrast to the family income levels, it is observed that for the Great Recession phase, the 2008 household net worth level begins to be significant and positive as of quantile 40 (q40). This means the effect of the level of net worth in spending behavior is null for quantiles below q40, so it does not affect them, but it is positive and increasing as of that quantile. The higher the level of net wealth, the greater the sensitivity to changes in it and in the corresponding spending behavior. The OLS estimators do not reflect this heterogeneous effect. This behavior is maintained in the period 2014–2017 but from quantile 65 (q65) onwards. It is observed in both cases that the test of differences are significant, i.e., there is heterogeneity in the household spending behavior according to the level of net worth at the beginning of each phase. In the timeframe of the real estate bubble (2002–2005), notable distinctions only emerged when comparing the extremes (q05 versus q95).

4 Discussion and implications of the findings

Using the micro data of the HFS of the Bank of Spain, we have analyzed the consumption consequences of the household balance sheets and debt accumulation during the real estate bubble of 2002–2005, the Great Recession (2008–2011), as well as the subsequent economic recovery phase (2014–2017). We have used micro

data to correctly identify the channel and mechanism working at the macro level regarding the period of substantial private indebtedness, the Great Recession, and the ensuing expansion phase. Using quantile regression models, we find heterogeneity in household consumption behavior with respect to income and net worth in response to changes in household net worth in the Great Recession and the ensuing expansion period. Therefore, this heterogeneity cannot be attributed exclusively to exogenous shocks or unforeseen economic events. Additionally, during the real estate bubble period, this heterogeneity practically disappears, in line with Hyman Minsky's Paradox of Tranquility based on his Financial Instability Hypothesis (Minsky 1986, 1992).

The obtained results indicate that housing net worth shocks matter, feeding back the effects associated with the heterogeneous idiosyncratic characteristics of the households. In the Great Recession, for instance, negative housing shocks in highly indebted families, with lower income and lower net worth, had a greater negative impact on consumption than in the rest of the families. This verifies that the most vulnerable households were the hardest hit by the real estate and financial crisis. Concurrently, in periods of sustained growth, banks reduce their loan requirements and accept higher debt levels. Banks, families, and businesses will settle for a smaller proportion of liquid assets, leading to the paradox of tranquility: a happy period of economic activity will eventually make financial balance sheets more fragile. This economic fragility will be accompanied by speculative behaviors: banks and businesses will compete with each other by leveraging debt, and families will act similarly, causing inflation in stock prices and the real estate sector.

These findings favor the post-Keynesian theory on consumption. As Mian and Sufi, post-Keynesians concluded (Kim 2020) that securitization, unsustainable levels of credit expansion, distressed households, and the subsequent lack of aggregate demand were the most important drivers for household debt accumulation and consumption before and during the Great Recession. However, the persistence of heterogeneity in time, except during the real estate bubble period, is compatible with the post-Keynesian view that, opposite to Mian and Sufi interpretation (Kim 2020), the long-term trend of household balance-sheet fragility and rising inequality matters, being inequality a driver of credit demand compatible to the relative income hypothesis (Cynamon and Fazzari 2015). We obtain these results using, as Mian and Sufi approach, micro-data in order to highlight the effect of heterogeneous labor and households, which is not the usual post-Keynesian approach. Only during the peak of an economic boom driven by a cycle of private debt, which often ends in a balance-sheet recession (Koo 2003, 2009, 2015), does this heterogeneity disappear.

The greater inequality, specifically in the household distribution of income and net worth, favors higher consumption propensities for at least some households to changes in housing and financial net worth. This is compatible with the relative income hypothesis of Duesenberry (1949) extended in expenditure cascades models (Frank et al. 2014; Belabed et al. 2018), where households whose incomes are falling behind try to keep up with norms of spending set by those who benefit from rising inequality. This leads to unsustainable borrowing and balance sheet dynamics for the depleted households that finally affects to their expenditure behavior, as we show in our analysis.

In summary, the long-term process of income and net worth inequality are key to understand the macroeconomic dynamics of debt accumulation, household financial fragility, and the impact of changes in housing and financial net worth in households' consumption behavior (Cynamon and Fazzari 2015) before and during the Great Recession, thus extending to subsequent recovery phase (2014–2017). We can conclude that the greater the inequality, the greater the dynamics of indebtedness that end up generating enormous financial fragility destabilizing the economy as a whole. Therefore, reducing growing inequality becomes an economic policy objective to stabilize the economy.

Behavioral and evolutionary theorists should take into account these findings, in line with what Nelson and Consoli (2010) suggested. Evolutionary economics is in urgent need of a theory regarding household consumption behavior, and to achieve this, it must incorporate specific evidence from the demand side. The empirical evidence is unequivocal: income- and net-worth inequality dynamics reinforce cycles of debt accumulation, financial vulnerability, and household consumption behavior. Consequently, from both a behavioral and evolutionary standpoint, these dynamics should be an integral part of the theory of household consumption behavior within the field of evolutionary economics. Our results contribute to an informed debate on the moral foundations of economic action, in this case, thus rejecting the simplification of the Neoclassical orthodoxy to consider a single rational representative agent, summarizing the behavior of consumers, companies or investors.

5 Conclusion

Mian and Sufi's analysis (2009, 2010a, b, 2011, 2012a, b, 2013, 2014, 2015) is probably the most important empirical studies in order to identify macro level mechanisms regarding household debt accumulation, the effect of rising house on home equity-based borrowing, and the household consumption consequences of the housing collapse. Their empirical results emphasize that there is a heterogeneity of households' consumption behavior with respect to the unprecedented household debt accumulation during the Great Recession. Their results are inconsistent with Neoclassical theory of consumption (permanent income/life cycle theory), and are more compatible with the post-Keynesian theory of inequality and consumption, that is, the relative income hypothesis and the habit persistence theory (Duesenberry 1949; Marglin 1984; Cynamon and Fazzari 2008, 2015, 2016; Stockhammer and Wildauer 2016).

However, there are clear differences between post-Keynesian and Mian and Sufi's views about the interpretations of these results. Mian and Sufi (2009, 2010a, b, 2015) perceive the Great Recession and the heterogeneity of households' consumption behavior, with respect to the debt accumulation, deal to exogenous shocks, unforeseen economic events, focused on short and medium-run effects, and supply credit constraints. Post-Keynesians economists, however, focus on longer time horizons considering a financial crisis as an endogenous phenomenon, with net worth inequality being an important reason for housing borrowing and debt accumulation (Brown 2008; Barba and Pivetti 2009; Dymski 2010; Palley 2011; van Treeck 2014).

On the other hand, while Mian and Sufi use micro data in their empirical analysis, the use of these is absent in post-Keynesian macro analysis when they highlight heterogeneous households.

The aim of this paper is to shed light on this controversy. For this purpose, micro data of the HFS of Bank of Spain are employed in order to analyze household consumption behavior as a function of housing and financial net worth, controlling for levels of income and wealth at three distinct periods. The first coincides with the development of the real estate bubble of 2002–2005, the second one refers to Great Recession (2008–2011), and finally, the subsequent phase of economic recovery (2014–2017). If the results on the heterogeneity in household consumption and its dependence on income and net worth levels are given and kept in both periods, the evidence would accumulate in favor of the post-Keynesian theory. On the contrary, if heterogeneity were only maintained in the Great Recession, but not in the recovery phase, Mian and Sufi's explanation of attributing the financial crisis and the consumption behavior of families to an exogenous shock would be reinforced.

Using quantile regression models, we find heterogeneity in household consumption behavior with respect to income and net worth levels, in response to changes in household net worth in all these periods. The coefficient of the change in housing net worth on household expenditure variation is positive, and it increases as the variation in the housing wealth becomes higher. The test of differences concludes, within each period, that there are significant differences for the tails. In the Great Recession, these significant differences extend to more quantiles, beyond q05 and q95, since there are also significant differences between the 25th quantile (q25 or 25% of households with lowest changes in their household net worth) with respect to the 75th quantile (q75, the quartile group with higher variations in its housing worth). However, such heterogeneity is not observed for the period of the real estate bubble.

On the other hand, the coefficient of the 2008 family income level on household expenditure variation in 2008–2011 is negative up to the q75 quantile (those with the highest income), for which it has a zero effect. Moreover, by means of quantile difference tests, we observe that there are notable differences between the extremes (q05 with respect to q95, q25 with respect to q75) indicating a heterogeneity of consumption with respect to the level of family income at the beginning of the Great Recession. Regarding the coefficient of the 2014 household income level in the face of consumption changes in the 2014–2017 period, a more subdued pattern of heterogeneity is observed. There are significant differences between the 25th quantile (q25 or 25% of households with lowest income) with respect to the 75th quantile (q75, the quartile group with higher income), but not between the tails (q05 with respect q95). For the period of the real estate bubble, the effect on most quantiles is negligible. Additionally, no heterogeneity is observed in the differences F-tests.

Finally, the coefficient of the level of household net worth at the beginning of each period on household consumption behavior is positive. The 2008 household net worth level begins to be significant and positive as of quantile 40 (q40). This means the effect of the level of net worth in spending behavior is null for quantiles below q40, so it does not affect them, but it is positive and increasing as of that quantile. The higher the level of net wealth, the greater the sensitivity to changes in it and in

the corresponding spending behavior. The OLS estimators do not reflect this heterogeneous effect. This behavior is maintained in the period 2014–2017 but from quantile 65 (q65) onwards. It is observed in both cases that the test of differences is significant, i.e., there is heterogeneity in the household spending behavior according to the level of net worth at the beginning of each phase. During the real estate bubble period (2002–2005), the only significant differences were found between the tails (q05 compared to q95).

All these findings are compatible with the relative income hypothesis of Duesenberry (1949) extended in expenditure cascades models (Frank et al. 2014; Belabed et al. 2018), and financial instability hypothesis of Hyman Minsky (1986, 1992), eventually favors the post-Keynesian theory on consumption. The long-term process of income and net worth inequality feeds into the macroeconomic dynamics of debt accumulation, household financial fragility, and the impact of changes in housing and financial net worth in Spanish households' consumption behavior before and during the Great Recession, extending to subsequent recovery phase (2014–2017).

From our findings, we can conclude that the greater the inequality, the greater the dynamics of indebtedness that end up generating enormous financial fragility. Therefore, reducing growing inequality becomes an economic policy objective to stabilize the economy.

Data availability The datasets are available in https://www.bde.es/bde/en/areas/estadis/estadisticas-por/encuestas-hogar/relacionados/Encuesta_Financi/

Declarations

References

Andrle M, Bruha J, Solmaz S (2017) On the sources of business cycles: implications for DSGE models. European Central Bank No. 2058

Barba A, Pivetti M (2009) Rising household debt: Its causes and macroeconomic implications, a long-period analysis. Camb J Econ 33:113–137. https://doi.org/10.1093/cje/ben030

Belabed CA, Theobald T, van Treeck T (2018) Income Distribution and Current Account Imbalances. Camb J Econ 42:47–94. https://doi.org/10.1093/cje/bew052

Bernanke B, Gertler M (1989) Agency Costs, Net Worth, and Business Fluctuations. Am Econ Rev 79:14–31

Blanchard O (2009) The State of Macro. Annu Rev Econ 1:209–228. https://doi.org/10.1146/annurev.economics.050708.142952

Brown C (2008) Inequality consumer credit and the saving puzzle. Edward Elgar, Cheltenham

Brunnermeier MK, Sannikov Y (2014) A macroeconomic model with a financial sector. Am Econ Rev 104:379–421. https://doi.org/10.1257/aer.104.2.379

Campbell J, Cocco J (2007) How do house prices affect consumption? Evidence from micro data. J Monet Econ 54:591–621. https://doi.org/10.1016/j.jmoneco.2005.10.016

Carroll C, Kimball MS (1996) On the concavity of the consumption function. Econometrica 64:981–992. https://doi.org/10.2307/2171853

Cochrane J (1991) A simple test of consumption insurance. J Polit Econ 99:957–976. https://doi.org/10.1086/261785

Constantinides G, Duffie D (1996) Asset pricing with heterogeneous consumers. J Polit Econ 104:219–240. https://doi.org/10.1086/262023

Cynamon BZ, Fazzari S (2008) Household debt in the consumer age: Source of growth—risk of collapse. Capital Soc 3:1–32. https://doi.org/10.2202/1932-0213.1037

Cynamon BZ, Fazzari S (2015) Rising inequality and stagnation in the US economy. Eur J Econ Econ Policies: Interv 12:170–182. https://doi.org/10.4337/ejeep.2015.02.03

Cynamon BZ, Fazzari S (2016) Inequality, the Great Recession and slow recovery. Camb J Econ 40:373–399. https://doi.org/10.1093/cje/bev016

Davidson P (2009) The Keynes Solution: the Path to Global Economic Prosperity. St. Martin's Press, New York

Duesenberry JS (1949) Income, saving and the theory of consumer behaviors. Harvard University Press, Cambridge

Dutt AK (2005) conspicuous consumption, consumer debt, and economic growth. In: Setterfield M (ed) Interactions in Analytical Political Economy. Routledge, New York

Dutt AK (2006) Maturity, stagnation and consumer debt: A Steindlian approach. Metroeconomica 57:339–364. https://doi.org/10.1111/j.1467-999X.2006.00246.x

Dutt AK (2006) Aggregate demand, aggregate supply and economic growth. Int Rev Appl Econ 20(3):319–336. https://doi.org/10.1080/02692170600736094

Dymski GA (2010) Why the subprime crisis is different: A Minskyian approach. Camb J Econ 34:239–255. https://doi.org/10.1093/cje/bep054

Frank R, Levine AS, Dijk O (2014) Expenditure cascades. Rev Behav Econ 1:55–73. https://doi.org/10.1561/105.00000003

Friedman M (1957) Theory of the consumption function. Princeton University Press, Princeton

Friedman M (1963) Windfalls, the "horizon", and related concepts in the permanent-income hypothesis measurement in economics. Studies in Mathematical Economics and Econometrics in Memory of Yehuda Grunfeld. Stanford University Press, Stanford

Galbraith JK (2008) The Predator State: How Conservatives Abandoned the Free Market and Why Liberals Should Too. Free Press, New York

Gertler M, Gilchrist S (2018) What Happened: Financial Factors in the Great Recession. J Econ Perspect 32:3. https://doi.org/10.1257/jep.32.3.3

Godley W (2012) Seven Unsustainable Processes: Medium-Term Prospects and Policies for the United States and the World. In: Lavoie M, Zezza G (eds) The Stock-Flow Consistent Approach. Palgrave Macmillan, London

Goodhart C (2009) The continuing muddles of monetary theory: A steadfast refusal to face facts. Economica 76:821–830. https://doi.org/10.1111/j.1468-0335.2009.00790.x

Guerrieri V, Lorenzoni G (2017) Credit crises, precautionary saving and the liquidity trap. Q J Econ 132:1427–67. https://doi.org/10.1093/qje/qjx005

Hall RE (1978) Stochastic implications of the life cycle-permanent income hypothesis: theory and evidence. J Pol Econ 86(6):971–987. https://doi.org/10.1086/260724

Hands DW (2021) The many faces of unification and pluralism in economics: The case of Paul Samuelson's Foundations of Economic Analysis. Stud Hist Philos Sci 88:209–219. https://doi.org/10.1016/j.shpsa.2021.06.008

He Z, Krishnamurthy A (2013) Intermediary asset pricing. Am Econ Rev 103:732–770. https://doi.org/10.1257/aer.103.2.732

Heaton J, Lucas D (1992) The effects of incomplete insurance markets and trading costs in a consumption-based asset pricing model. J Econ Dyn Control 16:601–620. https://doi.org/10.1016/0165-1889(92)90051-F

Heaton J, Lucas D (1996) Evaluating the effects of incomplete markets on risk sharing and asset pricing. J Polit Econ 104:443–487. https://doi.org/10.1086/262030

Justiniano A, Primiceri G, Tambalotti A (2010) Investment shocks and business cycles. J Monet Econ 57:132–145. https://doi.org/10.1016/j.jmoneco.2009.12.008

Keen S (1995) Finance and economic breakdown: Modeling Minsky's Financial Instability Hypothesis. J Post Keynes Econ 17:607–635. https://doi.org/10.1080/01603477.1995.11490053

Keynes JM (1936) The General Theory of Employment, Interest, and Money. Palgrave Macmillan, Cambridge

Kim YK (2020) Household Debt Accumulation and the Great Recession of the United States: A Comparative Perspective. Rev Radic Polit Econ 52:26–49. https://doi.org/10.1177/0486613419868031

King M (1994) Debt deflation: Theory and evidence. Eur Econ Rev 38:419–55. https://doi.org/10.1016/0014-2921(94)90083-3

Koo R (2003) Balance Sheet Recession: Japan's Struggle with Uncharted Economies and its Global Implications. John Wiley & Sons, Singapore

Koo R (2009) The Holy Grail of Macroeconomics: Lessons from Japan's Great Recession. John Wiley & Sons, Singapore

Koo R (2015) The Escape from Balance Sheet Recession and the QE Trap. John Wiley & Sons, Singapore

Lavoie M (2022) Post-Keynesian Economics: New Foundations. Edward Elgar Publishing, Cheltenham

Lucas R (2003) Macroeconomic priorities. Am Econ Rev 93:1–14. https://doi.org/10.1257/000282803321455133

Marglin SA (1984) Growth, Distribution, and Prices. Harvard University Press, Cambridge

Medialdea García B, Sanabria Martín A (2022) Income inequality and household debt as a factor of financial fragility in the Spanish economy. Socio-Econ Rev 20(3):1425–1447. https://doi.org/10.1093/ser/mwab005

Meghir C (2004) A retrospective on Friedman's Theory of Permanent Income. Econ J 114(496):293–306. https://doi.org/10.1111/j.1468-0297.2004.00223.x

Mian A, Sufi A (2009) The consequences of mortgage credit expansion: Evidence from the U.S. mortgage default crisis. Q J Econ 124:1449–96. https://doi.org/10.1162/qjec.2009.124.4.1449

Mian A, Sufi A (2010a) The Great Recession: Lessons from microeconomic data. Am Econ Rev: Pap Proc 100:51–56. https://doi.org/10.1257/aer.100.2.51

Mian A, Sufi A (2010b) Household leverage and the recession of 2007–09. IMF Econ Rev 58:74–117. https://doi.org/10.1057/imfer.2010.2

Mian A, Sufi A (2011) House prices, home equity-based borrowing, and the US household leverage crisis. Am Econ Rev 101:2132–2156. https://doi.org/10.1257/aer.101.5.213

Mian A, Sufi A (2012a) The effects of fiscal stimulus: Evidence from the 2009 "cash for clunkers" program. Q J Econ 127:1107–42. https://doi.org/10.1093/qje/qjs024

Mian A, Sufi A (2013) Household balance sheets, consumption and the economic slump. Q J Econ 128:1687–1726. https://doi.org/10.1093/qje/qjt020

Mian A, Sufi A (2014) What explains the 2007–2009 drop in employment? Econometrica 82:2197–223. https://doi.org/10.3982/ECTA10451

Mian A, Sufi A (2015) House of Debt: How They (and You) Caused the Great Recession, and How We Can Prevent It from Happening Again. University of Chicago Press, Chicago and London

Mian A, Rao K, Sufi A (2013) Household balance sheets, consumption, and the economic slump. Q J Econ 128:1687–1724. https://doi.org/10.1093/qje/qjt020

Mian A, Sufi A. (2012b) What explains high unemployment? The aggregate demand channel, National Bureau of Economic Research No. w17830. https://doi.org/10.3386/w17830

Minsky HP (1986) Stabilizing an Unstable Economy. Yale University Press, New Haven

Minsky HP (1992). The Financial Instability Hypothesis. The Jerome Levy Economics Institute of Bard College Working Paper 74

Moore BJ (1988) Horizontalists and Verticalists: The Macroeconomics of Credit Money. Cambridge University Press, Cambridge

Nelson CR (1987) A reappraisal of recent tests of the Permanent Income Hypothesis. J Political Econ 95(3):641–646

Nelson RR, Consoli D (2010) An evolutionary theory of household consumption behavior. J Evol Econ 20:665–687. https://doi.org/10.1007/s00191-010-0171-7

Palley TI (2011) A theory of Minsky super-cycles and financial crises. Contrib Political Econ 30:31–46. https://doi.org/10.1093/cpe/bzr004

Palley TI (2013) Horizontalists, verticalists, and structuralists: the theory of endogenous money reassessed. Rev Keynes Econ 1(4):406–424. https://doi.org/10.4337/roke.2013.04.03

Rogers C (2018) The conceptual flaw in the microeconomic foundations of dynamic stochastic general equilibrium models. Rev Political Econ 30:72–83. https://doi.org/10.1080/09538259.2018.1442894

Rogers C (2018) The New Macroeconomics Has No Clothes. Rev Keynes Econ 6:22–33. https://doi.org/10.4337/roke.2018.01.02

Romer P (2016) The Trouble with Macroeconomics. https://paulromer.net/trouble-with-macroeconomics-update. Accessed July, 2022.

Samuelson PA (1947) Foundations of Economic Analysis. Harvard, Cambridge

Sinai T, Souleles NS (2005) Owner-occupied housing as a hedge against rent risk. Q J Econ 120:763–89. https://doi.org/10.1093/qje/120.2.763

Skidelsky R (2011) The relevance of Keynes. Camb J Econ 35(1):1–13. https://doi.org/10.1093/cje/beq043

Stockhammer E, Wildauer R (2016) Debt-driven growth? Wealth, distribution and demand in OECD Countries. Camb J Econ 40:1609–1634. https://doi.org/10.1093/cje/bev070

Telmer C (1993) Asset-pricing puzzles and incomplete markets. J Finance 48:1803–1832. https://doi.org/10.1111/j.1540-6261.1993.tb05129.x

van Treeck T (2014) Did inequality cause the U.S. financial crisis? J Econ Surv 28:421–448. https://doi.org/10.1111/joes.12028

Variato AM (2015) Can we say Minsky Moment when Households Matter? In: Fazzari SM, Greenberg E, Cristini A, Leoni R (eds) Cycles, Growth, and the Great Recession: Cycles, Growth and the Great Recession. Routledge, London

Wray RL (2008) Lessons from the subprime meltdown. Chall 51:40–68. https://doi.org/10.2753/0577-5132510205

Wray RL (2009) The rise and fall of money manager capitalism: A Minskian approach. Camb J Econ 33:807–28. https://doi.org/10.1093/cje/bep024

Wray RL (2011) Minsky's money manager capitalism and the global financial crisis. Int J Polit Econ 40:5–20. https://doi.org/10.2753/IJP0891-1916400201