

Article

Macroeconomic Determinants of Household Debt in OECD Countries

Bogdan Andrei Dumitrescu ^{1,*} , Adrian Enciu ¹ , Cătălina Adriana Hândoreanu ¹ , Carmen Obreja ¹ and Florin Blaga ²

¹ Department of Money and Banking and Center of Financial and Monetary Research CEFIMO, Bucharest University of Economic Studies, 010961 Bucharest, Romania; adrian.enciu@fin.ase.ro (A.E.); catalina.handoreanu@fin.ase.ro (C.A.H.); carmen.obreja@fin.ase.ro (C.O.)

² Faculty of Finance and Banking, Doctoral School of Finance, Bucharest University of Economic Studies, 010961 Bucharest, Romania; blaga.florin@yahoo.com

* Correspondence: bogdan.dumitrescu@fin.ase.ro; Tel.: +40-722268342

Abstract: This article investigates the macroeconomic determinants of household debt in developed economies using a sample comprising 26 OECD countries for the period of 2002q1–2020q4. By resorting to the unconditional quantile regression, we find relevant asymmetries in the response of household debt. According to our results, economic growth leads to lower household debt, but the beneficial effect decreases as the level of household debt increases. Inflation lowers household borrowing only if the level of debt is high. Higher house prices lead to higher household debt, with the impact becoming stronger as the level of debt is higher. Investments go hand in hand with household debt, and higher investments lead to higher levels of borrowing, even when household debt is already high. Mortgage credit interest rates are positively linked with household debt, starting with higher debt levels. A rising unemployment rate leads to lower household debt, but the link becomes weaker as the level of debt increases. Higher public expenditures are generally associated with lower household debt. In addition, we find that household debt exhibits very powerful autoregressive behavior, being difficult to reduce rapidly in the case of need.

Keywords: household debt; macroeconomic determinants; OECD countries; asymmetric response; unconditional quantile regression



Citation: Dumitrescu, B.A.; Enciu, A.; Hândoreanu, C.A.; Obreja, C.; Blaga, F. Macroeconomic Determinants of Household Debt in OECD Countries. *Sustainability* **2022**, *14*, 3977. <https://doi.org/10.3390/su14073977>

Academic Editor: Vasili Erokhin

Received: 10 February 2022

Accepted: 25 March 2022

Published: 28 March 2022

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



Copyright: © 2022 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

1. Introduction

In the past two decades, the ratio of household debt to GDP increased steadily in the vast majority of OECD countries. For example, considering a sample of 26 OECD countries, household debt increased during 2002q1–2020q4 with around 22 percentage points of GDP. Moreover, out of these 26 countries, only three (Germany, Ireland, and Japan) recorded during this period a decline in household debt expressed as a share in GDP. This evolution was supported by the financial sector development, easier access to credit, and low interest rates compared to historical standards, which were also favored by the predominance of expansionary monetary policies. There is a debate in the economic literature about the benefits and risks associated with higher household debt.

Rising household debt can be beneficial for welfare. The life cycle hypothesis described in [1] points to the desire of households to borrow to smooth out their consumption over their lifetimes and to purchase durable goods such as houses or cars. More to the point, households borrow during periods of reduced incomes, such as in recessions, and repay their debts in periods of higher incomes, such as in expansions. Both the smoothing of consumption during their entire lifetimes and the purchasing of durable goods through borrowing are conditioned by the ability of households to borrow, which depends, for instance, on the depth of the local financial market, credit standards, the creditworthiness of debtors, and the ability of creditors to rigorously assess the latter. In addition, the ability

of households to smooth consumption through credit will also depend on the willingness of creditors to provide credit during bad times, which can be challenging. Government regulations play a role in encouraging or discouraging lending. For example, [2] complemented the life cycle hypothesis with the permanent income hypothesis, which states that current consumption depends not only on current income but also on projected revenues over a lifetime. Therefore, it makes sense for households, in anticipation of higher future revenues, to borrow in the present in order to smoothen consumption over their lifetimes.

Rising household debt can also pose risks to future welfare. Rapidly increasing household debt could lead to solvency problems, and these vulnerabilities could turn into serious difficulties, especially during crisis periods. The issue is even more problematic when a lending boom is accompanying an asset price boom, such as in real estate. In the case of a bubble, its bursting has far more negative consequences if it is driven by a credit boom, as happened during the subprime crisis started in the US in 2007. Furthermore, at higher levels of debt, creditors may be reluctant to provide debtors with funds during bad times, which would exacerbate economic fluctuations and would diminish the welfare of households, as they are no longer able to smooth out their consumption due to borrowing restrictions. These problems also have the potential to be long-lasting, as debt is difficult to reduce once it reaches a high level relative to incomes.

Against this background, economic policy makers should monitor household debt and promote policies designed to support a good balance between its benefits and risks. For this purpose, the identification of the factors influencing household debt is of great importance to designing adequate policies. Moreover, the response of household debt to its determinants could be asymmetric, depending on the level of household debt; for instance, GDP growth could have a different effect if household debt is high compared to the case in which it is at a low level.

The main objective of this paper is to identify the macroeconomic factors that influence household debt in OECD countries that could guide policymakers in formulating adequate policies on the matter. The second objective of this paper is to investigate possible heterogeneities in the response of household debt to its macroeconomic determinants by resorting to unconditional quantile regression.

The contribution of this paper to the literature in the field is threefold: first, it identifies the macroeconomic determinants of household debt; second, by focusing on OECD countries rather than on a single country like most of the previous studies, it can offer conclusions applicable for developed economies; and third, it identifies relevant heterogeneities in the response of household debt, depending on its level. To our knowledge, no investigation of such heterogeneities was previously performed. Additionally, the study points to the possible relevant policy implications of the results obtained in the econometric analysis.

The remainder of the paper is organized as follows. Section 2 provides a brief description of the related literature; Section 3 describes the econometric approach and the variables used; Section 4 presents the results; and Section 5 provides a discussion of the obtained results, including implications for policymakers, while the last section concludes.

2. Literature Review

The papers investigating the driving factors for household debt are mainly focused on single-country analysis, with some using micro-level data, while the others are based on macroeconomic data.

For example, ref. [3] used an overlapping generation framework to find the main causes of the increase in household debt in the US and concluded that the motivation to smooth out consumption and the need to finance the acquisition of a house are the main driving forces. They find that household debt is affected also by shocks in: the real interest rate, an unexpected rise in the real cost of borrowing decreases debt; real income, an unexpected rise in income increases debt; and demography, a larger proportion of the young population increases debt.

Moreover, ref. [4] analyzed the household debt of the Chilean economy using a survey. The EFH survey of household income and debt was carried out for the first time in Chile in 2007. The authors performed separate studies for mortgages and consumer defaults and found that income and income-related variables are the only significant variables for both categories of debt. According to their study, demographic variables influence only one debt category.

A survey, the respective British Household Panel Survey, is also used by [5] to analyze and understand the evolution of debts in the household sector in the United Kingdom. The reason behind their study is the rapid growth of debt level (from 105% of household income to 140% in only ten years). The authors modify the basic model of the life cycle so that it can account for the observed cross-sectional balance sheet position of British households. According to the empirical model, the actual level of debt is sustainable even if a shock on the real interest rate level appears.

Moving forward, ref. [6] investigate the cause that leads to the increase in the debt-to-income ratio of households in Norway and conclude that it is attributable to the increase in house prices and also to low interest rates. Interestingly, they note that a rise—even followed by a partial correction—in the price of houses has a lasting increase in the rise of debt, due to the higher average price of house sales and also the wealth effects and easier access to credit due to an increased value of the collateral. Furthermore, investigating the factors behind the increase in household debt in Norway, [7] shows that the main drivers are the housing capital (represented by prices multiplied by the existing stock of housing), the real interest rate, and the turnover of housing.

Along the same line of argument, ref. [8] investigated the issues of high household debt in South Africa by looking at the micro level. They conclude that the high cost of servicing previous debt, the saving rate among South Africans, and a general lack of financial education are the main drivers. They point out that the high level of household debt in South Africa is a deterrent for starting small businesses, restricting entrepreneurial activity with negative consequences on the overall performance of the economy. Their method of investigation is based on questionnaires related to the personal financial situation.

In addition, ref. [9] point out that the increase in the debt-to-income ratio in Australia is largely attributable to financial regulation which led to lower credit restrictions and good inflation performance, which translated into low and stable interest rates, promoting lending. The authors state that the increase in household debt is not likely to be attributable to speculative behavior on mortgage markets as they do not find evidence of over-building of houses in Australia, while sustainable lending was promoted through the sound balance sheets of banks, who largely transferred to debtors the decrease in interest rates.

In another interesting study, ref. [10] investigated the influence factors of the household debt-to-income ratio in Australia by resorting to macroeconomic data and using long-term cointegration analysis and also an error correction model for the short term. They revealed that in the long run changes in the debt ratio are positively related to housing prices and negatively related to interest rates. They conclude that successful monetary policy, translated into low and stable interest rates, contributes to the increase in household debt. In the short run, the household debt-to-income ratio is influenced positively by house prices and economic conditions as described by a sentiment indicator and negatively by inflation. In addition, their results show a high inertia for household debt, with the authors concluding that it takes a long time for households to modify their debt level according to the state of the economy.

Similarly to refs. [10,11] explored the issue of household debt in Australia using a CVAR model. The econometric approach uses seven variables to investigate why Australian households exhibit high debt levels. They used GDP, the number of new dwelling approvals, the house price index, interest rate, unemployment, the consumer price index, and population growth and found significant evidence linking all the covariates to the Australians' debt. More precisely, they found a negative link between household debt and the level of interest rates through the cost of borrowing/servicing existing debt; the

unemployment rate through the impact on household income and confidence; and inflation through its impact on the credit supply that shrinks due to the erosion of the principal. Regarding inflation, the authors also mention a demand effect which acts in the opposite direction, namely the increased demand from debtors for borrowing as a result of devaluing debt in real terms. However, the authors conclude that in the case of Australia, the supply-side effect dominates. Moreover, the authors find a positive link between household debt and GDP growth through its impact on consumer confidence and through enlarging the size of the economy, diminishing the share of households which are credit constrained; the house price index because of the wealth effect and the possibility to obtain higher loans based on the higher value of the collateral; and new dwellings through a quantitative effect, in the sense that these new dwellings will generate additional loans for their purchase.

Furthermore, ref. [12], using a vector error correction model, investigated the determinants of household debt in South Africa by testing seven macroeconomic variables: house prices, inflation measured by the consumer price index, household income, GDP, interest rates, household consumption expenditures, and household savings. The authors find a positive link between household debt and inflation, GDP explained through the confidence channel, and consumption expenditures explained by the smoothing behavior of households. Although the authors found that the link between household debt and house prices and interest rates is not statistically significant, despite the fact that in the econometric estimates the sign was as anticipated, they state that there are reasons to believe that these factors are important. Moreover, the authors find a negative link between household income and debt, pointing to the beneficial effect of increased employment on the level of household debt. In addition, the authors emphasize that a reduction in income inequality could boost the beneficial effect of rising incomes on the level of household debt.

Another interesting study, by [13], investigated the macroeconomic determinants of the debt-to-income ratio by using a sample composed of 31 OECD countries for the years 1996–2015, applying a panel data regression. He finds that household debt is positively affected by average wages, the proportion of young people, and the proportion of highly educated individuals (those with a tertiary education). In the opposite direction act the interest rate, economic growth, and income inequality. The author notes that the results related to the link between household debt and the variables of GDP growth and income inequality could have been affected by the consequences of the economic and financial crisis of 2007–2008.

Another study investigating the causes of rising household debt in OECD countries is [14], which used a panel of 13 countries over the period of 1993–2011 by appealing to vector error correction models. Their main results show that the most important factor that drives household debt is represented by house prices in real terms and that debt accumulates primarily during the boom phase of house prices.

In the same respect, [15] tested both demand- and supply-side factors as determinants for household debt in 33 OECD countries during 1995–2016 and concluded that the latter are more persistent, while the effect of the first appear to be unstable in time. More precisely, they find that there is a positive link between household debt and wealth and house prices. Moreover, the quality of bankruptcy laws strongly influences the level of household debt, with creditors more willing to supply loans if they are better protected. In addition, the Anglo-Saxon legal systems and social-democratic and welfare models are more favorable to the accumulation of household debt compared to the French and German legal systems or conservative welfare states.

Another recent study investigating the determinants of household debt in 11 OECD countries over the period of 1995–2007 is [16], which finds that the most important factors triggering a higher level of debt are house prices and low interest rates, while the explanatory power of financial deregulation is low. Moreover, this study rejects the expenditures cascade hypothesis that, respectively, an increase in income inequality could promote higher household debt through the effect of copying the spending behavior of richer households by poorer ones.

In relation to the macroeconomic determinants of household debt, there are numerous indicators considered, although some are more present than others. Studies were carried out mainly in developed economies, and the directions of the links between household debt and its macroeconomic determinants differ at times from study to study. However, in many cases, the authors point out that the link between household debt and its determinants can go in both directions due to multiple channels of influence. In this context, more studies on the matter could shed light on the direction of these links. Furthermore, to our knowledge, none of the previous studies have investigated the possible asymmetries in the response of household debt to its determinants, depending on the level of the dependent variable.

Another strand of literature studied the links between household debt and entrepreneurship. For example, [17] have shown that business ownership constitutes a crucial determinant of household debt in general and investments in risky assets in particular. Moreover, [18] pointed out that informal business owners have difficulties in documenting their income credibly when applying for a business loan. This fact makes their income flows extremely volatile from the point of view of the credit provider ([19]).

Another direction of research investigated the link between debt and income. For example, [20] revealed that household liabilities have a procyclical pattern, suggesting positive and significant coefficients of debt to income. Furthermore, [21] provide strong empirical evidence suggesting that a shock to credit supply leads to a boom–bust cycle in the real economy through credit-driven household demand. They show that the level of household debt in the US affected the severity of the economic decline of 2007–2008, with more indebted regions suffering larger losses. They concluded that household debt can play a role in the amplitude of economic fluctuations. Therefore, monitoring household debt and applying adequate measures can play a role in the stabilization of the economy.

3. Materials and Methods

3.1. Econometric Approach

The main goal of the paper is to identify the factors that influence the level of household debt. Our model is specified as follows:

$$HD_{i,t} = \alpha_i + \beta_1 HD_{i,t-1} + \beta_2 CV_{i,t} + \beta_3 CD_{i,t} + \varepsilon_{i,t}. \quad (1)$$

In Equation (1), $i = \overline{1, N}$ and $t = \overline{1, T}$ are countries and years, $HD_{i,t}$ is the Household Debt for country I in year t , $HD_{i,t-1}$ is the Household Debt for country i in year $t - 1$, and $CV_{i,t}$ is a matrix of control macroeconomic variables, while $CD_{i,t}$ is a matrix of dummy variables that describe financial crises or the pandemic period. Finally, $\varepsilon_{i,t}$ represents the error term.

To solve the potential endogeneity issues when estimating Equation (1), the academic papers use a panel GMM approach. However, in some situations, such regression techniques can lead to erroneous conclusions, especially when the distribution of the dependent variable is asymmetric. To overcome this problem, we can use the quantile regression proposed by [22], which has the capacity to draw inferences on the data that rank above or below the Household Debt's conditional mean of household debt. As it does not have any specific hypothesis about the distribution of $\varepsilon_{i,t}$, the sensitivity to outliers is not a big problem compared to the mean regression approach; so, it can provide more accurate and robust regression results.

For any level τ , across Household Debt's conditional distribution, denoted y , given the set of explanatory variables, denoted x , the conditional quantile $Q_y(\tau|x)$ shows $\inf\{k : C(k|x) \geq \tau\}$, where $C(*|x)$ represents the conditional distribution function. To assess the impact of a certain factor or event at a certain level throughout the household debt distribution, the most common approach is conditional quantile regression (CQR) for panel data developed by [19]:

$$Q_{y_{i,t}}(\tau|x_{i,t}) = \alpha_i + x_{i,t}^T \beta^{CQR}(\tau). \quad (2)$$

In Equation (2), $y_{i,t}$ is the Household Debt, $x_{i,t}$ denotes the matrix of explanatory factors, and $\beta^{CQR}(\tau)$ is the common slope, while α_i is a location-shift coefficient. To control for unobserved country heterogeneity, ref. [23] treats the fixed effects of the panel as nuisance factors. The importance of this method lies in the inclusion of a penalty term in the minimization problem, which leads to:

$$\min_{(\alpha, \beta)} \sum_{k=1}^K \sum_{t=1}^T \sum_{i=1}^N w_k \rho_{\tau_k} \left(y_{i,t} - \alpha_i - x_{i,t}^T \beta(\tau_k) \right) + \lambda \sum_i |\alpha_i|. \quad (3)$$

In Equation (3), K is the quantiles' index, ρ_{τ_k} is the quantile loss-function, and w_k is the relative weight associated with the k th quantile. The penalty term λ is included to diminish the individual fixed effects to zero. Furthermore, when λ approaches zero, the model converges to a standard fixed effects specification.

However, in conditional quantile regression, the dependent variable distribution is specified given a certain set of factors, and the results are sensitive when excluding or adding another covariate. To overcome this issue, ref. [24] developed unconditional quantile regression (UQR) based on the influence function (IF) and the recentered influence function (RIF). More specifically, the IF is an analytical algorithm quantifying the influence of a particular factor on a distributional statistic and has the following form:

$$IF(y_{i,t}; v(F_{y_{i,t}})) = \lim_{\varepsilon \rightarrow 0} \left(\frac{v[(1-\varepsilon)F_{y_{i,t}} + \varepsilon G_{y_{i,t}}] - v(F_{y_{i,t}})}{\varepsilon} \right). \quad (4)$$

In Equation (4), $0 \leq \varepsilon \leq 1$, $F_{y_{i,t}}$ represents the cdf. of $y_{i,t}$ and $G_{y_{i,t}}$ denotes the distribution that puts mass at the value $y_{i,t}$, while $v(F_{y_{i,t}})$ is the value of the considered statistic. The RIF is an estimator v with a probability distribution F at point $y_{i,t}$ and is computed by adding this statistic to its IF:

$$RIF(y_{i,t}; v(F_{y_{i,t}})) = v(F_{y_{i,t}}) + IF(y_{i,t}; v(F_{y_{i,t}})). \quad (5)$$

In Equation (5), the expected value of the RIF is $v(F_y)$, if the expected value of the $IF(y_{i,t}; v(F_{y_{i,t}}))$ is zero. If we select the τ th quantile as the statistic of interest and estimate the density functions based on Kernel density techniques, the RIF, given q_τ , is specified as follows:

$$RIF(y_{i,t}; q_\tau; F_{y_{i,t}}) = q_\tau + IF(y_{i,t}; q_\tau; F_{y_{i,t}}) = q_\tau + \frac{\tau - \mathbb{I}\{y_{i,t} \leq q_\tau\}}{f_{y_{i,t}}(q_\tau)}. \quad (6)$$

In Equation (6), q_τ is the τ th quantile of the unconditional distribution of Household Debt and $f_{y_{i,t}}(q_\tau)$ express the probability density function of $y_{i,t}$ conditioned by the τ th quantile based, while $\mathbb{I}\{y_{i,t} \leq q_\tau\}$ is an indicator function showing whether $y_{i,t}$ is below the τ th quantile. Thus, the UQR estimator is given by Equation (7):

$$RIF(y_{i,t}; q_\tau; F_{y_{i,t}}) = x_{i,t}^T \beta^{UQR}(\tau). \quad (7)$$

3.2. Data Description

In this study, we consider a balanced panel with quarterly data from 2002 to 2020, using a sample of 26 OECD countries, namely Australia, Austria, Belgium, Colombia, Czechia, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Luxembourg, the Netherlands, New Zealand, Norway, Poland, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom, and the USA. A detailed description of the variables that we use in this study is presented in Table 1.

Table 1. Description of the variables.

Variable	Description	Source
Household debt to GDP (HD)	Total outstanding debt of households to banks and other financial institutions as a percentage of GDP.	World Bank Database
Lagged household debt to GDP (LHD)	Total outstanding debt of households to banks and other financial institutions as a percentage of GDP.	World Bank Database
Economic Growth (EG)	The percentage change in the gross domestic product from the previous quarter using constant prices. Data are seasonally adjusted.	World Bank Database
Inflation (INFL)	Percent change in the CPI from the same month in the previous year.	World Bank Database
Investment to GDP (INV)	Gross fixed capital formation, including land improvements; plant, machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings as percent of GDP.	The Global Economy
Government expenditures (GE)	Total spending by all levels of government but excluding public enterprises.	The Global Economy
House price index (HPI)	A house price index (HPI) measures the price changes of residential housing as a percentage change from some specific start date (which has an HPI of 100). We use quarterly changes in the empirical approach.	The Global Economy
The mortgage credit interest rate (MCRI)	The average interest rate on mortgage loan products offered to individuals and households by the commercial banks in the country. The mortgage credit is a loan used to finance the purchase of real estate.	The Global Economy
The unemployment rate (UNPM)	It represents the share of the labor force that is without work, but available for and seeking employment.	The Global Economy
Global economic crises (CD)	A dummy variable equal to one in 2008q4, 2009, and 2010.	Own calculation
COVID-19 pandemic (PD)	A dummy variable equal to one in 2020q2 to 2020q4.	Own calculation

In selecting the list of explanatory variables, we resorted to economic intuition and previous studies investigating the macroeconomic determinants of household debt. Moreover, we also considered minimum wage as a proxy for economic development. However, we removed this factor from the baseline specification after imposing a 50% threshold on absolute values for the correlation coefficient. Additional details regarding the correlation structure of the explanatory variables can be visualized in Table 2.

The correlation matrix suggests that the covariates do not exhibit a high degree of dependencies among them, leading to the conclusion that multicollinearity is not an issue in our analysis (this is also confirmed by Variance Influence Factor Analysis—all the coefficients range between 1 and 5, as suggested by [25]). Second, the univariate analysis indicates that, considered separately, all the explanatory variables included in the baseline specification have a statistically significant impact on the level of household debt. In this way, we also overcome the potential endogeneity caused by the model's misspecification. The results are reported in Appendix A.

Table 2. Correlation matrix.

	LHD	EG	INV	INFL	GE	HPI	MCIR	UNE	PD	CD
LHD	100.0%									
EG	−13.5%	100.0%								
INV	−7.8%	14.2%	100.0%							
INFL	−16.2%	13.4%	11.8%	100.0%						
GE	−11.2%	−0.4%	3.9%	3.2%	100.0%					
HPI	−7.3%	24.0%	7.3%	3.9%	0.7%	100.0%				
MCIR	−12.5%	19.0%	9.6%	36.9%	3.0%	5.6%	100.0%			
UNE	−24.6%	−6.0%	−17.3%	3.9%	−7.9%	−7.9%	4.1%	100.0%		
PD	1.5%	−22.6%	1.9%	−11.5%	4.0%	6.5%	−15.5%	−1.7%	100.0%	
CD	3.8%	−15.1%	−6.0%	−3.7%	−0.3%	−11.0%	3.0%	10.3%	−7.1%	100.0%

Furthermore, there is the caveat of potential endogeneities. The endogeneity might arise for three reasons: omitted variables, reverse causality, and measurement errors. Considering our econometric analysis, the reverse causality might be the most problematic (we choose a large set of covariates to overcome the misspecification problems, while the measurement errors are hard to quantify). More specific, we have the following situations that might be problematic from an endogeneity perspective: (i) normally, higher-level investments lead to higher indebtedness, but if the latter is large enough it could threaten financial stability and implicitly increase the sovereign risk, which would especially reduce foreign investment; (ii) easier access to credit, leading to greater household indebtedness, could fuel a speculative increase in house prices and the reverse causality; and (iii) the increased demand for mortgage lending could create a crowding-out effect, leading to higher interest rates.

Some very influential papers, such as [26], argued that it is impossible to analyze certain interactions between different types of nonstationary variables in a panel data approach. For this reason, we have computed for each variable three panel unit root tests, developed by the [27]-LLC test, (see Table 3 for the results).

Table 3. Panel unit root test—Levin et al. (2002).

Variable	No Trend		Trend	
	Statistic	Probability	Statistic	Probability
HD	−3.78525	0.0001	−5.28184	0.0000
LHD	−3.67053	0.0001	−6.00103	0.0000
EG	−11.3451	0.0000	−1.22232	0.1101
INFL	−2.09905	0.0179	−1.36476	0.0862
INV	−1.32115	0.0932	0.07958	0.5317
GE	−4.4454	0.0000	−1.12992	0.1532
HPI	−3.96557	0.0000	−4.40449	0.0000
MCIR	−6.46224	0.0000	−1.54186	0.0616
UNE	−1.42808	0.0766	−1.43918	0.0751

As we can see in Table 2, with some minor exceptions, all the covariates included in the baseline model have stationary behavior at the 10% level (the dummy variables were not included in the stationary analysis).

4. Results

Table 4 provides the estimated coefficients for a representative selection of quantiles. According to the results presented in the following, several interesting facts come to light. As expected, lagged household debt (LHD) exhibits a persistent impact on the current level of household debt. All the coefficients are statistically significant at the 1% level, indicating a very powerful autoregressive behavior for the household debt. Moreover, the impact

increases monotonically from the lower to the upper quantile, indicating that the higher the level of household debt in the previous year, the higher the current household debt.

Table 4. UQR results.

Variables	Arrelano–Bond Estimator	Q10	Q25	Q50	Q75	Q90
Intecept	0.5985 *** (0.0000)	0.6311 *** (0.0056)	0.0317 (0.8440)	−0.5331 *** (0.0096)	−0.8377 *** (0.0001)	−1.3431 *** (0.0000)
LHD	0.9937 *** (0.0000)	0.9894 *** (0.0000)	0.9944 *** (0.0000)	0.9986 *** (0.0000)	1.0027 *** (0.0000)	1.0032 *** (0.0000)
EG	−0.1180 *** (0.0000)	−0.1373 *** (0.0000)	−0.1095 *** (0.0000)	−0.0954 *** (0.0000)	−0.0907 *** (0.0000)	−0.0725 *** (0.0000)
INFL	−0.0069 (0.3670)	0.0175 (0.3249)	0.0024 (0.9816)	0.0025 (0.7669)	−0.0046 (0.4312)	−0.0199** (0.0401)
INV	0.0248 *** (0.0000)	0.0027 (0.6994)	0.0221 *** (0.0074)	0.0411 *** (0.0000)	0.0497 *** (0.0000)	0.0778 *** (0.0000)
GE	0.0000 (0.1000)	0.0001 (0.5641)	−0.0004 * (0.0628)	−0.0005 *** (0.0074)	−0.0002 (0.1949)	−0.0009 *** (0.0009)
HPI	0.0638 *** (0.0000)	0.0293 * (0.0531)	0.0501 *** (0.0030)	0.0695 *** (0.0000)	0.0975 *** (0.0000)	0.0717 *** (0.0000)
MCIR	0.1308 *** (0.0000)	−0.0182 (0.2298)	0.0184* (0.0926)	0.0599 *** (0.0000)	0.1108 *** (0.0000)	0.1827 *** (0.0000)
UNE	−0.1163 *** (0.0000)	−0.0530 *** (0.0000)	−0.0391 *** (0.0000)	−0.0205 *** (0.0010)	−0.0140 ** (0.0228)	−0.0060 (0.4066)
CD	0.1648 *** (0.0000)	−0.0060 (0.9408)	0.0362 (0.5786)	0.0169 (0.7876)	0.1299 (0.2233)	0.3983 *** (0.0023)
PD	0.3272 *** (0.0000)	−0.2724 * (0.9408)	0.2607 * (0.0699)	0.4024 *** (0.0001)	0.4332 *** (0.0002)	0.7849 ** (0.0012)
Pseudo R-squared		0.9720	0.9749	0.9754	0.9753	0.9725
Observations	1937	1937	1937	1937	1937	1937

The symbols *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

For the UQR coefficients, we use a Gaussian kernel, while the robust standard errors, were bootstrapped with 200 replications. The symbols *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. The P-values are in parentheses. The Arrelano–Bond one step estimator is computed with one lag for the dependent variable. With respect to economic growth (EG), the impact coefficients are negative, regardless of the selected quantile. This empirical fact suggests that during episodes of economic boom, the level of household debt decreases. The impact is more pronounced across inferior quantiles, compared to the superior ones, i.e., when the level of household debt is already low. Similarly to lagged household debt, we observe a monotonically increasing impact trajectory.

Regarding inflation, we notice that the coefficients are statistically significant only for the superior quantile. This indicates that rising prices do not affect households' propensity for loans, except for the case in which household debt is very high, for which a negative relationship can be identified (see the coefficient for the 90th quantile).

The impact exhibited by investments on household debt is statistically significant from the 25th to the 90th quantiles. Additionally, we notice a monotonically increasing elasticity from the lower to the higher quantile, which is a very interesting result. Indeed, an important part of the investment consists of the purchase of houses, which is most often financed by debt. Given this transmission channel, we can conclude that the results obtained are economically intuitive.

Moving forward, when the dependent variable is at a low level (10th quantile), there is no significant relationship between government expenditure and household debt. Starting with the 25th quantile, the relationship becomes negative and is more and more visible across superior quantities. As a possible explanation, we can state that when the household debt is high, the crowding-out effect exists, i.e., the government wants to finance itself for raising the public spending and to be in competition for funds with the households. Consequently, interest rates will rise, thus discouraging the appetite for debt. Another equally plausible explanation is based on the existence of a Ricadian behavior characterizing households, i.e., higher taxes in the future are anticipated by households, which react by saving their incomes now rather than investing them alongside other financing sources such as loans.

With regard to housing prices, we notice that their impact increases monotonically from the 10th to the 75th quantile throughout the household debt's distribution. Across 90th quantile, the impact diminishes but is still high compared with the lower or middle quantiles.

The interest rate has a positive impact on debt, except for the 10th quantile. However, the impact increases considerably from the 25th to the 90th quantile, indicating that the higher the interest rate the higher the indebtedness becomes.

The coefficients associated with the unemployment rate suggest that when household debt is extremely high, it is not sensitive to movements in the labor market. For the rest of the distribution, there is a negative and monotonically increasing relationship between unemployment and household debt.

Finally, we find statistically significant results relating the global financial crises to household debt evolution only at the 90th quantile (when the debt is relatively high). However, the COVID-19 pandemic exhibits a persistent and monotonically increasing impact on household debt from the 10th to the 90th quantile. Indeed, in the last two years, the pandemic led to a sharp decline in income for many economic agents, which obviously led to a decline in GDP and an increase in debt.

To assess the robustness of the results, we additionally estimate a linear model which accounts for some of the potential endogeneity between household debt and its determinants. More specifically, we estimate a GMM model using the Arellano–Bond estimator by accounting for a series of instruments but also for the first lag of the dependent variable, considering the persistence characterizing the evolution of household debt. With only two exceptions, namely government expenditures and the crises dummy, all the other coefficients are estimated for the 50th quantile, which is the benchmark of comparison, and have similar values to and statistical significance with the GMM estimates. This suggests that using the unconditional quantile regression does not bias the impact coefficients, and furthermore, we can rely on the story it narrates on household debt determinants, given a distributional approach.

In addition, we acknowledge that in order to have a high-quality analysis on the determinants of household debt, it is crucial to provide some results as robustly as possible, regardless of the specifications or econometric framework. In this particular situation, we used the ordinary correlation matrix to have a first picture of the interaction between the covariates. However, in a panel data framework, the correlation matrix might overlook some potential issues arising from cross-sectional heterogeneity, such as fixed or random effects. Moreover, the aforementioned correlation coefficients are extremely low, and this fact might lead to a different sensitivity in the baseline specification. All in all, both methods (GMM and UQR) account for a fixed effect compared to the standard correlation matrix, which does not, and this is the main cause of some inconsistency in signs.

The values of Pseudo R-squared reveal that the dynamic of the independent variables explains to a considerable extent the evolution of the household debt.

5. Discussion

This research has investigated household debt determinants for 26 OECD countries, referring to macroeconomic determinants and possible heterogeneities, depending on the

level of household debt. Such an endeavor is relevant given that the level of household debt influences the financial stability of a country and its resilience to a financial crisis. The literature shows a more pronounced negative economic effect during a crisis, following a more rapid accumulation of debt in the period preceding the crisis. On the other hand, especially for developing countries, accumulating debt could allow households to smooth their lifetime consumption and enjoy increased welfare. Therefore, there is a fine balance between the benefits and risks associated with debt accumulation. Our results could be useful to policy makers in developing policies designed to find such a balance.

First, our results show a very persistent impact of household debt. Otherwise said, debt is difficult to reduce in a short period of time, and indebted households are able to correct this status, if needed, only slowly. This should motivate policymakers to be proactive and prudent when designing policies that influence household debt. Policymakers should closely monitor household debt and intervene early if there are signs of rapid deterioration or if the debt reaches levels that are considered dangerous.

Second, economic growth promotes the reduction in household debt. This is consistent with the life cycle hypothesis and the permanent income hypothesis. Thus, during periods of economic contraction, households increase debt to cope with the negative shock, thus smoothing consumption, while during economic expansions debt is reduced in real terms. In this context, economic policies designed to stabilize the economy should also stabilize household debt. This result emphasizes the merits of countercyclical monetary and fiscal policies and the importance of prudence in good times. Alternatively, procyclical economic policies could also induce more volatility in the level of household debt, which could negatively interfere with future economic growth. Another interesting result is that economic growth influences household debt differently depending on the level of the latter. Household debt decreases faster with economic growth if the level of debt is already low. Alternatively, debt is reduced more slowly by economic growth if the level of debt is at a higher level. This result highlights the greater relative importance of stabilizing monetary and fiscal policies at higher levels of household debt. Moreover, it should be emphasized that the data sample comprises 26 OECD countries which are developed economies that arguably provide household better access to credit. This link could be different in countries with less-developed financial systems, which could prevent household borrowing for the purpose of smoothing consumption.

Third, inflation is relevant for household debt only when the level of household debt is high. The negative sign points out that an increase in inflation leads to lower household debt. This could be explained by the supply effect: lenders diminish their lending offer given the erosion of the principal. There is also a demand effect going in the opposite direction: inflation reduces debt in real terms, thus increasing the willingness of the household for additional borrowings. However, for the quantile for which there is statistical significance, household debt is already high, which could depress the demand effect. A negative sign thus suggests the dominance of the supply effect.

Fourth, the change in house prices is positively linked with household debt, with the impact becoming stronger as the level of debt is higher. This means that an increase in the price of houses leads to higher household debt. This result reflects the fact that households respond to the higher acquisition price of dwellings by increasing the financing from external sources. This could be explained by wealth effects and easier access to credit, due to an increased value of the collateral. Moreover, the impact is more pronounced when the level of debt is already high.

Fifth, higher investments go hand in hand with higher debt. This result is not surprising given that during the analyzed period, important residential investments were financed through debt. Additionally, a faster rise in the price of real estate compared to incomes and easier access to credit make this result economically intuitive.

To an extent, the results related to the impact of house prices and investments on household debt should not pose too much concern for policymakers, as increased residential investments and access to dwellings promote welfare. However, policymakers should be

concerned to have a sustainable level of the prices of real estate assets, as a high increase for them, for example, could generate a steep increase in household debt that could pose problems in terms of financial stability. Therefore, the promotion of adequate regulations and supervision of the housing market is an important element in the macroeconomic management of household debt. Another interesting result is that the impact of investments on debt is higher when the level of the latter is higher. This could be explained by the fact that household debt is usually higher in countries with more developed financial systems where the credit supply is also higher. Thus, financing investments seems to be possible even in the presence of a high level of household debt.

Sixth, the mortgage credit interest rate does not influence the level of household debt for the lower quantiles, while, starting with the 50th quantile, the link becomes statistically significant and positive. This result could be explained by considering that during the analyzed period interest rates were at low levels compared to historical standards, while the price of houses rose relatively fast, which could have stimulated debtors to borrow more, even if the price of credit was higher. This could be another argument for policymakers on the need of proper supervision of the housing market.

Seventh, there is a negative link between unemployment and household debt, with the link becoming weaker as the level of debt is higher. The negative relationship is intuitive and can be explained through the detrimental impact of rising unemployment on household income and confidence. The weaker effect for higher levels of debt could be linked to the difficulties in reducing large amounts of debt. This result could provide another reason for policymakers involved in macroeconomic management, emphasizing the additional risks associated with higher levels of household debt.

Eighth, government spending increases household debt only for low levels of the latter. This could be explained, for example, by the fact that governments can boost consumer confidence through public expenditure. However, the sign rapidly turns as household debt is higher, with a negative response to rising public expenditures, possibly due to a crowding-out effect or a Ricardian behavior of households. From a policy point of view, this result should make fiscal policymakers more cautious when deciding to change the level of budgetary expenditures. Thus, an increase in government spending eventually financed through debt can impede the ability of households to smooth out consumption by borrowing. Households, confronted either with increases in interest rates due to a crowding-out effect related to the rise in the financing needs of the government or confronted with the potential future increase in taxes, decide to decrease their debt. Thus, higher government spending could also have a negative effect on welfare through this channel, which emphasizes once more the merits of fiscal prudence.

The limitations of the current research include possible other variables explaining the behavior of household debt, and that the findings could be applicable more to developed economies or at least for those with relatively good access and credit and financial development. Possible future directions for additional research on this topic include expanding the list of candidate variables that influence household debt and applying the model to economies with less-developed financial systems.

6. Conclusions

This paper investigated the macroeconomic determinants of household debt in 26 OECD countries and the possible heterogeneities in the response, depending on the level of household debt. For this purpose, we used the unconditional quantile regression. We found that household debt exhibits very powerful autoregressive behavior, being difficult to reduce rapidly in the case of need. Furthermore, we found significant heterogeneities in the response of household debt to macroeconomic determinants. Economic growth contributes to the reduction in household debt, but the beneficial effect becomes lower as the level of household debt is higher. Higher house prices lead to higher household debt, with the impact becoming stronger as the level of debt is higher. Inflation lowers household borrowing only if the level of debt is high. Investments go hand in hand with household

debt, and higher investments lead to higher levels of borrowing, even when household debt is already high. Mortgage credit interest rates are positively linked with household debt, starting with the 50th quantile. A rising unemployment rate leads to lower household debt, but the link becomes weaker as the level of debt increases. Higher public expenditures are generally associated with lower household debt. The results could be very useful for policymakers who take into account the level of household debt in relation to financial stability. The main implications stemming from the present research in this respect refer to being vigilant and intervening early before household debt reaches high levels, promoting sound and countercyclical economic policies, and providing adequate supervision of the housing market. Good macroeconomic management has multiple implications for the level of household debt and, more importantly, on its sustainability, on the ability of households to smoothen consumption over their lifetimes, and on the overall performance of the economy.

Author Contributions: B.A.D., A.E., C.A.H., C.O. and F.B.; conceptualization, B.A.D., A.E. and C.O.; methodology, B.A.D. and F.B.; software, B.A.D. and F.B.; validation, B.A.D. and F.B.; formal analysis, A.E. and C.O.; investigation, B.A.D. and C.A.H.; data curation, C.A.H. and A.E.; writing—original draft preparation, B.A.D., A.E., C.A.H. and C.O.; writing—review and editing, B.A.D., A.E., C.A.H., C.O. and F.B.; supervision, B.A.D.; project administration, B.A.D. and C.A.H. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Data Availability Statement: The data presented in this study are available on request from the corresponding author. The data are not publicly available due to privacy.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. Individual impact coefficients of covariates.

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Intecept	2.36 ***	1.38 ***	0.24 *	1.48 ***	1.34 ***	0.77 ***	1.60 ***	1.55 ***	1.51 ***
LHD	0.97 ***	0.98 ***	0.98 ***	0.98 ***	0.98 ***	0.98 ***	0.99 ***	0.97 ***	0.98 **
EG	−0.11 ***								
INFL		0.02 ***							
INV			0.04 ***						
GE				0.01 ***					
HPI					0.02 ***				
MCIR						0.09 ***			
UNE							−0.1 ***		
CD								0.27 ***	1.11 ***
PD									

The symbols *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

References

1. Modigliani, F.; Brumberg, R. Utility Analysis and the Consumption Function: An Interpretation of Cross-section Data. In *Post Keynesian Economics*; Rutgers University Press: New Brunswick, NY, USA, 1954; pp. 388–436.
2. Friedman, M. *A Theory of the Consumption Function*; Princeton University Press: Princeton, NJ, USA, 1957.
3. Barnes, S.; Young, G. *The Rise in Us Household Debt: Assessing Its Causes and Sustainability*; Bank of England Working Papers No. 206; Bank of England: London, UK, 2003.
4. Alfaro, R.; Gallardo, N. The determinants of household debt default. *Econ. Anal. Rev.* **2012**, *27*, 55–70. [[CrossRef](#)]
5. Tudela, M.; Young, G. *The Determinants of Household Debt and Balance Sheets in the United Kingdom*; Bank of England Working Paper Series No. 266; Bank of England: London, UK, 2005.
6. Jacobsen, D.H.; Naug, B.E. What influences the growth of household debt? *Econ. Bull.* **2004**, *75*, 103–111.
7. Anundsen, A.; Jansen, E. Self-reinforcing effects between housing prices and credit. *J. Hous. Econ.* **2013**, *22*, 192–212. [[CrossRef](#)]

8. Kotze, L.; Smit, A.v.A. Personal finances: What is the possible impact on entrepreneurial activity in South Africa? *S. Afr. Bus. Rev.* **2008**, *12*, 156–172.
9. Bloxham, P.; Kent, C. Household indebtedness. *Aust. Econ. Rev.* **2009**, *42*, 327–339. [[CrossRef](#)]
10. Philbrick, P.; Gustafsson, P. Australian Household Debt: An Empirical Investigation into the Determinants of the Rise in the Debt-to-Income Ratio. Master's Thesis, Lund University, Lund, Sweden, 2010.
11. Meng, S.; Hoang, T.N.; Siriwardana, M. The determinants of Australia household debt: A macro level study. *J. Asian Econ.* **2013**, *29*, 80–90. [[CrossRef](#)]
12. Meniago, C.; Mukuddem-Petersen, J.; Petersen, M.A.; Mongale, I.P. What causes household debt to increase in South Africa? *Econ. Model.* **2013**, *33*, 482–492. [[CrossRef](#)]
13. Bolibok, P. The macroeconomic drivers of household debt-to-income ratio: Evidence from the OECD countries. *Copernic. J. Financ. Account.* **2018**, *7*, 29–41. [[CrossRef](#)]
14. Glenn, L.M.; Stockhammer, E. The drivers of household indebtedness reconsidered: An empirical evaluation of competing arguments on the macroeconomic determinants of household indebtedness in OECD countries. *J. Post Keynes. Econ.* **2018**, *41*, 547–577.
15. Coletta, M.; De Bonis, R.; Piermattei, S. Household debt in OECD countries: The role of supply-side and demand-side factors. *Soc. Indic. Res.* **2018**, *143*, 1185–1217. [[CrossRef](#)]
16. Stockhammer, E.; Wildauer, R. Expenditure cascades, low interest rates or property booms? Determinants of household debt in OECD Countries. *Rev. Behav. Econ.* **2018**, *5*, 85–121. [[CrossRef](#)]
17. Heaton, J.; Deborah, L. Portfolio choice and asset prices, the importance of entrepreneurial risk. *J. Financ.* **2000**, *55*, 1163–1198. [[CrossRef](#)]
18. DeBacker, J.; Panousi, V.; Ramnath, S. *A Risky Venture: Income Dynamics within the Non-Corporate Private Business Sector*; Working Paper, Mimeo: New York, NY, USA, 2014.
19. Wildemaue, J.I.R.; Sanroman, G. Household debt and debt to income: The role of business ownership. *Q. Rev. Econ. Financ.* **2022**, *83*, 52–68. [[CrossRef](#)]
20. Iacoviello, M. Household debt and income inequality, 1963–2003. *J. Money Credit Bank.* **2008**, *40*, 929–965. [[CrossRef](#)]
21. Mian, A.; Sufi, A. *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, IL, USA, 2015.
22. Koenker, R. Quantile regression for longitudinal data. *J. Multivar. Anal.* **2004**, *91*, 74–89. [[CrossRef](#)]
23. Koenker, R.; Bassett, G.J. Regression quantiles. *Econometrica* **1978**, *46*, 33–50. [[CrossRef](#)]
24. Firpo, S.; Fortin, N.M.; Lemieux, T. Unconditional quantile regressions. *Econometrica* **2009**, *77*, 953–973.
25. Kline, R.B. *Principles and Practice of Structural Equation Modeling*; The Guilford Press: New York, NY, USA, 1998.
26. Wen, J.; Chang, C.-P. Government ideology and the natural disasters: A global investigation. *Nat. Hazards* **2015**, *78*, 1481–1490. [[CrossRef](#)]
27. Levin, A.; Lin, C.-F.; Chu, C.-S.J. Unit root tests in panel data: Asymptotic and finite-sample properties. *J. Econom.* **2002**, *108*, 1–24. [[CrossRef](#)]