

Master in Monetary and Financial Economics

Determinants of Household Debt in the European Union Countries

Inês Tomás

Supervisor:

PhD Ricardo Barradas, Assistant Professor ISCAL-IPL

Co-Supervisor:

PhD Emanuel Reis Leão, Assistant Professor ISCTE-IUL

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Acknowledgement message

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Resumo

A dívida das famílias nos países da União Europeia tem vindo a aumentar, mostrando maior ênfase até à crise financeira em 2007-2008. Muitos destes países mostraram valores inferiores após este período contudo, ainda elevados quando comparados com o período pré-crise. Assim, esta dissertação testa empiricamente os determinantes da dívida das famílias nos 28 países da União Europeia para o período entre 1995 e 2017.

Esta análise é uma análise econométrica utilizando dados em painel. As sete hipóteses testadas, tendo em conta a literatura disponível sobre este tema, são o preço das casas, o preço dos ativos financeiros, a desigualdade, o rendimento das famílias, os gastos do estado em saúde e bem-estar, a população ativa e as taxas de juro. Os resultados obtidos mostram que o preço das casas, rendimento das famílias, gastos do estado em saúde e bem-estar e taxas de juro exercem o efeito positivo na dívida das famílias. Por outro lado, o preço dos ativos financeiros e a desigualdade têm uma influência negativa na dívida das famílias.

Palavras-chave: Dívida das famílias, União Europeia, dados em painel.

Classificação JEL: C33 e E21

Abstract

Households' indebtedness in the European Union countries has increasing, showing greater emphasis until the financial crisis in 2007-2008. Many of these countries showed lower values after this period, however, still high when compared to the pre-crisis period. Thus, this dissertation empirically tests the determinants of households' indebtedness in the 28 countries of the European Union for the period between 1995 and 2017.

This is an econometric analysis using panel data. The seven hypotheses tested, taking into account the available literature on this topic, are house prices, financial asset prices, personal income inequality, households' labour income, welfare state expenditures, working-age population and interest rates. The results obtained show that house prices, household's labour income, welfare state expenditures and interest rates have a positive effect on households' indebtedness. On the other hand, the financial asset prices and personal income inequality have a negative influence on households' indebtedness.

Keywords: Households' indebtedness, European Union, panel data.

JEL Classification: C33 and E21

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I. Introduction

The household debt has represented an important phenomenon in the more developed economies, showing its major consequences after the 2007-2008 financial crisis. Households' indebtedness played a crucial role in the last financial and economic crisis due to situations of over indebtedness. Today, several countries have already exhibited lower values, although they are still very close to the ones achieved during the pre-crisis period.

Due to its growing importance, several studies and macroeconomic theories have been developed, however, none of them emphasis on all the countries of the European Union (EU). These studies focus their work mainly in the Organization for Economic Co-operation and Development (OECD) countries and in specific countries that represent and had a significant position on the world's economy. For the OECD the household debt "is defined as all liabilities of households (including non-profit institutions serving households) that require payments of interest or principal by households to the creditors at a fixed dates in the future. Debt is calculated as the sum of the following liability categories: loans (primarily mortgage loans and consumer credit) and other accounts payable. The indicator is measured as a percentage of net household disposable income."

The macroeconomic research states that the household debt is a cause of financial crisis (e.g., Alter, *et al.*, 2018) and for that reason it's decisive to understand what the determinants are, leading to the household debt in order to implement policies to solve the problem and avoid the same behavior in the future. For instance, if the main reason for the household debt is the house prices increasing, possible measures to adopt could be the implementation of a cap in the houses price or the increasing of houses supply.

Being such an important factor, based on the analysis and research made by Moore and Stockhammer (2018), drivers of household debt can be explained by several effects observed in the day-to-day life. Others are reflected on literature as Keynesian models, wealth effects and Life Cycle models. The household debt can be justified by the house prices and its positive influence in household borrowing via collateral effects (Ryoo, 2016; Godley and Lavoie, 2007); the use of household debt to purchase financial assets (Cooper and Dynan, 2016); an income loss causes a debt accumulation in order to maintain the family's relative consumption similar with their richer peers, which is deeply related to the rise of income inequality (Frank *et al.*, 2014). The reduction of households' labour income also lead debt to increase in order to offset that reduction (Barba and Pivetti, 2008; Stockhammer, 2012, 2015) and the low level of

interest rates since they are the prime reason behind the household borrowing increasing (Taylor, 2009).

Therefore, the contribution of this dissertation is to complement all the empirical research and work already done about the household debt phenomenon but now for the EU countries. So far, it is not known a global analysis for the EU countries. The most similar work is from Moore and Stockhammer (2018) where they study all the same seven drivers but for thirteen OECD countries. The household debt in the EU in percentage of the Gross Domestic Product (GDP), still shows alarming numbers and increases the concern with family's vulnerabilities to negative shocks in the economy, for instance, the interest rate growing and/or income losses, which is particularly relevant in the current downturn due to the COVID-19 pandemic.

In this context, the analysis and testing lie on seven determinants called as household drivers: house prices, financial assets, expenditure cascade, households' labour income, welfare state expenditures, working-age population and interest rates. These hypotheses will be tested using panel data model for all the 28 EU countries over the period from 1995 to 2017.

Our results show that house prices, financial asset prices, personal income inequality, households' labour income, welfare state expenditures and interest rates are the main determinants of household's indebtedness in the European Union countries.

This dissertation is organized as follows:

- Section II comprises a literature review of household indebtedness and its determinants.
- Section III provides the data and methodology.
- Section IV presents our results and the respective discussion.
- Section V concludes.

II. Literature Review

As mentioned before, the intention of this dissertation is to discover what are the main determinants of EU countries households' indebtedness. This is a very important topic that is gain relevance over the last years and for that reason, and with all the literature available regarding this topic, the research question is: what are the main reasons for households' indebtedness in the EU? By answering this question and knowing what the determinants are, we will be able not only to answer this question but also to think about solutions to solve it.

Moore and Stockhammer (2018) identified eight determinants based in theoretical and empirical studies about households' indebtedness, which describe the relationship between it and Keynesian models and Life Cycle Model.

Keynes's base idea is that the consumers apply their goods and savings amounts, according to their income level. However, the consumer's income is influenced by other events as the interest rate, for instance.

The Life Cycle Model, according to Apps and Rees (2001, p.1), "is the hypotheses that the household chooses its consumption at any point in time in the light of its entire lifetime income stream, using capital market to decouple current consumption from current income, so as to keep its discounted marginal utility of consumption constant over time". Also, in other words, and quoting Browning and Crossley (2001, p.1), "is the standard way that economists think about the intertemporal allocation of time, effort and money". It means that consumers are rational individuals who aims to maximize their consumption utility.

Moore and Stockhammer (2018) perform all the existing literature about households' indebtedness and identify the following eight hypotheses: house prices, financial asset prices, personal income inequality, households' labour income, welfare state expenditures, working-age population and interest rates. The authors analyzed each one of the variables and grouped the hypotheses in asset-transaction explanations, consumption-oriented explanations, monetary policy and credit supply explanations as described in Table 1.

Table 1 – Summary of the determinants of household debt

| Hypotheses Explanations | |
|----------------------------------|-------------------------------|
| Financial Asset Explanation | 1. House Prices |
| | 2. Financial Asset Prices |
| Consumption-Oriented Explanation | 3. Personal Income Inequality |
| | 4. Households' Labour Income |
| | 5. Welfare State Expenditures |
| | 6. Working-Age Population |
| Monetary Policy Explanation | 7. Interest Rates |
| Credit Supply Explanation | 8. Credit Supply |

Source: Moore and Stockhammer (2018)

In the asset transaction explanations, Ryoo (2016) model shows how house prices have influence in borrowing, as, the house prices increase, the borrowing will also rise since the access to credit will be eased via collateral effects.

The hypothesis related to financial asset prices, also considered as an asset transaction explanation, according to Moore and Stockhammer (2018, p.550) is “based on the rationale that upward movements in the prices of assets that households demand drive households to take on debt as leverage to purchase such assets”. It means that increases in stock prices boosts household indebtedness. The variable used for testing this hypothesis was the real stock prices index from the OECD database. Moore and Stockhammer (2018) find some evidence for the rejection of the hypothesis in the short-run and no evidence for long-run effects.

The personal income inequality is grouped as a consumption-oriented explanation. The authors mentioned are Frank *et al.* (2014), who have suggested that “in the face of upward-looking consumption norms, income inequality drives households who have become relatively poorer, because of real income losses, to accumulate debt to maintain relative consumption with their richer peers”. Moore and Stockhammer (2018) used the top 1% income share and they didn't find evidence for long-run or short-run effects.

The second consumption-oriented explanation is the households' labour income. Moore and Stockhammer (2018, p.551) sustain that the households' labour income hypothesis “states that households who experience reduced wage incomes take on debt to maintain path-dependent, backward-looking consumption norms.

At the macroeconomic level (...) the households' labour income hypothesis state that income inequality drives household indebtedness, and that the increase in household debt is based on the growth of consumption expenditures exceeding that of income". Moore and Stockhammer (2018) used the average annual wages per full-time and full-year equivalent employee in the total economy from OECD database and find some evidence for rejection of the hypothesis in the short/run and no evidence for long-run effects.

The third consumption-oriented explanation is the welfare state expenditures. Lapavitsas (2013, p.240) explaining that "rising household indebtedness has been associated with changes in the social provision of basic services including housing, health, education, transport and so on. To the degree to which social provision has retreated, or failed to expand, private provision has taken its place, mediated by finance". It means that changes in the basic services as health or education have influenced the household indebtedness. Moore and Stockhammer (2018) used the variable of government spending on welfare (which combines government spending on health, education and housing) in percentage of the GDP from OECD database. They also concluded that the hypothesis was inconclusive.

The fourth and the last consumption-oriented explanation is the working-age population. This hypothesis relates with the Life Cycle Model and according to Moore and Stockhammer (2018, p.552) "it relies on perfectly informed, forward-looking households that are capable of detailed calculations of income and consumption, based on past, current, and perfectly predicted future information on their consumption and real income levels. These households are experts in balancing their finances over their entire life, as they know all the future income streams that they will earn for their entire lives, and they enjoy access to perfectly functioning credit and capital markets." By the Life Cycle Model, it is assumed that, according by Moore and Stockhammer (2018, p.552) "if a major part of the population is young, and if they are not credit-constrained, households would accumulate debt. Household debt (...) depends on whether households have existing savings; households will only borrow if they have no savings or if they have depleted existing savings". Moore and Stockhammer (2018) used the ratio of dependents (people younger than 15 or older than 64) to the working-age population (those ages 15–64) from the World Bank database. These authors find some evidence for support the hypothesis, mainly in the long-run.

The interest rates is an important cause of households' indebtedness. The European Central Bank (ECB) is responsible for managing the interest rate for the Euro Zone countries and the impact of an interest rate decrease, in the household debt, is positive since households will have their access to credit facilitated.

If there is an interest rate increase, the consumers will save more money. The opposite can also happen, meaning if the interest rate decreases, the consumers will spend more money and save less. The ECB has one single goal: to maintain price stability without prejudice the objective of price stability. To ensure the price stability, the inflation rate should be “close to, but below, two percent in the medium term”. The ECB assures the price stability by increasing or decreasing the interest rate: if there’s a risk of inflation increase, the ECB increases the interest rate in order to withdraw money from the market. On the other hand, if there’s a risk of inflation decreases, the ECB decreases the interest rate in order to encourage the money circulation in the market. For this reason, the interest rates is responsible for households’ indebtedness since it will be easier for families have access to borrowing money. Moore and Stockhammer (2018) defend that low federal funds interest rates are a prime reason for the housing boom in the United States of America (USA). Low federal funds interest rates increase household’s indebtedness because the low short-term interbank interest rate means cheap borrowing for banks, which is passed onto households in the form of cheap borrowing. These authors used the real short-term interest rate from the OECD database.

The last determinant studied by Moore and Stockhammer (2018) was the credit supply. They state that households take on debt because banks increase their willingness to lend, and thus supply more loans to households. The mechanism here is that the credit constraints that households previously faced are removed, allowing them to borrow more than earlier allowed. This hypothesis wasn’t tested by these authors since the information available for credit supply was very poor.

Moore and Stockhammer (2018) study was performed for a panel of 13 OECD countries over the period from 1993 to 2011, using panel error correction models. The countries included in their sample were Australia, Belgium, Canada, Germany, Spain, Finland, France, United Kingdom, Italy, Japan, Norway, Sweden and the US. These authors have concluded that house prices is the most important and strong determinant of households’ indebtedness in the short-term and in the long-term. The remaining determinants don’t show a statistical significant influence on households’ indebtedness.

Table 2 is a summary of the aforementioned eight hypotheses and how they influence the households’ indebtedness.

Table 2 – Hypotheses on the determinants of household debt

| Hypotheses | Theoretical Argument |
|--------------------------------------|---|
| 1. House Prices | Household debt is driven by house prices, as an increase in house prices increases collateral, which relaxes credit constraints, and an increase in house prices increases household wealth, which prompts consumption which is realized by borrowing against the value of the residential property |
| 2. Financial Asset Prices | Upward movements in stock prices drive households to take on debt as leverage to purchase further stocks |
| 3. Personal Income Inequality | An increase in the income of households at the top of the distribution drives household debt, because households at the lower end of the distribution take on debt to emulate the consumption of richer households |
| 4. Households' Labour Income | Households use debt as a substitute for reduced wage income to maintain path-dependent, backward looking consumption norms |
| 5. Welfare State Expenditures | Reduced welfare spending causes households to take on debt for spending on their basic welfare needs |
| 6. Working-Age Population | The working-age population determines household debt because the working-aged accumulate debt while the non-working elderly dissave, and the non-working young do not have debt |
| 7. Interest Rates | A low short-term interest rate drives households' indebtedness because borrowing becomes cheaper |
| 8. Credit Supply | Banks supply more loans to households, allowing households to take on more debt than what was previously allowed |

Source: Moore and Stockhammer (2018)

Other authors, such as Stockhammer and Wildauer (2018) also reach the same conclusion. These authors tested four explanations to explain the households' indebtedness: personal income inequality hypothesis, housing boom hypothesis, low interest hypothesis and credit market deregulation hypothesis. The study tests these four hypotheses by estimating the determinants of household borrowing using a panel of 11 OECD countries (Australia, Belgium, Canada, Finland, France, Italy, Netherlands, Norway, Sweden, United Kingdom and the US) for the period of 1980-2011.

They conclude that real estate prices were the most important drivers of household debt. In contrast they do not find a significant impact of shifts in the income distribution on household sector indebtedness.

A similar work was carried out by Romão and Barradas (2020) by applying a time series econometric analysis for Portugal from 1988 to 2016. They conclude that financial asset prices, the degree of personal income inequality, households' labour income and the fraction of the working-age population positively impact Portuguese households' indebtedness, whereas the housing prices negatively impact Portuguese households' indebtedness. They also conclude that the increase in financial asset prices and the decline in housing prices were the main drivers of Portuguese households' indebtedness in the last few decades.

The main purpose of this dissertation is to determine drivers of household debt in the European Union by performing a panel data econometric analysis for the period between 1995 and 2017.

III. Data and Methodology

The collected data for this study is annual and consists of a panel for all the 28 European Union countries (Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and United Kingdom) over the period of 1995-2017. The period and frequency were chosen according to data availability (the variable to proxy the welfare state expenditures were only available since 1995 and the variable to measure personal income inequality was only available until 2017).

The households' indebtedness is from Eurostat database and it is assessed by the total financial liabilities of households and non-profit institutions serving households in percentage of the gross domestic product; house prices is from OECD, Eurostat and BIS (Bank of International Settlements) databases and corresponds to the natural logarithm of the real house price index (2015=100); the financial asset prices are from the Fred St. Louis, OECD and Investing databases and corresponds to the natural logarithm of the total share prices for all shares (2015=100); the personal income inequality is measured through the top 1% income share and it was obtained in the World Inequality database (WID); the households' labour income is proxied by the compensation per employee as percentage of gross domestic product at market prices per person employed, traditionally called as adjusted labour share, and it was extracted from AMECO database; the welfare state expenditures is measured by the general government spending with health, education and housing in percentage of the gross domestic product and it's available in Eurostat database; to proxy the working-age population, it was calculated the ratio between the total active population and the total population aged between 15 and 64 years, available in PORDATA database; the hypothesis on interest rates is measured using the real short-term interest rate collected from AMECO database. Note that the credit supply hypothesis, as previous mentioned, will not be integrated in this empirical study since, according to Moore and Stockhammer (2018), it requires data on securitization, market-based financial intermediation, and changes in financial regulation, which is not available for the EU countries. Although there is an index of financial reforms (from Abiad *et al.* (2008) in the IMF's Database of Financial Reforms) and a credit regulation index (from the Fraser Institute) we cannot use these variables for two reasons. Firstly, the index of financial reforms and the credit regulation index will reduce the number of observations and cross sections substantially, which could compromise a relatively good sample to carry out our estimates.

Secondly, these two indexes do not capture bank activities that reflect bank-side drivers of household debt, such as the use of off-balance sheet vehicles and securitization.

The data is available for all the countries in the EU, but in some cases, there are countries to which it wasn't possible to find the information for all the years: Austria (2000-2017), Bulgaria (2005-2017), Croatia (2011-2017), Cyprus (2004-2017), Czechia (2008-2017), Estonia (2005-2017), Greece (1997-2017), Hungary (2007-2017), Ireland (2001-2017), Latvia (2006-2017), Lithuania (2000-2017), Luxembourg (2007-2017), Malta (2007-2017), Poland (2010-2017), Romania (2009-2017), Slovakia (2005-2017) and Slovenia (2007-2017). We obtained therefore an unbalanced panel.

As already discussed in the previous Section, it is expected a positive effect on households' indebtedness from the variables house prices, financial asset prices, personal income inequality and working-age population; and a negative effect from households' labour income, welfare state expenditures and interest rates.

In the Appendix, the plots of these variables are presented in Figure A1 to Figure A8. Table 3 and Table 4 show the descriptive statistics and the correlation coefficients between all variables.

Table 3 - The descriptive statistics

| Variable | Mean | Median | Maximum | Minimum | Std. Deviation | Skewness | Kurtosis |
|----------------------------|-------|--------|---------|---------|----------------|----------|----------|
| Households' Indebtedness | 0.611 | 0.544 | 1.502 | 0.020 | 0.306 | 0.838 | 3.154 |
| House Prices | 4.454 | 4.560 | 5.127 | 3.174 | 0.343 | -1.277 | 4.648 |
| Financial Asset Prices | 4.531 | 4.520 | 9.176 | 2.731 | 0.665 | 2.690 | 17.792 |
| Personal Income Inequality | 0.100 | 0.102 | 0.201 | 0.045 | 0.022 | 0.239 | 3.864 |
| Households' Labour Income | 0.533 | 0.538 | 0.638 | 0.352 | 0.049 | -0.381 | 2.933 |
| Welfare State Expenditures | 0.117 | 0.116 | 0.165 | 0.068 | 0.019 | -0.031 | 2.421 |
| Working-Age Population | 0.720 | 0.724 | 0.856 | 0.580 | 0.057 | -0.213 | 2.293 |
| Interest Rates | 0.006 | 0.004 | 0.174 | -0.051 | 0.002 | 1.455 | 10.155 |

Table 4 - The correlation coefficients between all variables

| Variable | HD | HP | FA | EC | FW | WR | AS | LI |
|----------------------------|----------|-----------|-----------|-----------|----------|----------|-----------|-------|
| Households' Indebtedness | 1.000 | | | | | | | |
| House Prices | 0.170*** | 1.000 | | | | | | |
| Financial Asset Prices | 0.023 | 0.427*** | 1.000 | | | | | |
| Personal Income Inequality | -0.017 | 0.088* | 0.060 | 1.000 | | | | |
| Households' Labour Income | 0.306*** | -0.067 | -0.112** | -0.230*** | 1.000 | | | |
| Welfare State Expenditures | 0.370*** | -0.145*** | -0.365*** | -0.208*** | 0.360*** | 1.000 | | |
| Working-Age Population | 0.492*** | 0.012 | -0.142*** | 0.040 | 0.042 | 0.440*** | 1.000 | |
| Interest Rates | -0.092** | -0.494*** | -0.197*** | 0.004 | 0.065 | -0.051 | -0.178*** | 1.000 |

Note: *** indicates statistical significance at 1% level, ** indicates statistical significance at 5% level and * indicates statistical significance at 10% level.

By observing the correlations, all of them are less than 0.8, which according to Studenmund (2005), is the traditional rule of thumb to exclude the existence of multicollinearity.

With regards to correlations, all the independent variables are statistically significant with household debt with exception of financial asset prices and personal income inequality. By observing the plots (Figure A1 to Figure A8 in Appendix) and the corresponding correlations (Table 4), it's possible to conclude that, during the period of 1995-2017, the households' indebtedness has a positive growth which occurred simultaneously with a rise of personal income inequality, a decrease on the level of interest rates, an increase of the working-age population, a decline in households' labour income, a rise of housing prices and an increase of financial asset prices.

With regards to econometric methodology, we need to evaluate if there are individual effects in our panel data. These individual effects can be related, for example, with specificities of each country that have influenced household's indebtedness. These effects can either be fixed or random. For that, it is necessary to run the redundant fixed effects test which is available on Table 5. The corresponding p-value is zero, which is lower than the traditional significance levels. So, the null hypothesis is rejected and we conclude that there is evidence of individual effects, meaning countries heterogeneity. This exclude the estimation using the pooled ordinary least squares estimator.

Table 5 – Redundant Fixed Effects Test

| | p value |
|------------------------|----------------|
| Cross-Section/Period F | 0.000 |

Now, and in order to understand if these effects are fixed or random, we apply the Hausman Test (Table 6). According to Frondel *et al.*, (2010), the Hausman Test is based on the idea that the set of coefficient estimates obtained from the fixed effects estimator – taken as a group – should not differ systematically from the set derived via random-effects estimation under the null hypothesis that the unobservable, individual-specific effects and the regressors are orthogonal. Since the respective p-value is lower than the conventional significance levels, the null hypothesis is rejected. We conclude therefore that the fixed effects estimator is the most appropriate econometric framework to produce our results.

Table 6 – Hausman Test

| | p value |
|----------------------|----------------|
| Cross-section random | 0.043 |

IV. Results and Discussion

As mentioned in the previous Section, the estimator chosen to produce our estimates was the Fixed Effects which can be observed in Table 7:

Table 7 – Fixed Effects Model

| Variable | Coefficient | Std. Error | t-Statistic |
|----------------------------|-------------|-----------------------------------|-------------|
| House Prices | 0.143*** | 0.025 | 5.743 |
| Financial Asset Prices | -0.081*** | 0.009 | -8.644 |
| Personal Income Inequality | -0.619** | 0.311 | -1.993 |
| Households' Labour Income | 0.659*** | 0.198 | 3.334 |
| Welfare State Expenditures | 1.540*** | 0.536 | 2.870 |
| Working-Age Population | -0.246 | 0.205 | -1.200 |
| Interest Rates | 0.517** | 0.239 | 2.156 |
| C | 0.049 | 0.195 | 0.250 |
| <i>R-squared = 0.949</i> | | <i>Adjusted R-squared = 0.942</i> | |

Note: *** indicates statistical significance at 1% level, ** indicates statistical significance at 5% level and * indicates statistical significance at 10% level.

At a first glance, it is possible to note that, by looking at the R-squared and the adjusted R-squared, our model explains more than 94% of the variation of the European households' indebtedness through time. Also, at the conventional significance levels, all the variables are statistically significant with the exception of the working-age population. It means that our results suggest that the working-age population don't explain the households' indebtedness in the European countries. The statistical insignificance of the working-age population could be explained by the fact that they face now more precarity labour conditions, which tends to increase their credit constraints and their corresponding indebtedness.

Looking with more detail to each variable, house prices, as expected is statistically significant by exerting a positive impact on household's indebtedness in the EU countries. An increase of 1 percent (%) in the house prices implies an increase of 0.14% in the household's indebtedness in the EU countries. This result is also in line with other empirical works on this subject (Kohn and Dynan, 2007; Oikarinen, 2009; Gimeno and Martinez-Carrascal, 2010; Valverde and Fernandez, 2010; Meng *et al.*, 2013; Anundsen and Jansen, 2013; Rubaszek and Serwa, 2014; Stockhammer and Wildauer, 2018). There is a substantial literature which argues that property price dynamics are primarily driven by speculative waves (Shiller, 2015). This argument provides justification for our regression specification. The financial asset prices is also statistically significant with a negative impact on household's indebtedness. An increase of 1% in the financial asset prices, implies a decrease of 0.08% in the level household's indebtedness. This result is not in line with the empirical work available (Moore and Stockhammer, 2018; Kohn and Dynan, 2007).

This counterintuitive result seems to suggest that households enjoy the period of growth in financial assets to liquidity them in order to use this income to repay existing debts, which promotes a decrease in the level of indebtedness. The personal income inequality is statistically significant and has a negative effect on the household's indebtedness. An increase of 1 percentage point (p.p.) in the personal income inequality, leads to a decrease of 0.62% in the household's indebtedness. This result is not in accordance with the empirical work of several authors (Klein, 2015; Malinen, 2016; Stockhammer and Wildauer 2018) which results indicate that the income inequality increase contributes to the increase of household's indebtedness. As studied by Pardo and Santos (2014) for the Spanish economy, families resort less to borrowing, especially those of lower income and wealth, due to their credit constraints. The household's labour income has a statistically positive impact on household's indebtedness. An increase of 1 p.p. in the household's labour income, originates an increase of 0.66% in household's indebtedness. Also, this result is not in accordance with the empirical work from Moore and Stockhammer (2018) but was reported by Valverde and Fernandez (2010) for the Spanish economy. This fact could be associated with the higher conservative stance of the banks, according to which the level of households' wages is still the best determinant to assess the risk of them when they want a credit. Welfare state expenditures are statistically significant by exerting a positive impact on household's indebtedness. An increase of 1 p.p. in welfare state expenditures, will cause an increase of 1.54% in the household's indebtedness. Once again, this result is not in accordance with the empirical work from Moore and Stockhammer (2018) and Wiedemann A. (2019) since, it suggests, the EU household's take on debt when there's an increasing on welfare spending. As described by Lagoa and Barradas (2020) for the Portuguese economy, when there's a rise of social spending by the State, the households are not concerned about saving. In fact, it will boost them to consume more by incurring into debt as they feel protected by the State. Finally, the level of interest rates is statistically significant and impacts positively the household's indebtedness. An increase of 1 p.p. in interest rates, lead to an increase of 0.52% in the household's indebtedness. This result is not in accordance with the empirical works (Moore and Stockhammer, 2018; Stockhammer and Wildauer, 2018; Bordo and Meissner, 2012). It suggests, the EU household's don't accumulate debt when there's a decrease in the interest rate and the debt is cheaper. The small importance of the public housing and the malfunctioning of the rental market for housing purposes have favored households to buy home through housing credit despite the cost of the respective borrowing (Barradas *et al.*, 2018).

It is possible to confirm that house prices, financial asset prices, personal income inequality, households' labour income, welfare state expenditures and interest rates are the main determinants of households' indebtedness in the European Union countries.

Please note that during the period of 1995-2017, household's debt wasn't "stable" (Figure A1 in Appendix). In fact, it's possible to identify two distinct periods: one from 1995 to 2009 and other from 2010 to 2017. In the period of 1995-2009 it's clear a rising of households' indebtedness. On the other hand, during the period of 2010-2017, the households' indebtedness exhibits a decreasing trend in the following years. Taking this into account, we re-estimated our model for these two periods in order to understand if determinants of household's debt in the EU are relatively the same through time.

Starting with the period of 1995-2009, the redundant fixed effects test (Table 8) presents a corresponding p-value equal to zero, which is lower than the traditional significance levels. This exclude the estimation using the pooled ordinary least squares estimator. For the Hausman Test (Table 9), the respective p-value is higher than the conventional significance levels and for that reason, we conclude that the random effects estimator is the most appropriate econometric framework to produce our results (Table 10).

Table 8 – Redundant Fixed Effects Test (1995-2009)

| | |
|------------------------|----------------|
| | p value |
| Cross-Section/Period F | 0.000 |

Table 9 – Hausman Test (1995-2009)

| | |
|----------------------|----------------|
| | p value |
| Cross-section random | 0.672 |

Table 10 – Random Effects Model (1995-2009)

| Variable | Coefficient | Std. Error | t-Statistic |
|-----------------------------------|-------------|-----------------------------------|-------------|
| House Prices | 0.237*** | 0.020 | 12.109 |
| Financial Asset Prices | 0.048*** | 0.012 | 3.900 |
| Personal Income Inequality | -0.862** | 0.397 | -2.169 |
| Households' Labour Income | 0.768** | 0.304 | 2.530 |
| Welfare State Expenditures | 5.043*** | 0.652 | 7.730 |
| Working-Age Population | 1.231*** | 0.228 | 5.400 |
| Interest Rates | 0.703*** | 0.200 | 3.519 |
| C | -2.489 | 0.243 | -10.237 |
| <i>R-squared = 0.804</i> | | <i>Adjusted R-squared = 0.798</i> | |

Note: *** indicates statistical significance at 1% level, ** indicates statistical significance at 5% level and * indicates statistical significance at 10% level.

At the conventional significance levels, all variables are statistically significant (before the working-age population wasn't). The financial asset prices and working-age population show different conclusions in comparison with the results for the full period. Both variables exert a positive effect on the households' indebtedness during this period. In fact, during this period, beside the Subprime crisis started in 2007, the EU countries suffer the impact a little bit later than that, being the major impact felt in near 2010. The positive effects from financial asset prices can be justify by the usage of these financial asset as a collateral to get in debt until the crisis.

For the period of 2010-2017, the redundant fixed effects test (Table 11) presents a corresponding p-value equal to zero, which is lower than the traditional significance levels. This exclude the estimation using the pooled ordinary least squares estimator. For the Hausman Test (Table 12), the respective p-value is lower than the conventional significance levels and for that reason, we conclude that the fixed effects estimator is the most appropriate econometric framework to produce our results (Table 13):

Table 11 – Redundant Fixed Effects Test (2010-2017)

| | p value |
|------------------------|----------------|
| Cross-Section/Period F | 0.000 |

Table 12 – Hausman Test (2010-2017)

| | p value |
|----------------------|----------------|
| Cross-section random | 0.064 |

Table 13 – Fixed Effects Model (2010-2017)

| Variable | Coefficient | Std. Error | t-Statistic |
|-----------------------------------|--------------------|-----------------------------------|--------------------|
| House Prices | -0.069 | 0.046 | -1.503 |
| Financial Asset Prices | -0.053*** | 0.014 | -3.692 |
| Personal Income Inequality | -0.255 | 0.416 | -0.613 |
| Households' Labour Income | 1.502*** | 0.200 | 7.526 |
| Welfare State Expenditures | 2.431*** | 0.568 | 4.276 |
| Working-Age Population | -0.022 | 0.347 | -0.063 |
| Interest Rates | 0.934** | 0.366 | 2.549 |
| C | 0.162 | 0.286 | 0.566 |
| <i>R-squared = 0.982</i> | | <i>Adjusted R-squared = 0.977</i> | |

Note: *** indicates statistical significance at 1% level, ** indicates statistical significance at 5% level and * indicates statistical significance at 10% level.

At the conventional significance levels, the variables of house prices and personal income inequality lost their statistically significance in comparison with the full period. It was a “non-indebtedness” period, challenging for all the EU countries with severe economic, financial and social impacts and for that reason, it was expected that the households postpone buying a house. It’s safe to say that the estimations obtain for the period of 1995-2017 are compound and affected by two distinct periods with different events: the period 1995-2009 can be called as a pre-crisis period or indebtedness period and the 2010-2017 as a pro-crisis period or “non-indebtedness” period.

In order to find out which variable better contributes to the EU countries households’ indebtedness for the period of 1995 to 2017, Table 14 presents the economic effect of the variables that are statistically significant in our estimation. During this time, the households’ indebtedness didn’t show the same trend as the Figure A1 in the Appendix shows: from 1995 to 2009 it exhibited an increasing trend and from 2010 to 2017, a decreasing. For that reason, the analysis of the economic effects was built for these two periods and for the full period as a whole.

Table 14 – The economic effects

| Period | Variable | Coefficient | Actual Cumulative Change | Economic Effect |
|---|-----------------------------------|-------------|--------------------------|-----------------|
| Increase of Households’ Indebtedness (1995-2009) | House Prices | 0.237 | 0.78 | 0.185 |
| | Financial Asset Prices | 0.048 | 1.02 | 0.049 |
| | Personal Income Inequality | -0.862 | 0.105 | -0.091 |
| | Households’ Labour Income | 0.768 | -0.039 | -0.030 |
| | Welfare State Expenditures | 5.043 | 0.079 | 0.396 |
| | Working-Age Population | 1.231 | 0.042 | 0.052 |
| | Interest Rates | 0.703 | -0.293 | -0.206 |
| Decrease of Households’ Indebtedness (2010-2017) | Financial Asset Prices | -0.053 | 0.23 | -0.012 |
| | Households’ Labour Income | 1.502 | -0.021 | -0.031 |
| | Welfare State Expenditures | 2.431 | -0.088 | -0.215 |
| | Interest Rates | 0.934 | 8 | 7.472 |
| Full Period (1995-2017) | House Prices | 0.143 | 0.91 | 0.130 |
| | Financial Asset Prices | -0.081 | 1.21 | -0.098 |
| | Personal Income Inequality | -0.619 | 0.229 | -0.142 |
| | Households’ Labour Income | 0.659 | -0.080 | -0.052 |
| | Welfare State Expenditures | 1.540 | -0.037 | -0.057 |
| | Interest Rates | 0.517 | -1.439 | -0.744 |

Note: The actual cumulative change corresponds to the growth rate of the correspondent variable during the respective period. The economic effect is the multiplication of the coefficient by the actual cumulative change.

For the period from 1995 to 2009, we settled that the household's indebtedness increasing was caused by the growth of welfare state expenditures, house prices, working-age population and financial asset prices. In fact, these variables had a total impact in the household's indebtedness increasing by about 39.6, 18.5, 5.2 and 4.9 per cent, respectively, during that time, being the main effect triggered by the welfare state expenditures. Attenuating this increasing are the growth of personal income inequality and the decline of interest rates and household's labour income with negative impact of 9.1, 20.6 and 3 per cent, respectively.

In the period from 2010 to 2017, it was observed a household's indebtedness decreasing explained by the reduction of welfare state expenditures, household's labour income and financial asset prices. The effect of each one of the determinants was 21.5, 3.1 and 1.2 per cent respectively. During that time, mitigating these prejudicial effects was the interest rates growth, otherwise the EU households' indebtedness would have even been lower by around 747.2 per cent.

For the full period from 1995 to 2017, we concluded that the house prices growth was the main driver of the EU households' indebtedness, contributing for its increase with 13 per cent. On the other hand, the growth of personal income inequality and financial asset prices and the reduction of interest rates, welfare state expenditures and household's labour income weren't enough to stop the households' indebtedness increase. Actually, the EU households' indebtedness would have been higher by around 14.2, 9.8, 74.4, 5.7 and 5.2 per cent if there hadn't been the growth of personal income inequality and financial asset prices and the reduction of interest rates, welfare state expenditures and household's labour income.

In order to confirm the robustness of our estimates, we also proceed with a jackknife analysis (Table A1 in the Appendix). We can conclude that the majority of our variables maintain their statistical significance and the same impacts on households' indebtedness, which seems to ensure the robustness of our results.

V. Conclusion

As suggested by Moore and Stockhammer (2018), there are eight variables that cause the household's indebtedness: house prices, financial asset prices, expenditure cascade, households' labour income, welfare state expenditures, working-age population, interest rates and credit supply. The main goal of this dissertation was to determine the households' indebtedness drivers in the European Union for all the 28 countries, during the period of 1995 to 2017. This was achieved, by econometrically testing seven hypothesis identified in the existing literature (house prices, financial asset prices, expenditure cascade, households' labour income, welfare state expenditures, working-age population and interest rates). The credit supply, as in Moore and Stockhammer (2018), wasn't tested due to the difficulty of getting accurate proxy.

The model was estimated using a panel data and the obtained results show that house prices, household's labour income, welfare state expenditure and interest rates exert a positive influence on the households' indebtedness, while the financial asset prices and personal income inequality exert a negative effect. These findings also settle the importance of these macroeconomic determinants in households' indebtedness evolution during the last years. From the period between 1995 and 2009, the growth of welfare state expenditures, house prices, working-age population and financial asset prices were the main drivers leading to the EU countries households' indebtedness increase. In the period from 2010 to 2017, the decrease of the EU countries households' indebtedness was caused by the reduction of welfare state expenditures, household's labour income and financial asset prices. Over the full period, the main driver of the EU countries households' indebtedness increasing was the house prices. To mitigate households' indebtedness, policy makers should keep working on macroprudential policies to avoid debt and real estate booms. These measures will promote a sustainable households' indebtedness trend in the coming years and make the economy less vulnerable to future adverse events.

In this dissertation, as mentioned before, we are not taking into account the credit supply due to lack of an accurate proxy to measure it. However, it is known that during this period, the availability of credit and the easy borrowing access was responsible for an economical and financial crisis. Kohn and Dynan (2007) mentioned that, for the USA economy, the financial innovation has facilitated households' ability to allow current consumption to be influenced by expected future asset values and when those expectations are revised, easier access to credit could well induce consumption to react more quickly and strongly than previously.

Also, this work is only analyzing macroeconomic determinants as households' indebtedness drivers. It would be interesting to analyze the microeconomic by reflecting on data at household-level in order to go a little deep and understand if the results would be different by influence of households' behavior.

VI. References

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VII. Appendix

Figure A 1 - Households' Indebtedness

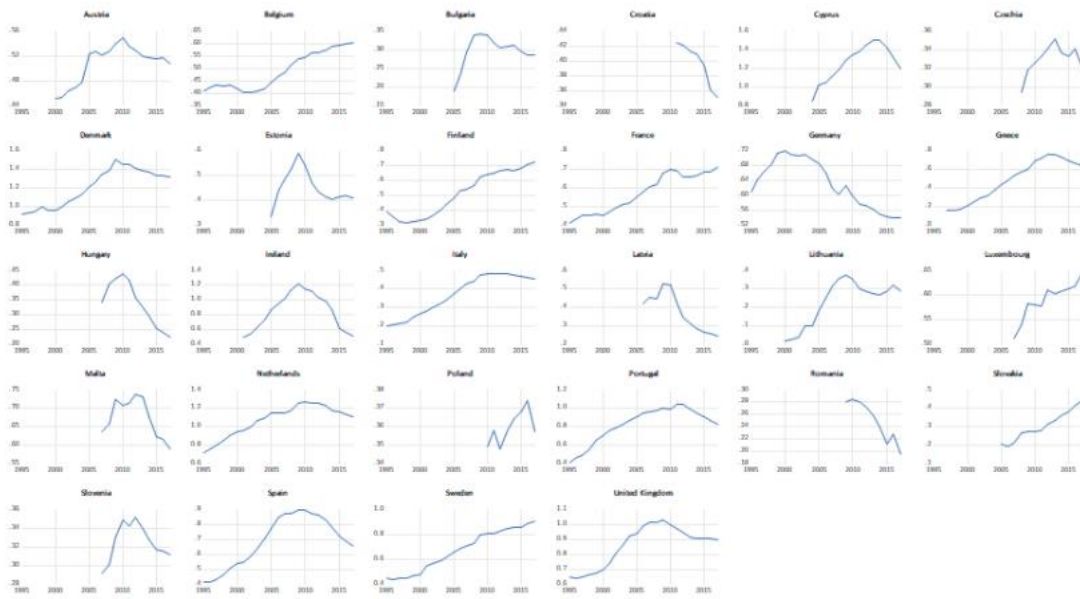


Figure A 2 – House Prices



Figure A 3 - Financial Asset Prices

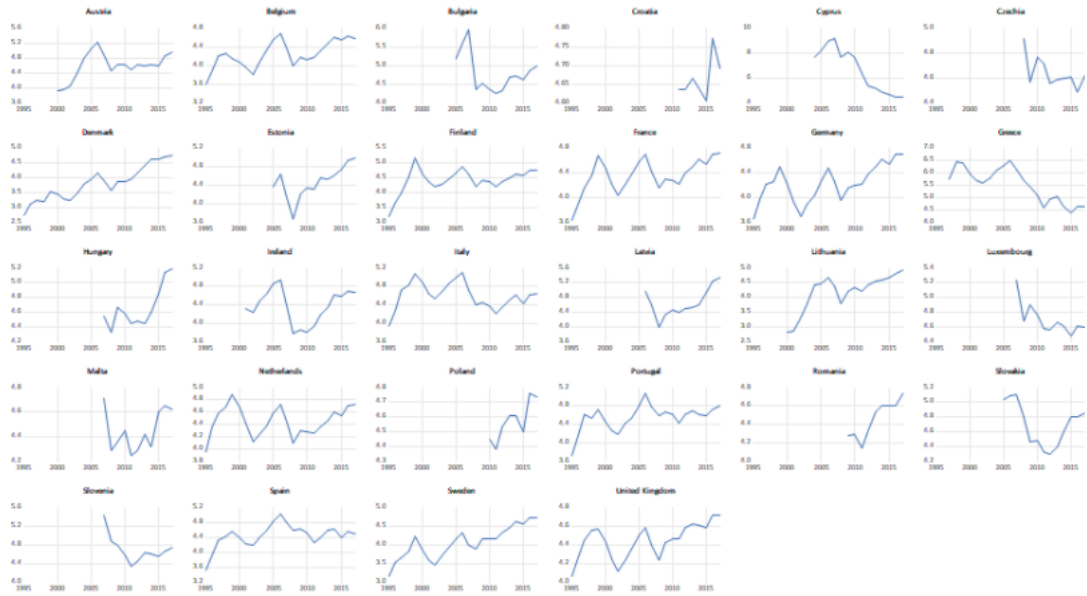


Figure A 4 - Personal Income Inequality

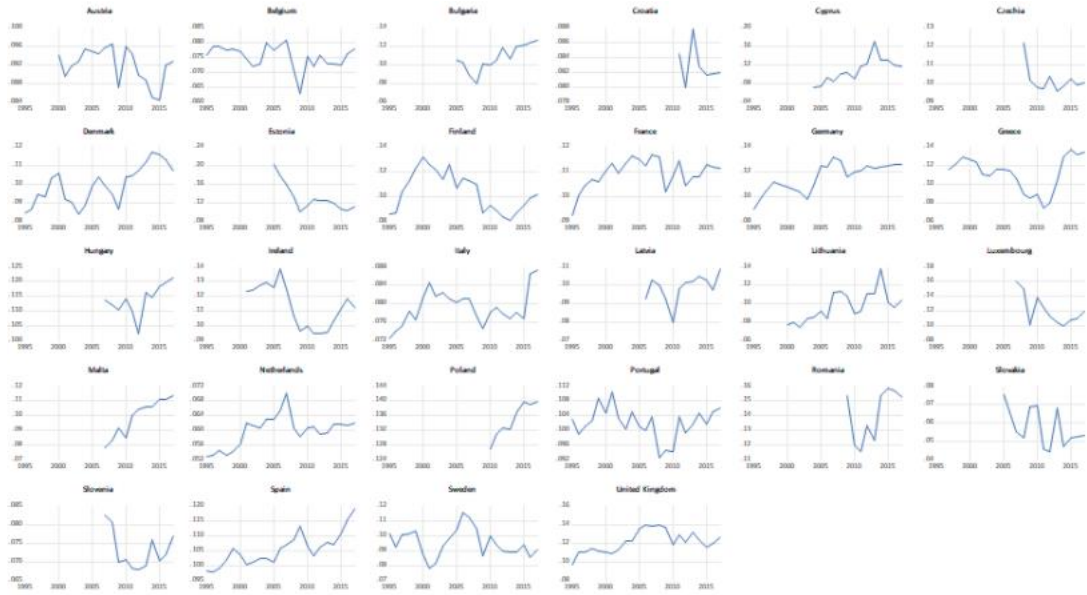


Figure A 5 - Households' Labour Income

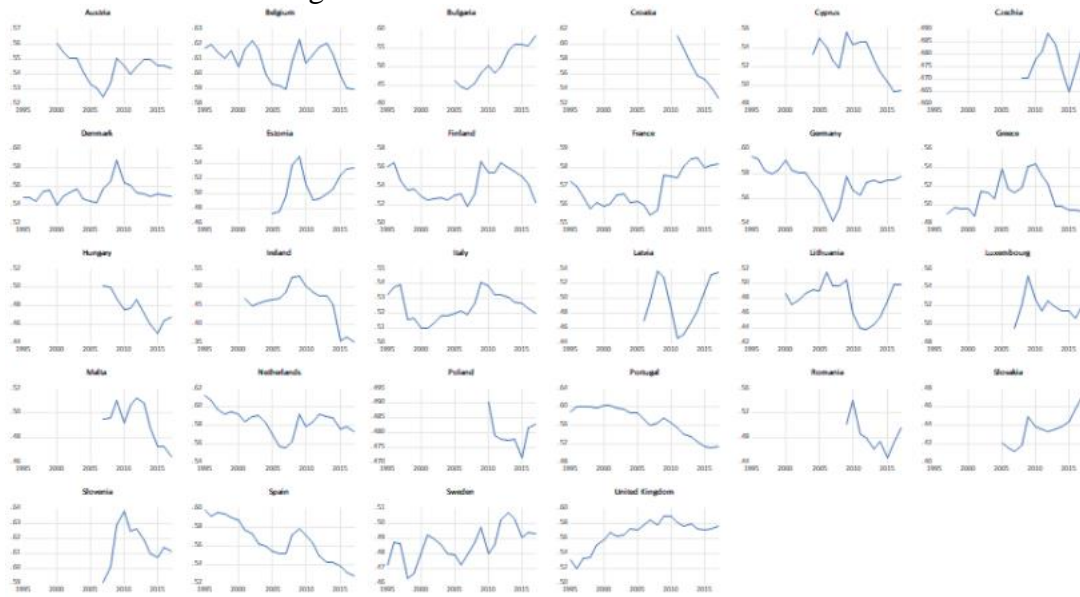


Figure A 6 - Welfare State Expenditures

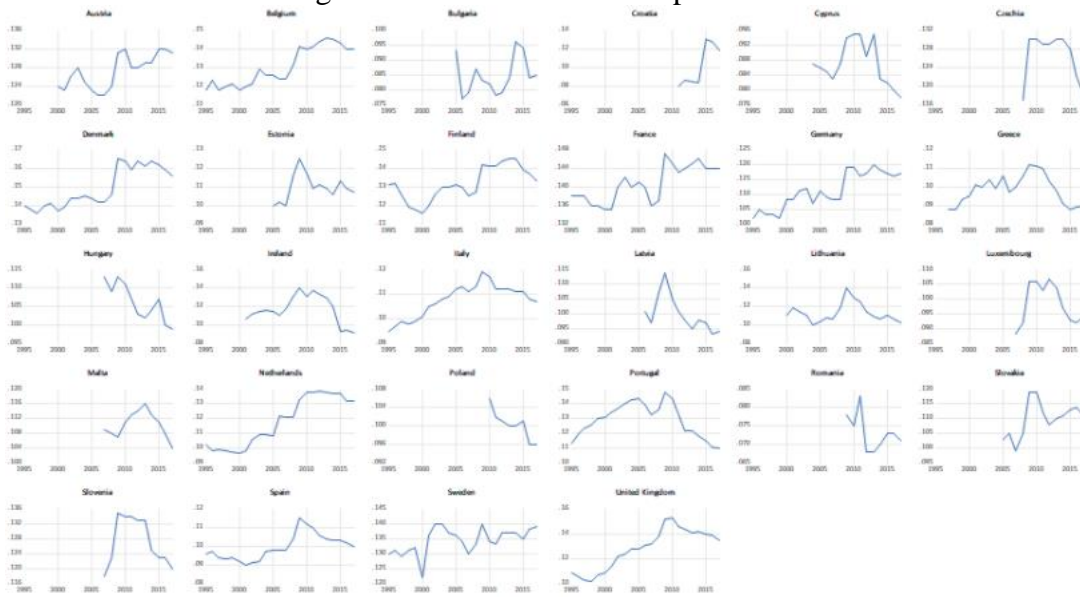


Figure A 7 - Working-Age Population

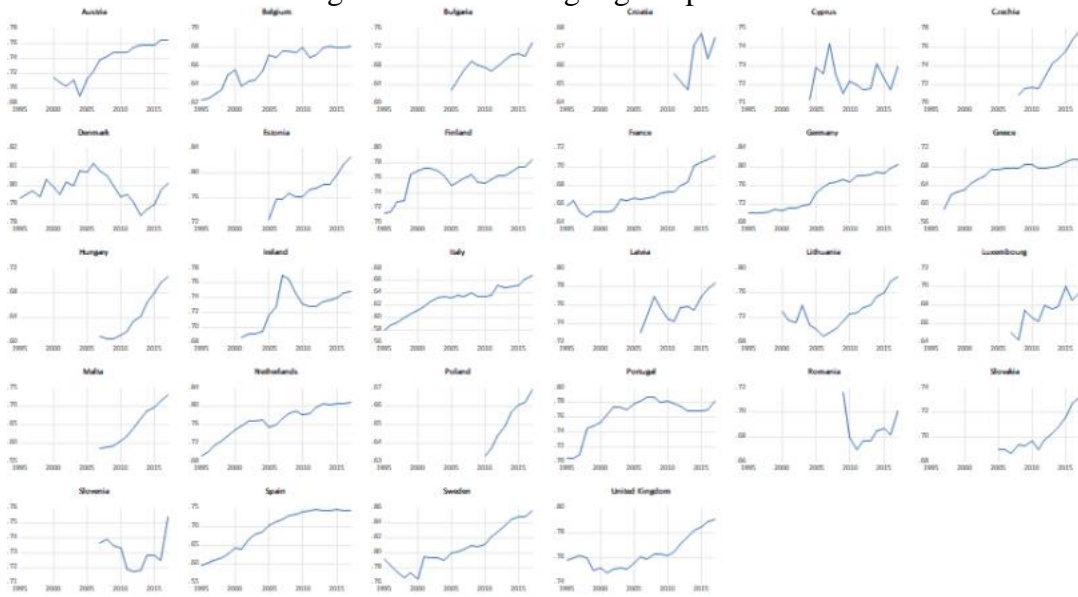


Figure A 8 - Interest Rates

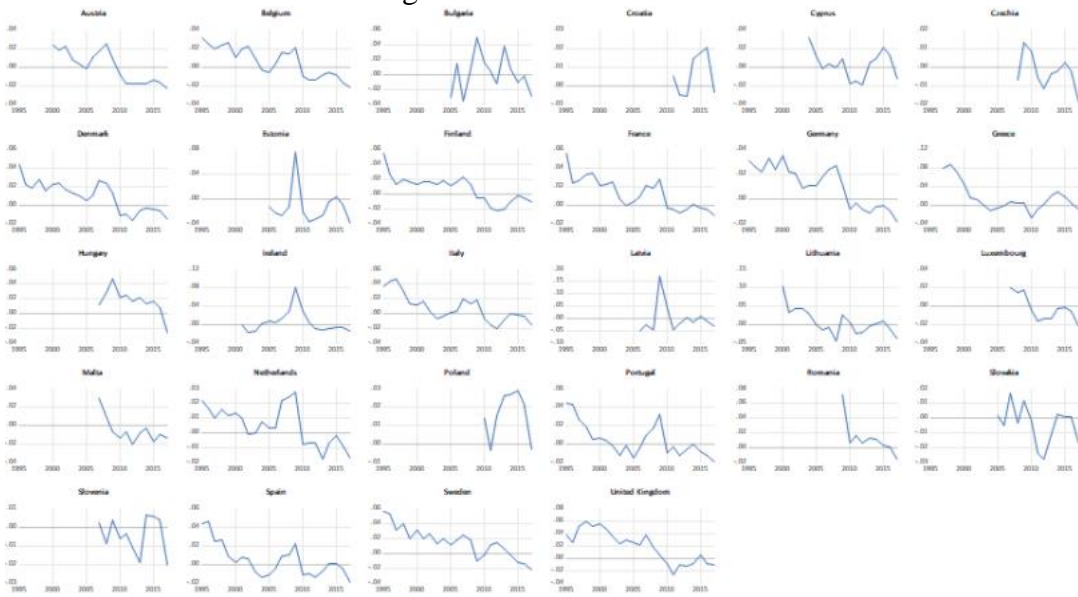


Table A1 – Model robustness analysis

| | House Prices | Financial Asset Prices | Personal Income Inequality | Households' Labour Income | Welfare State Expenditures | Working-Age Population | Interest Rates |
|--------------------|---------------------------------|-----------------------------------|----------------------------------|--------------------------------|--------------------------------|----------------------------------|--------------------------------|
| Austria | 0.150*** (0.026) [5.871] | -0.082*** (0.010) [-8.581] | -0.656** (0.314) [-2.090] | 0.654*** (0.199) [3.287] | 1.479*** (0.543) [2.724] | -0.184 (0.208) [-0.884] | 0.479** (0.242) [1.983] |
| Belgium | 0.152*** (0.025) [6.152] | -0.083*** (0.009) [-8.878] | -0.744** (0.307) [-2.421] | 0.607*** (0.196) [3.090] | 1.606*** (0.538) [2.984] | -0.269 (0.204) [-1.320] | 0.594** (0.236) [2.516] |
| Bulgaria | 0.139*** (0.026) [5.359] | -0.082*** (0.010) [-8.623] | -0.46473 (0.328) [-1.417] | 0.835*** (0.230) [3.634] | 1.386** (0.553) [2.504] | -0.206 (0.209) [-0.985] | 0.602** (0.248) [2.422] |
| Croatia | 0.143*** (0.025) [5.714] | -0.081*** (0.009) [-8.595] | -0.626** (0.313) [-1.999] | 0.606*** (0.211) [2.875] | 1.811*** (0.620) [2.923] | -0.253 (0.207) [-1.225] | 0.529** (0.241) [2.198] |
| Cyprus | 0.275*** (0.021) [12.890] | -0.060*** (0.013) [-4.582] | -0.843** (0.367) [-2.298] | -0.024 (0.210) [-0.114] | 4.354*** (0.518) [8.400] | 0.484*** (0.185) [2.609] | 0.351 (0.228) [1.540] |
| Czechia | 0.143*** (0.025) [5.697] | -0.081*** (0.010) [-8.524] | -0.620** (0.316) [-1.995] | 0.653*** (0.200) [3.265] | 1.555*** (0.542) [2.862] | -0.250 (0.208) [-1.201] | 0.523** (0.242) [2.162] |
| Denmark | 0.148*** (0.025) [6.059] | -0.099*** (0.010) [-10.104] | -0.952*** (0.313) [-3.044] | 0.617*** (0.195) [3.173] | 1.123** (0.537) [2.092] | 0.214 (0.218) [0.982] | 0.403* (0.237) [1.702] |
| Estonia | 0.150*** (0.025) [5.899] | -0.081*** (0.010) [-8.461] | -0.785** (0.340) [-2.312] | 0.675*** (0.200) [3.365] | 1.494*** (0.542) [2.757] | -0.218 (0.208) [-1.049] | 0.546** (0.246) [2.221] |
| Finland | 0.141*** (0.025) [5.563] | -0.083*** (0.010) [-8.558] | -0.620* (0.331) [-1.872] | 0.674*** (0.202) [3.347] | 1.496*** (0.550) [2.718] | -0.227 (0.214) [-1.062] | 0.484** (0.246) [1.964] |
| France | 0.155*** (0.025) [6.125] | -0.083*** (0.010) [-8.683] | -0.620** (0.315) [-1.972] | 0.685*** (0.201) [3.401] | 1.267** (0.550) [2.305] | -0.336 (0.210) [-1.604] | 0.576** (0.243) [2.375] |
| Germany | 0.035 (0.025) [1.386] | -0.067*** (0.009) [-7.802] | 0.027 (0.288) [0.094] | 0.873*** (0.180) [4.853] | 1.439*** (0.486) [2.963] | 0.253 (0.192) [1.322] | 0.242 (0.218) [1.111] |
| Greece | 0.171*** (0.025) [6.821] | -0.063*** (0.010) [-6.281] | -0.499 (0.325) [-1.538] | 0.486** (0.199) [2.445] | 2.230*** (0.543) [4.110] | -0.313 (0.205) [-1.528] | 0.724*** (0.252) [2.871] |
| Hungary | 0.142*** (0.025) [5.657] | -0.081*** (0.010) [-8.560] | -0.623** (0.314) [-1.986] | 0.660*** (0.200) [3.292] | 1.543*** (0.544) [2.838] | -0.186 (0.212) [-0.879] | 0.485** (0.243) [2.000] |
| Ireland | 0.168*** (0.024) [6.890] | -0.075*** (0.009) [-8.404] | -0.564* (0.298) [-1.894] | 0.041 (0.202) [0.202] | 0.767 (0.515) [1.489] | -0.512*** (0.197) [-2.599] | 0.326 (0.230) [1.419] |
| Italy | 0.144*** (0.026) [5.617] | -0.084*** (0.010) [-8.755] | -0.653** (0.317) [-2.064] | 0.696*** (0.203) [3.437] | 1.482*** (0.548) [2.704] | -0.252 (0.209) [-1.205] | 0.524** (0.244) [2.144] |
| Latvia | 0.141*** (0.025) [5.591] | -0.078*** (0.010) [-8.153] | -0.521* (0.313) [-1.666] | 0.776*** (0.206) [3.769] | 1.350** (0.542) [2.492] | -0.233 (0.206) [-1.134] | 0.572** (0.290) [1.971] |
| Lithuania | 0.125*** (0.027) [4.602] | -0.086*** (0.010) [-8.842] | -0.788** (0.328) [-2.403] | 0.679*** (0.210) [3.232] | 1.725*** (0.568) [3.038] | -0.242 (0.213) [-1.137] | 0.554** (0.249) [2.222] |
| Luxembourg | 0.142*** (0.025) [5.571] | -0.081*** (0.010) [-8.441] | -0.644** (0.328) [-1.963] | 0.657*** (0.201) [3.274] | 1.572*** (0.544) [2.888] | -0.236 (0.208) [-1.136] | 0.504** (0.242) [2.086] |
| Malta | 0.143*** (0.025) [5.678] | -0.081*** (0.010) [-8.537] | -0.650** (0.319) [-2.037] | 0.650*** (0.201) [3.234] | 1.561*** (0.545) [2.863] | -0.263 (0.223) [-1.178] | 0.540** (0.243) [2.218] |
| Netherlands | 0.133*** (0.026) [5.106] | -0.079*** (0.010) [-8.185] | -0.612* (0.318) [-1.921] | 0.705*** (0.207) [3.399] | 1.494** (0.597) [2.501] | -0.311 (0.213) [-1.464] | 0.473* (0.247) [1.916] |
| Poland | 0.144*** (0.025) [5.772] | -0.081*** (0.010) [-8.617] | -0.630** (0.313) [-2.015] | 0.648*** (0.199) [3.256] | 1.545*** (0.540) [2.864] | -0.248 (0.206) [-1.202] | 0.515** (0.241) [2.142] |
| Portugal | 0.193*** (0.024) [7.896] | -0.085*** (0.009) [-9.538] | -0.419 (0.297) [-1.411] | 0.836*** (0.191) [4.383] | 1.790*** (0.536) [3.340] | -0.296 (0.201) [-1.480] | 0.644*** (0.229) [2.816] |

| | | | | | | | |
|-----------------------|--------------------------------|----------------------------------|---------------------------------|--------------------------------|--------------------------------|---------------------------------|-------------------------------|
| Romania | 0.145*** (0.025) [5.759] | -0.082*** (0.010) [-8.645] | -0.654** (0.319) [-2.052] | 0.684*** (0.202) [3.390] | 1.504*** (0.544) [2.765] | -0.222 (0.208) [-1.067] | 0.539** (0.243) [2.223] |
| Slovakia | 0.145*** (0.025) [5.788] | -0.082*** (0.009) [-8.710] | -0.580* (0.315) [-1.840] | 0.595*** (0.200) [2.981] | 1.544*** (0.538) [2.869] | -0.259 (0.205) [-1.263] | 0.483** (0.240) [2.014] |
| Slovenia | 0.144*** (0.025) [5.747] | -0.082*** (0.010) [-8.619] | -0.626** (0.314) [-1.992] | 0.664*** (0.200) [3.323] | 1.573*** (0.543) [2.898] | -0.254 (0.209) [-1.219] | 0.524** (0.242) [2.167] |
| Spain | 0.121*** (0.026) [4.649] | -0.080*** (0.010) [-8.450] | -0.590* (0.314) [-1.879] | 0.789*** (0.205) [3.848] | 1.602*** (0.543) [2.949] | -0.583** (0.229) [-2.543] | 0.482** (0.243) [1.985] |
| Sweden | 0.123*** (0.026) [4.695] | -0.084*** (0.010) [-8.753] | -0.548* (0.320) [-1.715] | 0.647*** (0.202) [3.206] | 1.681*** (0.558) [3.013] | -0.290 (0.210) [-1.382] | 0.493** (0.247) [1.992] |
| United Kingdom | 0.157*** (0.025) [6.169] | -0.082*** (0.010) [-8.690] | -0.518 (0.319) [-1.623] | 0.728*** (0.200) [3.631] | 1.997*** (0.560) [3.568] | -0.421** (0.212) [-1.984] | 0.509** (0.246) [2.066] |

Note: The results corresponds to Coefficient, Std. Error and t-Statistic, respectively. *** indicates statistical significance at 1% level, ** indicates statistical significance at 5% level and * indicates statistical significance at 10% level.