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Social Rental Housing Provision and the Financial Vulnerability
of European Households

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Dedictory

In memory of my good friend Craig Miller

Forever thankful to my Mom for her unconditional support

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This paper uses data from the Eurosystem Household Finance and Consumption Survey

Abstract

Using data from the Eurosystem Household Finance and Consumption Survey (HFCS) and the OECD Affordable Housing Database, this thesis explores the link between the stock of social rental housing in the economy and the financial vulnerability of its renters in Europe. The implemented analytical approach consisted of the OLS estimation of a linear regression model with heteroskedasticity consistent standard errors. Using the debt-to-asset ratio as an indicator of financial vulnerability, the obtained findings point towards the existence of a negative but rather small statistically significant correlation between the level of financial vulnerability of the renters in an economy and the stock of social rental housing. This interdependence is sensible to country-specific characteristics.

Keywords

Social rental housing, financial vulnerability, macroprudential policy, debt-to-asset ratio.

Kurzfassung

Unter Verwendung von Daten aus dem Eurosystem Household Finance and Consumption Survey (HFCS) sowie der OECD Affordable Housing Database untersucht diese Arbeit den Zusammenhang zwischen dem Bestand an Sozialmietwohnungen in einer Volkswirtschaft und der finanziellen Verwundbarkeit ihrer Mieter in Europa. Der angewandte analytische Ansatz bestand in der OLS-Schätzung eines linearen Regressionsmodells mit heteroskedastizitätskonsistenten Standardfehlern. Unter Verwendung des Verschuldungs-zu-Vermögens-Verhältnisses als Indikator für finanzielle Verwundbarkeit deuten die Ergebnisse auf das Vorhandensein eines negativen, wenn auch eher geringen, statistisch signifikanten Zusammenhangs zwischen dem Ausmaß der finanziellen Verwundbarkeit der Mieter in einer Volkswirtschaft und dem Bestand an Sozialmietwohnungen hin. Diese Interdependenz ist sensibel gegenüber länderspezifischen Merkmalen.

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1 Introduction

In recent times, a recurring public debate has been taking place in most western economies pointing towards the need for policymakers to intervene housing markets in an attempt to tackle what many have referred to as a “housing affordability crisis”, a situation in which housing expenses outpace income growth, potentially hindering the access to affordable housing to the average citizen (Wetzstein, 2017). Although, to a certain extent, the same pattern can be observed across nations, the situation is not homogeneous. The different regulatory frameworks and degrees of complexity regarding how rental and social rental housing markets are structured, overall housing ownership preferences, demographic trends and economic prospects, all have an effect on the performance of a country’s housing market in terms of welfare outcomes. One of such interventions from the supply side consists of increasing the provision of social rental housing, whose rent and access conditions are determined by public institutions or other mechanisms different to regular market allocations, normally taking into account the socioeconomic conditions of the households.

Relatedly, the supply of social rental housing can have positive effects beyond the scope of their immediate beneficiaries. On the one hand and as mentioned before, households living in some form of publicly provided form of housing typically pay an amount of rent that goes in line with their socioeconomic profile, lowering their chances of experiencing financial hardships i.e. being financially vulnerable (Mauser and Voith, 2024). On the other hand, there are examples in the literature, such as Li (2021), which show that increases in the overall supply of housing stock can lead to lower rent levels. This would support the idea that all renters in the economy could benefit in terms of their financial vulnerability from how much institutions promote and develop affordable housing alternatives.

In response to this conjuncture, this master’s thesis aims to give an answer to whether European renters, even if their dwellings don’t fall into the category of social rental housing, benefit in terms of their financial vulnerability from the stock of social rental housing present in their economies.

Extensive research has studied the socioeconomic and welfare outcomes of public and social housing. In a study for The Netherlands, Van Dijk (2018) studies the effects on low-income households of Europe’s largest public housing program and finds a negative effect on employment outcomes for the households involved. Reingold et al. (2001) find urban public housing to be closely linked to neighborhood disadvantage, but to have a rather small impact on social capital and labor force participation.

Relatedly, other string of literature seeks to explore and identify the determinants of financial vulnerability by using household survey data and proposing different indicators of financial distress. Examples of such research can be found in Anderloni et al. (2012), Daud et al. (2019) and Fernández-López et al. (2023) among others.

This study combines elements present in the available literature and provides additional novelties. Firstly and most importantly, using survey data, it explores from a macro perspective the role that the stock of social

rental housing present in an economy plays on the financial vulnerability of households. This approach is novel and relevant in terms of policy implications, as our results could serve as incentives for government bodies across Europe to allocate a higher share of their budgets to social housing programs and thus help reduce the systemic risks in their economies. Secondly, taking the linear regression model proposed by Anderloni et al. (2012) on the determinants of financial vulnerability as reference, we include additional independent variables -the most relevant being the provision of social rental housing in the economy as a share of the total housing stock-, propose an alternative dependent variable and re-estimate the resulting econometric specification using a different multi-country sample and alternative data sources which allow for cross-country comparisons within Europe.

To conduct our analysis, we use data from the OECD Affordable Housing Data Base, from which we obtain data regarding the stock of social rental housing as a share of the total housing stock for a group of 17 European countries around the year 2022. Additionally, we use the latest available 2021 Eurosystem Household Finance and Consumption Survey (HFCS) wave, which offers data on the socioeconomic characteristics and balance sheets of a subset of European households renting their main residences. Through our model, we find the correlation between the debt-to-asset ratio, our proposed financial vulnerability indicator, and the stock of social rental housing to be rather small, negative in sign and statistically significant. Moreover, this interdependence seems to be sensible to country-specific characteristics.

The remainder of this paper is structured as follows: section 2 provides an overview of the available literature and lays down the theoretical foundations of this thesis, section 3 gives an account of the available data sources and main descriptive statistics, section 4 describes the methodology, section 5 presents the obtained results, section 6 documents the conducted robustness tests, section 7 discusses the implications of our findings and section 8 concludes.

2 Theoretical Framework

2.1 Concept of Financial Vulnerability

Understanding the factors and behavioral motives that shape the financial well-being of households and their ability to make informed and rational financial decisions has significant policy implications. In recent years and as Badarinza et al. (2016) point out, the field of household finance, understood as the study of “the ways in which households use financial instruments to attain their objectives” (Badarinza et al., 2016, p. 2), has attracted an increasing amount of attention from the literature due to a surge in data availability which has made it increasingly feasible to study household financial decisions in much more detail. As Guiso and Sodini (2012) note, modern structural changes such as the progressive privatization of pension systems, financial innovations and the progressive liberalization of credit markets which has made credit more accessible, have

made households play an even more important role in modern financial decision-making.

Given the relevance in the economy of households as an independent institutional sector, studying their vulnerabilities becomes fundamental. Ampudia et al. (2014) argue that the majority of the wealth in the economy is held by households and it is wealth which ultimately determines lifetime consumption patterns, influencing economic activity and possibly affecting overall financial stability due to their close links with the financial sector. Also, during their lifetime, households constantly need to make decisions regarding matters such as how to pay for their present and future consumption or how to inter-temporally allocate their resources to carry out investments in the form of human capital and also durable goods (Guiso and Sodini, 2012). In the presence of market imperfections, making such decisions entails risks and households do not always have access to the tools and the knowledge in the form of financial literacy to minimize it, making them susceptible to experience economic hardships. On a macro level, this can jeopardize economic stability and pose a considerable danger to the financial sector, as occurred for instance during the Great Recession of 2008.

In the literature, many authors have attempted to capture the full dimension of this issue by using the concept of financial vulnerability. Mauser and Voith (2024) analyze the multiple definitions that have been given to this phenomenon and incorporate psychological and ecological elements to the debate in order to differentiate this concept from other *a priori* related notions such as poverty, financial fragility or economic insecurity, which refer to rather sustained economic issues and deserve a different treatment and measurements. According to these authors, financial vulnerability can be defined as “the (conditional) likelihood to experience financial hardship (in case of a financial shock)” (Mauser and Voith, 2024, p. 7). Put it differently, it refers to the odds that an unforeseen income shock places an individual in a position where maintaining their subsistence becomes difficult.

Fernández-López et al. (2023) sum up and characterize in four categories the ways in which the literature measures financial vulnerability. According to the authors, a first category refers to a set of measurements which differentiate between consumption and saving related issues, and household-debt. The second category distinguishes between objective and self-reported measures. The third category takes into account the number of items used to construct the measures of financial vulnerability and the fourth and last category looks into whether households are financially vulnerable or not, and not the the extent to which they are.

In this thesis we will work with objective measures of financial vulnerability. On the one hand, they abstract from individual biases and are the most used in the literature in the realm of macroprudential policy design. On the other hand, they have the limitation that they may not be able to fully take into account all the financial vulnerability determinants. Although several other indicators have been proposed, the three main standard indicators in the realm of macro-prudential policy design are the debt-service-to-income, the debt-to-asset and the debt-to-income ratios (Albacete et al., 2022), all of which will be defined in detail at a later stage.

2.2 Determinants of Financial Vulnerability

There is a large body of literature dedicated to studying the determinants of financial vulnerability. On a study using survey data from the Eurosystem Household Finance and Consumption Survey (HFCS), Albacete et al. (2022) perform a micro-simulation analysis and find both inflation and interest rate shocks to affect the share of financially vulnerable households in Austria. Using the same data source, Gaigalienė and Kaniauskaitė (2024) find that household liquidity is more relevant than household debt and debt burden when it comes to explaining a household's financial vulnerability in Europe. In an assessment of the financial resilience of households in Italy, Brunetti et al. (2016) highlight the relevance of portfolio choices with respect to the likelihood of experiencing financial hardships. From a broader perspective, in a seminal contribution to household finance theory, Guiso and Sodini (2012) underline the role of household balance sheet composition, risk preferences and beliefs, financial decision-making and borrowing behavior when it comes to determining lifetime wealth.

Anderloni et al. (2012) construct their own measure of financial vulnerability using a Nonlinear Principal Components Analysis (NLPCA) which they later use as independent variable in a linear regression model to analyze the determinants of financial vulnerability by means of survey data extracted from a sample of Italian households. On the one hand, they find a positive correlation between the level of financial vulnerability and the level of debt servicing and impulsivity. On the other hand, they find a negative correlation between the level of financial vulnerability and the level of education. Following the methodology of Anderloni et al. (2012) and using sample data collected in Spain from the Survey of Financial Competences, Fernández-López et al. (2023) also find the level of financial vulnerability of individuals to have a negative correlation with their self-perceived financial literacy level. Also following the same methodology, Daud et al. (2019) use survey data from a sample of Malaysian households and find income level, marital status, age, education attainment and the financial behavior when it comes to money management to be statistically significant determinants of financial vulnerability. In a study aiming at identifying items that contribute to the distress of Australian households, Worthington (2006) find a positive correlation between the number of children and being part of an ethnic minority.

2.3 Social Rental Housing as a Macroprudential Policy Tool

The likelihood of experiencing financial hardships is not the same for every individual. As we've seen, income or education attainment are just some of the variables that influence the chances of being financially vulnerable. Due to their socioeconomic characteristics and the current housing market developments, some members of society find it hard to find an affordable house. According to a document addressing the European Parliament by Pape (2024), between 2010 and 2022 rent prices in the European Union went up by 18% and house prices by 47%. Also 10.6% of people residing in urban areas spent above 40% of their disposable income on housing

related expenditures.

In this study, we will adopt the definition of social rental housing used by the OECD Affordable Housing Database, adopted at the same time by Salvi del Pero et al. (2016), who define it as “residential rental accommodation provided at sub-market prices and allocated according to specific rules rather than according to market mechanisms” (Salvi del Pero et al., 2016, p. 36).

In contrast to other market instruments such as rent controls, which are in principle also conceived to make housing more affordable, the access to social rental housing is means-tested, which ensures that the ones who need it are the ones who can have access to it. However, rent controls can lead to inefficiencies in the form of resource misallocation across demographic sectors (Glaeser and Luttmer, 2003) and a reduction in the total stock of rental properties (Stacy et al., 2024). Also, there seems to be a lack of available data for OECD countries regarding rent control implementations, which makes the study of their impact on households’ financial vulnerability challenging.

Public institutions have many incentives to promote the access to affordable housing to their citizens. Firstly and from a legal perspective, the right to housing is recognized in most European constitutions and by means of the Article 31 of the European Social Charter (Council of Europe, 1996) its signatories agree to “take measures designed: (1) to promote access to housing of an adequate standard; (2) to prevent and reduce homelessness with a view to its gradual elimination; (3) to make the price of housing accessible to those without adequate resources”. Secondly, by guaranteeing access to affordable housing, governments can prevent poverty, allow for opportunity equality (e.g. better access to health services and education), foster labor market inclusion and most importantly with regards to our purposes, reduce household over-indebtedness (Salvi del Pero et al., 2016).

In principle, by making sure that the most vulnerable members of society can have access to affordable housing and therefore pay an amount of rent according to their socioeconomic profile, this would allow them *ceteris paribus* to be more capable of coping with e.g. debt obligations, unexpected expenses or labor-income shocks, reducing their likelihood of experiencing financial hardships. In this sense, social rental housing could be understood as a macroprudential policy tool, as it can have the effect of reducing the systemic risks of the economy.

However, not only the direct beneficiaries of social rental housing may benefit from this mechanism, but also, to some extent, all renters in the economy in a sort of spillover effect. Some scholars like Glaeser and Gyourko (2017) argue that expanding housing supply can help mitigate rising demand and ease the pressure on residential rents through so-called supply side effects. Li (2021) estimates the effect on adjacent residential rents of new high-rise buildings in New York City and report evidence of a 1% decrease in rents for every 10% increase in the stock of housing. In line with Li (2021), Mense (2025) finds in a study for Germany that a housing supply increase of 1% lowers rents by 0,19% on average. These results suggest that supplying more housing can help

mitigate affordability issues.

2.4 The Socioeconomic Outcomes of Social Rental Housing

The literature has studied the welfare outcomes of social housing programs. Schwartz et al. (2005) analyze the impact of subsidized housing projects in New York City through a difference-in-difference methodology and geographically coded data on housing investments. They find that the construction of this type of housing projects contributes to an increase in the price of the properties located in the vicinity and a revitalization of urban neighborhoods by providing new amenities to the community. Using data from the Panel Study of Income Dynamics, Newman and Harkness (2002) find that children growing up in public housing in the US between 1968 and 1982 managed to obtain higher employment rates, increased earnings and lower reliance on welfare benefits during the adulthood. Fauth et al. (2004) studied the impact that a random relocation of families from high-poverty to publicly funded housing units on middle-class income had on their socioeconomic prospects. The move led to better housing quality and satisfaction with the neighborhood, an increase in employment, improved physical health and a lower exposure to violence.

Van Dijk (2018) uses the lottery characteristics of the mechanism used to allocate public housing in The Netherlands to study the socioeconomic outcomes of public housing programs. In contrast to other findings obtained in research conducted for the US, he finds that in The Netherlands moving into public housing is linked with diminished earnings and workforce participation and also a higher need for public assistance, although the effects vary depending on the income attributes of the area where housing is offered, with individuals obtaining better job prospects for those moving into high-income neighborhoods. This result goes in line with Reingold et al. (2001), who find that it is the characteristics of the neighborhood which ultimately determine the lack of for example social capital or participation in the labor market.

2.5 Social Rental Housing Markets in Europe

According to the OECD (2024), there exist significant differences regarding the characteristics in terms of the size of social rental housing markets across Europe, their definition, the eligibility criteria to grant access to citizens to this form of housing, and its providers. It must be noted that not only can public institutions (national and regional authorities) promote the construction of social rental housing by directly providing and funding it themselves, but also by creating the legal framework that generates the necessary incentives for businesses to engage in this activity and thus enlarge the stock of social rental housing.

There are different social rental housing provision models across countries which differ between each other in the presence of the state and other non-profit or limited-profit corporations. Although, in any case, in most countries public institutions are the ones who directly provide the biggest share of social housing stock.

In the upcoming sections and with the help of summary statistics, a more in detail account of the size of the social rental housing stock and its more recent trends in Europe will be provided.

3 Data Sources, Research Design and Summary Statistics

3.1 Data Sources and Research Design

For the purposes of studying the financial vulnerability of European households that rent their main residence, we're going to use the **Eurosystem Household Finance and Consumption Survey (HFCS)**. The HFCS is a multi-country survey which is coordinately conducted by the national banks and relevant statistical institutions of a group of country members of the European Union under the supervision and guidance of the European Central Bank (ECB). The survey has been carried out a total of four times in so-called “waves” in the years 2010, 2014, 2017 and 2021. In this study we're going to use the latest available 2021 wave. This survey was implemented in 21 countries: Belgium, Croatia, Cyprus, Czechia, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Portugal, Slovakia, Slovenia and Spain (Fessler et al., 2023). The information extracted from the questionnaire yields a rich source of microdata at the household level regarding the socioeconomic characteristics, balance sheets and finance and consumption patterns of a statistically significant sample of households for each country. These traits turn this survey into an ideal data source to study household finance related phenomena, such as financial vulnerability, and derive up to a certain extent policy implications at the macro level.

Additionally, the **OECD Affordable Housing Database** provides data regarding housing quality, access and affordability for all the country members of the OECD. Among the many indicators that this database has available, we will use the indicator “PH4.2. Social Rental Housing Stock” (OECD, 2024), which delivers data regarding the share of social rental housing as a share of the total housing stock in a country for the years around 2010 and 2022. In our study we will use the data corresponding to 2022, as it is the one that tracks more closely the 2021 HFCS wave.

In order to combine our two datasets we first need to take a number of factors into consideration. First of all and from a general perspective, not all the countries that participate in the HFCS belong to the OECD and vice versa. This means that we do not have available housing stock data for all the countries that participate in the HFCS. Also, the OECD Affordable Housing Database doesn't provide complete year observations for all the countries that participate in the HFCS and at the same time are part of the OECD. For this reason, our country sample will be limited to 17 countries in total: Austria, Belgium, Czechia, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Latvia, Lithuania, the Netherlands, Portugal, Slovakia, Slovenia and Spain.

Our data has a number of further limitations. Although using survey data from a representative sample of households, such as the case of the HFCS, allows us to a certain extent to draw a significant number of

conclusions about the population, this data lacks the qualities of other indicators extracted, for example, from the national accounts of a country. Also, not all the socioeconomic sectors of the population are represented in this survey in particular, specially the ones at the top end of the income distribution (Fessler et al., 2023), a circumstance which adds difficulties to extracting conclusions regarding an entire country. These are aspects which we will need to take into consideration when interpreting our results.

Another circumstance that we need to take into account is related to the time aspects of our datasets. On the one hand, regarding the HFCS, the surveys that make up the 2021 wave were conducted between the years 2020 and 2022, which means that the COVID-19 pandemic affected the responses at least in terms of response rates and reluctance (Fessler et al., 2023). On the other hand, regarding our housing stock indicator from the OECD Affordable Housing Database, due to methodological issues, although the indicator was intended to be compiled for the years 2010 and 2022, there are differences in the reference years across countries (OECD, 2024). This way, for some countries only the last available year is provided, although it may not correspond to the year 2022, but some year in the vicinity. For our purposes, following the methodological criterion of the OECD and considering that this is to our knowledge the best available data source on the matter, we will make the assumption that the housing stock data on the latest available year is a sufficiently close estimate for the social housing stock in an economy in the year 2022.

3.2 Summary Statistics

We will first focus on the data extracted from the HFCS and that relates to financial vulnerability aspects of the households that rent their main residences in the EU, the sector of the population we aim to study. Following the methodology proposed by Ampudia et al. (2014), we will only use households that are indebted, as they are the ones who pose the most systemic risks to the economy and for which is possible to compute the most widely used financial vulnerability indicators in the literature. For the countries we have selected, Table 1 shows the distribution of indebted and non-indebted renters in the HFCS 2021 wave. In our sample, 4944 out of 13503 households who rent their main residence are indebted, which represents 36.61% of the total. The percentage of indebted households varies greatly across countries, with for example 22,28% in Austria, 50,76% in Spain or 60,20% in Ireland. Overall, the figures reveal a high degree of heterogeneity. Ampudia et al. (2014) attribute this heterogeneity to different factors such as unequal levels of financial deepening, differences in institutional settings or policy measures, tax incentives for indebted households or, more generally, to the various risk attitudes towards indebtedness among individuals.

Table 1. Distribution of Renters and Indebted Renters
Across Countries in the HFCS 2021 wave

Country	Renters	Indebted	% Indebted
Austria	1131	252	22.28
Belgium	544	177	32.54
Czechia	453	102	22.52
Germany	1541	508	32.97
Estonia	196	83	42.35
Spain	920	467	50.76
Finland	1969	1127	57.24
France	2590	884	34.13
Hungary	629	154	24.48
Ireland	912	549	60.20
Italy	785	154	19.62
Lithuania	54	9	16.67
Latvia	125	61	48.80
Netherlands	946	239	25.26
Portugal	447	104	23.27
Slovenia	148	35	23.65
Slovakia	113	39	34.51
<i>Total</i>	13503	4944	36.61

Data: HFCS 2021 wave. Own calculations.

Following a similar figure design to that of Albacete et al. (2022), figure 1 shows, for each country, an overview of the share of financially vulnerable households as a percentage of the total amount of indebted households according to the three main financial vulnerability indicators most predominantly present in the literature: the **debt-to-asset ratio**, the **debt-to-income ratio** and the **debt-service-to-income ratio**.

The debt-to-asset ratio (DODARATIO) is defined as the ratio between the total liabilities and the total gross assets of a household. It measures a household's overall solvency position (Ampudia et al., 2014). Albacete et al. (2022) categorize a household as financially vulnerable if this ratio is above or equal to 0.75. In total, 39.9% of the households in our sample can be categorized as financially vulnerable according to this indicator, with France being the country with the lowest percentage (18.7%) and Czechia the one with the highest percentage (59.8%). Table 11 (see appendix) shows the summary statistics for this ratio. In total, we can see that the median debt-to-asset ratio for our sample is 0.45. The country with the highest median debt-to-asset ratio is again Czechia with 1.19 and the one with the lowest is Lithuania with 0.17.

The debt-to-income ratio (DODIRATIO) is defined as the ratio between the total liabilities and the total gross household income. It measures the years that a household would need to generate income to repay its entire liabilities (Ampudia et al., 2014). Albacete et al. (2022) define a household to be financially vulnerable if this ratio is above or equal to 4. Following this criterion, only a total of 4% of households in our sample can be categorized as financially vulnerable, with the Netherlands being the country with a higher percentage of

financially vulnerable households according to this criterion (17.6%) and three countries -Lithuania, Latvia and Slovenia- not registering any financially vulnerable households according to this metric. Table 12 (see appendix) shows the summary statistics for this ratio. In total, we can see that the median debt-to-income ratio for our sample is of 0.19, with the Netherlands having the highest median (0.30) and Lithuania having the lowest (0.04).

The debt-service-to-income ratio (DODSTOTAL) is defined as the ratio between the total monthly debt payments and the gross monthly income of a household. This indicator shows the ability of a household to repay its liabilities without liquidating or selling their assets and reflects how able a household is to timely repay its debt (Ampudia et al., 2014). Albacete et al. (2022) consider a household to be financially vulnerable when this ratio takes values greater or equal to 0.4. A total of 3.6% of households can be characterized as financially vulnerable, with the Netherlands again registering the highest percentage and Slovenia and Portugal registering 0%. Table 13 (see appendix) provides the descriptive statistics for this ratio. In total, we can see that the median debt-service-to-income ratio for our sample is of 0.04, with Spain and France registering the highest median values with 0.09 each.

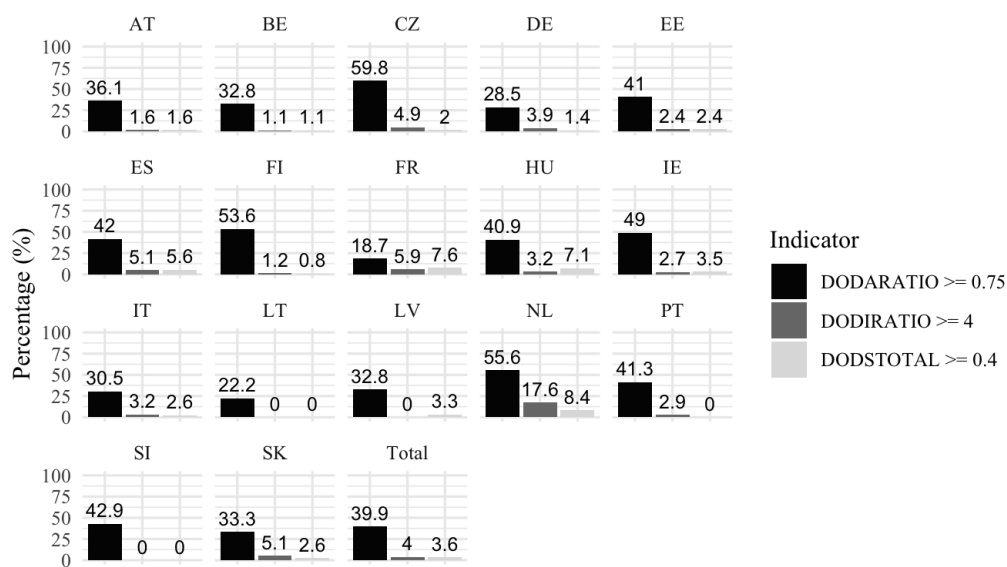


Figure 1. Percentage of Indebted Households that are Financially Vulnerable

Data: HFCS 2021 wave. Own calculations.

As we can tell from the standard deviations and minimum and maximum values on tables 11, 12 and 13 there's a notable presence of outliers. This circumstance can be mostly but not entirely attributed to the methodology followed by the HFCS, which imputes a total of five times all the observations for each household and variable. In subsequent sections, the presence of these observations in our sample will be addressed.

Now we continue with the data regarding the stock of social rental housing extracted from the OECD Affordable Housing Database. Figure 2 depicts the percentage of social rental dwellings as a share of the total

housing stock around the years 2010 and 2022 for the 17 countries we are considering. As we can see, The Netherlands and Austria clearly stand out as the two countries with the highest social rental housing provision, distantly followed by countries like Finland, France and Ireland, which clearly exceed the 10% share. The provision of social rental housing in the other countries in our sample is clearly below 10%, with countries like Spain or Estonia barely exceeding 1%. Except for France and the Slovak Republic, which saw an increase in the share over the considered period, the other countries for which data around both years is available have all experienced a decrease in the share of social rental housing as a share of total housing stock.

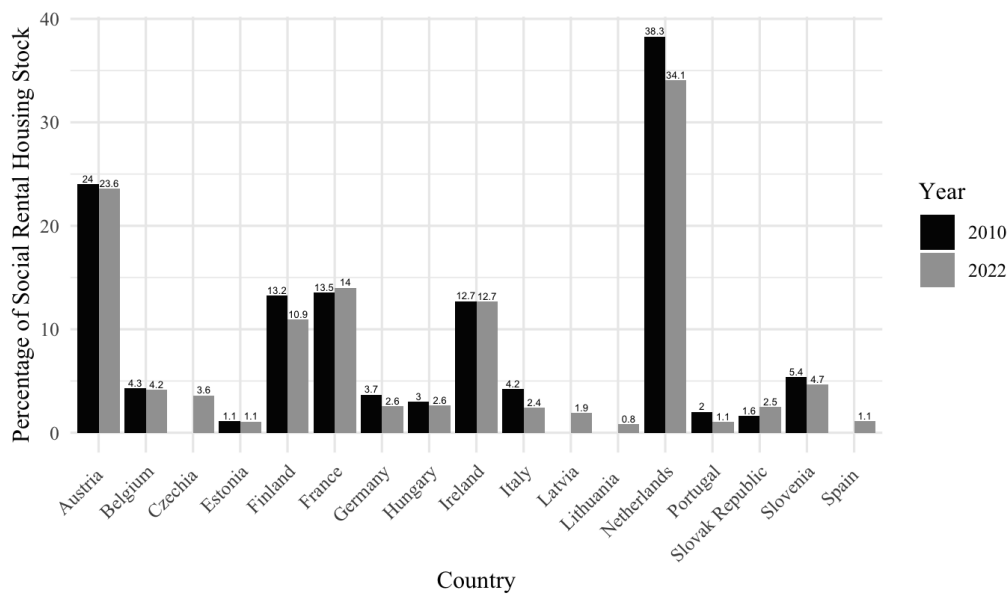


Figure 2. Percentage of Social Rental Dwellings Around the Years 2010 and 2022
Data: OECD Affordable Housing Database.

A useful thing to do to put this data into perspective is to compare how the provision of social rental housing has evolved compared to how the population has grown over the years. This should tell us whether countries are being able to adapt the stock of social rental housing to the size of their population. Table 2 summarizes the results for all the countries in our sample. Years marked with (*) are years for which the OECD doesn't have data available on the number of social rental dwellings.

As we can see, the population has grown in 10 out of the 17 countries in the sample. Due to data availability, it is only possible to compute the percentage growth in social rental dwellings for 12 countries. In The Netherlands, Finland, Slovenia, Germany and Portugal, although a population growth was observed, the provision of social rental housing decreased. In Austria, France, Ireland, Belgium, and Slovakia the increase in population was followed by an increase in their the provision. Nevertheless, the increases were not of the same size in all countries. In contrast to the already mentioned countries, Hungary and Estonia both saw their populations decline. However, the provision of social rental dwellings increased in Estonia and declined in Hungary.

Table 2. Comparison Between Population Growth and Social Rental Dwellings Growth

Country	Period	Population Growth (%)	Social Rental Dwellings Growth (%)
Austria	2010-2019	6,18	7,09
Belgium	2010-2018	4,66	4,94
Czechia	2010*-2021	-0,16	NA
Germany	2011-2021	3,64	-26,11
Estonia	2013-2017	-0,05	1,32
Spain	2010*-2019	1,17	NA
Finland	2010-2021	3,31	-6,25
France	2012-2018	2,63	11,65
Hungary	2011-2018	-1,84	-10,85
Ireland	2010-2016	4,06	0,23
Italy	2010*-2022	-1,47	NA
Lithuania	2010*-2020	-9,76	NA
Latvia	2010*-2016	-6,58	NA
Netherlands	2012-2021	4,64	-4,07
Portugal	2011-2021	-1,58	-46,58
Slovenia	2011-2018	0,86	-12,33
Slovakia	2011-2021	0,81	73,19

Data: OECD Affordable Housing Database and OECD Historical Population Database.

Years marked with an asterisk (*) indicate missing data on social rental dwellings.

Own calculations.

Table 3 shows the evolution of social rental dwellings per capita in the period covering approximately the years 2010 to 2022. This analysis is useful because it allows us to gain a deeper perspective into what changes in the provision of social rental housing overtime mean relative to the population size. Only Austria, France and Slovakia have managed to increase the stock of social rental housing present in their economies with respect to the size of the population. A total of 7 countries such as Finland or Germany show a decline, with the Netherlands registering the largest drop. Countries marked with NA indicate that the OECD doesn't have data available on the number of social rental dwellings for that same time period.

Table 3. Social Rental Dwellings Per Capita Around 2010 and 2022

Country	Around 2010	Around 2022	Δ
Austria	0.104	0.105	0.001
Belgium	0.027	0.027	0.000
Czechia	NA	0.018	NA
Germany	0.019	0.013	-0.005
Estonia	0.006	0.006	0.000
Spain	NA	0.006	NA
Finland	0.069	0.063	-0.006
France	0.070	0.076	0.006
Hungary	0.013	0.012	-0.001
Ireland	0.056	0.054	-0.002
Italy	NA	0.014	NA
Lithuania	NA	0.004	NA
Latvia	NA	0.010	NA
Netherlands	0.169	0.155	-0.014
Portugal	0.011	0.006	-0.005
Slovenia	0.022	0.019	-0.003
Slovakia	0.006	0.010	0.004

Data: OECD Affordable Housing Database and OECD Historical Population Database.
Own calculations.

4 Methodology

4.1 Anderloni et al. (2012)'s Linear Regression Model of Financial Vulnerability

In order to study the link between the stock of social rental housing in an economy and the financial vulnerability of its households, we will take the linear regression model on the determinants of financial vulnerability proposed by Anderloni et al. (2012) as reference. Taking into account the main aim of our study, and factors such as data availability issues and further considerations, we will introduce modifications to this model accordingly.

As dependent variable, Anderloni et al. (2012) use a self-constructed financial vulnerability index (FVI_i) computed using a Non-linear Component Analysis (NLPCA). Five specific questions of their questionnaire in which self-reported information regarding different dimensions of financial vulnerability (e.g. ability to cope with unexpected expenses or to make ends meet) was collected were used to compute it. Variables of different nature were used as regressors. Two variables related to household financial debt were considered: the logarithm of the debt-service-to-income ratio ($\log(dodstotal)_i$) and a dummy variable accounting for the presence of unsecured debt ($unsecdebt_i$) i.e. non-collateralised liabilities on the household's balance sheet. The inverse sine hyperbolic transformation of the monthly household income ($ihsincome_i$) and the household's financial wealth ($wealth_i$) were used as a measure for the financial resources of the household. Using additional dummy variables, the authors also controlled for the level of financial literacy ($finliteracy_i$), the possession of an insurance policy ($insurance_i$) the impulsivity level ($impulsivity_i$), as well as adverse shocks such as a job loss

(*jobloss_i*) or an illness (*othershock_i*). Lastly, they introduced other socioeconomic variables such as marriage status dummies (e.g. *single_i*), the years of education (*yearsofedu_i*), the number of children (*childnum_i*), home tenure status (*homeown_i* and *homerent_i*) and dummy variables regarding the location of the household within Italy (e.g. *northwest_i*). All things considered and omitting interaction terms, the full Anderloni et al. (2012)'s model specification is the following:

$$\begin{aligned}
 FVI_i = & \beta_0 + \beta_1 \log(dodstotal)_i + \beta_2 unsecdebt_i + \beta_3 finliteracy_i + \beta_4 impulsivity_i \\
 & + \beta_5 jobloss_i + \beta_6 othershock_i + \beta_7 wealth_i + \beta_8 ihsincome_i + \beta_9 single_i \\
 & + \beta_{10} widow_i + \beta_{11} separate_i + \beta_{12} divorced_i + \beta_{13} childnum_i + \beta_{14} age_i \\
 & + \beta_{15} gender(fem)_i + \beta_{16} yearsofedu_i + \beta_{17} homeown_i + \beta_{18} homerent_i \\
 & + \beta_{19} northwest_i + \beta_{20} northeast_i + \beta_{21} south_i + \beta_{22} insurance_i + \varepsilon_i
 \end{aligned}$$

4.2 Econometric Specification

In contrast to the model of Anderloni et al. (2012), we will use the debt-to-asset ratio financial vulnerability measure of the household i in country k (DtA_{ik}) as dependent variable. On the one hand, the HFCS doesn't include the questions in their questionnaire that Anderloni et al. (2012) used to construct their financial vulnerability index. On the other hand, these questions elicit self-reported information i.e. information that relies on the respondent's subjective perception of their current financial situation, which is likely to be influenced by biases. Indicators such as the debt-to-asset ratio aren't affected by this trait given their objective numerical nature. Also, the debt-to-asset ratio is a widely used and accepted financial vulnerability measure in the literature which additionally allows us to use income related variables as independent variables and not come across endogeneity issues, something that wouldn't be feasible if we used the debt-to-income or the debt-service-to-income ratio as dependent variables, which in our sample also don't present the same level of variability as the debt-to-asset ratio.

Regarding our independent variables, our main variable of interest and the main novelty of our analysis is the introduction of the stock of social rental dwellings in country k ($SRDS_k$). Furthermore, although the HFCS collects data on financial literacy, due to the lack of available data for our specific sample, we will use the education level of the household's reference person ($edurefperson_{ik}$) as a proxy for their level of financial literacy. I base this aspect of my methodology on the findings of Fernández-López et al. (2023), who find a positive correlation between financial literacy and education attainment. This variable represents the highest level of completed education of the reference person and takes ascending values ranging from 1 to 8, where "1" is associated with primary or no formal education and "8" is associated with a doctoral or parallel level.

Throughout the sample and for some variables, I will use data regarding the reference person of a household,

as this person represents the most financially knowledgeable member of a household and usually corresponds with the individual that earns the highest share of income. The HFCS determines who the reference person is depending on how the household is structured from a financial point of view.

Because we lack the data in our survey to explore the effect of a job loss, we are instead going to use the labor status of the reference person as variable of interest. This is a coded variable that takes values from 1 to 5, with 1 being an employee, 2 self-employed (*selfemployed_{ik}*), 3 unemployed (*unemployed_{ik}*), 4 retired (*retired_{ik}*) and 5 other labor status (*other_{ik}*). We will compare our estimates with respect to being employed. Relatedly, we have also introduced dummy variables regarding the marriage status of the reference person. This variable takes values from 1 to 5, with 1 being single, 2 married (*married_{ik}*), 3 consensual union (*consensualunion_{ik}*), 4 widowed (*widowed_{ik}*) and 5 divorced (*divorced_{ik}*). We will compare our coefficients with respect to being single. Additionally, we are also going to control for the number of children in the household (*numofchildren_{ik}*), the age of the reference person (*agerefperson_{ik}*) and a dummy variable indicating whether the reference person is female (*femalerefperson_{ik}*).

Regarding the financial variables of our model, we have also included the logarithm of the debt-service-to-income ratio ($\log(\text{dodstotal})_{ik}$), the inverse sine hyperbolic transformation of the total household gross annual income (*ihsincome_i*), the household's net wealth (*wealth_i*), dummy variables controlling for the presence of unsecured non-collateralised debt (*unsecdebt_{ik}*) and whole life insurance (*insurance_{ik}*). The reason why the total household gross income has been chosen in annual instead of monthly terms is because I interpret it to be a better measure of the financial resources available to the household. This same metric was also used by Fernández-López et al. (2023) and it's been expressed in inverse sine hyperbolic terms following the methodology of Anderloni et al. (2012).

As behavioral variable, we have also included the impatience level of the household. The HFCS measures the impatience level by how much the respondent would be willing to give up of a lottery win equivalent to the household's yearly income in order to receive the money now instead of waiting a year. The variable is coded from 1 to 5 (most to least impatience), 1 meaning that the respondent would be willing to give up 20% of the win, 2 equivalent to give up 10% of the win (*imp10percent_{ik}*), 3 to give up 5% (*imp5percent_{ik}*), 4 to give up 2% (*imp2percent_{ik}*) and 5 equivalent to giving up nothing (*impnothing_{ik}*). We will compare our estimates to the most impatient category. Lastly, we will control for the unobserved country heterogeneity and other confounding factors (different institutions, legislation, customs, etc.) by including country fixed-effects in the model (λ_k). The OLS regression results of the model specifications that include country fixed-effects will be presented separately.

The model will be estimated using Ordinary Least Squares (OLS) with robust standard errors after conducting Breusch-Pagan tests in all our model specifications and confirming the presence of linear forms of heteroskedasticity. The statistical software R (R Core Team, 2024) has been used to carry out all the computations.

Our full econometric specification can be expressed as follows:

$$\begin{aligned}
DtA_{ik} = & \beta_0 + \beta_1 SRDS_k + \beta_2 \log(dodstotal)_{ik} + \beta_3 edurefperson_{ik} + \beta_4 selfemployed_{ik} \\
& + \beta_5 unemployed_{ik} + \beta_6 retired_{ik} + \beta_7 other_{ik} + \beta_8 unsecdebt_{ik} + \beta_9 imp10percent_{ik} \\
& + \beta_{10} imp5percent_{ik} + \beta_{11} imp2percent_{ik} + \beta_{12} impnothing_{ik} + \beta_{13} networth_{ik} \\
& + \beta_{14} ihsgrossincome_{ik} + \beta_{15} married_{ik} + \beta_{16} consensualunion_{ik} + \beta_{17} widowed_{ik} \\
& + \beta_{18} divorced_{ik} + \beta_{19} numofchildren_{ik} + \beta_{20} agerefperson_{ik} + \beta_{21} femalerefperson_{ik} \\
& + \beta_{22} insurance_{ik} + \lambda_k + \varepsilon_i
\end{aligned}$$

Finally, in order to correct for the presence of outliers, we have omitted the top and bottom 1% observations. Table 4 shows the amount of indebted renters across countries in our sample after correcting for the presence of outliers.

Table 4. Distribution of Indebted Renters Across Countries Corrected for the Presence of Outliers

Country	Indebted Renters
Austria	63
Belgium	73
Czechia	44
Germany	229
Estonia	35
Spain	264
Finland	496
France	647
Hungary	58
Ireland	300
Italy	78
Latvia	35
Netherlands	69
Portugal	57
Slovenia	14
Slovakia	15
<i>Total</i>	<i>2477</i>

Data: HFCS 2021 wave. Own calculations.

5 Results

Table 5 shows the OLS regression results of five different model specifications which have been estimated in order to see whether the omission or inclusion of certain variables affects the robustness of our results. Our specifications mirror as much as possible those proposed by Anderloni et al. (2012) in order to allow for result comparability.

Table 5. OLS Regression Results.

VARIABLES	(1)	(2)	(3)	(4)	(5)
	DODARATIO	DODARATIO	DODARATIO	DODARATIO	DODARATIO
srds_percentage_total	−0.001*** (0.0004)	−0.002*** (0.0004)	−0.002*** (0.0004)	−0.002*** (0.0004)	0.003*** (0.001)
log_dodstotal	0.056*** (0.003)	0.068*** (0.003)	0.068*** (0.002)	0.062*** (0.003)	0.127*** (0.010)
edurefperson			0.003 (0.002)	0.0004 (0.002)	−0.006 (0.007)
selfemployed		−0.046*** (0.010)	−0.047*** (0.010)	−0.042*** (0.011)	−0.065** (0.023)
unemployed		0.012 (0.014)	0.012 (0.014)	0.008 (0.014)	−0.016 (0.054)
retired		0.065*** (0.012)	0.065*** (0.012)	0.068*** (0.012)	0.024 (0.028)
other		0.181*** (0.014)	0.181*** (0.014)	0.175*** (0.014)	0.060 (0.046)
unsecdebt				−0.139*** (0.011)	−0.073*** (0.028)
imp10percent					0.012 (0.026)
imp5percent					−0.021 (0.026)
imp2percent					−0.047* (0.027)
impnothing					−0.089*** (0.021)
networth	−0.00000*** (0.00000)	−0.00000*** (0.00000)	−0.00000*** (0.00000)	−0.00000*** (0.00000)	−0.00000*** (0.00000)
ihs_grossincome	0.046*** (0.005)	0.068*** (0.005)	0.067*** (0.005)	0.063*** (0.005)	0.067*** (0.013)
married	0.009 (0.008)	0.009 (0.008)	0.010 (0.008)	0.013* (0.008)	−0.024 (0.020)
consensualunion	−0.075*** (0.013)	−0.072*** (0.014)	−0.072*** (0.013)	−0.076*** (0.013)	−0.093** (0.029)
widowed	0.013 (0.018)	0.001 (0.019)	0.002 (0.019)	−0.001 (0.019)	0.030 (0.048)
divorced	0.022** (0.009)	0.029*** (0.009)	0.029*** (0.009)	0.028*** (0.009)	0.010 (0.025)
numofchildren	−0.002 (0.004)	0.001 (0.004)	0.002 (0.004)	0.001 (0.004)	0.009 (0.011)
agerefperson	−0.003*** (0.0002)	−0.004*** (0.0003)	−0.004*** (0.0003)	−0.004*** (0.0003)	−0.003*** (0.001)
femalerefperson	−0.011* (0.006)	−0.010* (0.006)	−0.011* (0.006)	−0.011* (0.006)	−0.040** (0.016)
insurance	−0.064*** (0.006)	−0.064*** (0.006)	−0.064*** (0.007)	−0.064*** (0.006)	−0.066*** (0.016)
Constant	0.261*** (0.054)	0.051 (0.055)	0.052 (0.055)	0.231*** (0.056)	0.296* (0.147)
Observations	10,664	10,664	10,664	10,664	1,439
R ²	0.162	0.179	0.180	0.192	0.285
Adjusted R ²	0.161	0.178	0.178	0.190	0.274
Residual Std. Error	0.297	0.294	0.294	0.292	0.274
F Statistic	171.494***	145.577***	137.083***	140.230***	25.676***

Data: HFCS 2021 wave and OECD Affordable Housing Database.

Note: *p<0.1; **p<0.05; ***p<0.01.

Across specifications (1) to (4) of the model, we can see how, all else equal, a 1% increase in the stock of social rental housing in the economy of country k is associated with an statistically significant decline in the debt-to-asset ratio of household i of 0.1% for specification (1) and 0.2% for specifications (2) - (4). With respect to the first specification, specification (2) includes the employment status of the reference person, specification (3) adds the education attainment of the reference person and specification (4) additionally includes the dummy variable controlling for the presence of unsecured debt in the household's balance sheet. In contrast, all else

equal, after controlling for the impatience level of the household in specification (5), a 1% increase in the stock of social rental housing in country k is correlated with a 0.3% increase in the debt-to-asset ratio. This coefficient is also statistically significant. However, after adding the impatience level of the household and due to data availability, we lose around 86.50% of the observations used to estimate specifications (1) - (4) and we also get higher standard deviations for all our coefficients, factors which make the estimations less precise and pose doubts regarding the robustness of this result.

With regards to the explanatory power of our model, around 16.2% of the variability of the debt-to-asset ratio is explained by the independent variables of specification (1), 17.9% and 18.0% in specifications (2) and (3) respectively, 19.2% in specification (4) and 28.5% in the last specification. By observing the adjusted R^2 values, we can see how adding regressors adds progressively more explanatory power to our model, although the relatively big jump in value of this parameter in specification (5) is most likely due to the loss of data points, as the F Statistic for this model is, though statistically significant, considerably smaller than in specifications (1) - (4).

If we now focus on the remaining independent variables of our model, we can first observe how, across all five specifications, a 1% increase in the debt-service-to-income ratio is associated with an increase in the debt-to-asset ratio of between 0.00056 in specification (1), 0.00068 in specifications (2) and (3), 0.00062 in specification (4) and 0.00127 in specification (5). All coefficients are statistically significant and are similar in size and sign to the ones obtained by Anderloni et al. (2012), pointing towards the role of this metric in, though marginally, heightening the financial vulnerability of households.

Regarding the labor status of the reference person, with respect to being an employee, being self-employed is associated with an statistically significant decrease in the level of financial vulnerability across specifications (2) to (5). However, being retired or having other labor status is linked to experiencing higher levels of financial vulnerability. The coefficients of these variables are statistically significant in all model specifications except specification (5). Lastly, the effect of being unemployed with respect to being an employee is not statistically significant in any of our specifications.

Holding unsecured debt is correlated with experiencing lower levels of financial vulnerability in specifications (4) and (5), which is a result that doesn't go in line with what we would expect. Also, the net worth of the household doesn't have any effect on its financial vulnerability and higher levels of income seem to be correlated with higher levels of financial vulnerability. These results come in sharp contrast with the ones obtained by Anderloni et al. (2012).

Specification (5) includes the impatience level of the respondent. Compared to the most impatient individuals in the sample, the coefficients corresponding to not giving up any lottery win and 2% of the lottery are negative and statistically significant. This way, being less impatient is correlated with experiencing lower levels of

financial vulnerability, which is a result that goes in line with the literature.

When it comes to the marital status of the reference person, with respect to being single, being on a consensual union is correlated with a statistically significant decrease in the level of financial vulnerability across all specifications and being divorced with a statistically significant increase in all specifications except on the fifth. This last result goes in line with the one obtained by Anderloni et al. (2012). Nevertheless, the effects of being married or widowed with respect to being single aren't statistically significant. Only being married is statistically significant and positive at the 10% level on the fourth specification.

Regarding the remaining independent variables, the number of children of the household is not a statistically significant variable, although the age of the reference person has an statistically significant effect on the household's financial vulnerability across all specifications, with older individuals being subject to experience lower levels of financial vulnerability. Being a female reference person is also correlated with having lower debt-to-asset ratios, with the variable being statistically significant at least at the 10% level across all specifications. Lastly, holding a whole life insurance is a statistically significant variable across all five specifications and is associated with lower debt-to-asset ratios.

To facilitate the readability of the regression results of our five model specifications after introducing country fixed-effects, the regression outputs have been split into tables 6 (specifications (1) to (4)) and 7 (specification (5)). Austria has been taken as the country of reference. The coefficients for the country fixed-effects of Slovakia are not reported due to data missingness. If we take a look at our main variable of interest, the stock of social rental housing in country k , we can see how, after introducing fixed-effects, the significance of the coefficients has dropped. In specification (1) the coefficient is not statistically significant and in specifications (2) to (5) the coefficients are only significant at the 10% confidence level. A 1% increase in the stock of social rental housing is correlated with a 0.4% percent decrease in the debt-to-asset ratio in specifications (2) to (4) and in specification (5) the coefficient signals a 12.8% decrease in the debt-to-asset ratio. Again, we have reasons to believe that the results obtained in specification (5) are not robust due to the missing observations. In short, we can conclude that my main variable of interest is sensible to the introduction of country fixed effects, signaling them as a confounding factor.

In terms of the fit of the model, overall, we can observe how the explanatory power of the model has increased after introducing country fixed-effects, with R^2 values ranging from 21.1% in specification (1) to 28.8% in specification (5). However, if we consider the adjusted R^2 values, we can see how introducing additional variables doesn't increase the explanatory power of the model, a circumstance that is clearly apparent in specifications (2) to (4), which all register the same adjusted R^2 value of 21.8%.

Table 6. OLS Regression Results with Country Fixed-Effects for Specifications (1) - (4)

	<i>Dependent variable: DODARATIO</i>			
	Model 1	Model 2	Model 3	Model 4
srds_percentage_total	−0.003 (0.002)	−0.004* (0.002)	−0.004* (0.002)	−0.004* (0.002)
log_dodstotal	0.076*** (0.003)	0.082*** (0.003)	0.082*** (0.003)	0.076*** (0.003)
edurefperson			0.001 (0.002)	−0.001 (0.002)
selfemployed		−0.052*** (0.010)	−0.052*** (0.010)	−0.048*** (0.010)
unemployed		−0.001 (0.014)	−0.001 (0.014)	−0.007 (0.014)
retired		0.055*** (0.012)	0.055*** (0.012)	0.058*** (0.012)
other		0.123*** (0.015)	0.123*** (0.015)	0.115*** (0.015)
unsecdebt				−0.136*** (0.010)
networth	−0.00000*** (0.00000)	−0.00000*** (0.00000)	−0.00000*** (0.00000)	−0.00000*** (0.00000)
ihs_grossincome	0.026*** (0.005)	0.045*** (0.005)	0.045*** (0.005)	0.039*** (0.005)
married	0.005 (0.008)	0.002 (0.007)	0.003 (0.008)	0.006 (0.007)
consensualunion	−0.011 (0.014)	−0.014 (0.014)	−0.014 (0.014)	−0.019 (0.013)
widowed	0.013 (0.017)	0.001 (0.017)	0.002 (0.017)	−0.00003 (0.017)
divorced	0.014 (0.009)	0.019* (0.009)	0.019* (0.009)	0.019* (0.009)
numofchildren	0.011** (0.004)	0.013*** (0.004)	0.013*** (0.004)	0.012*** (0.004)
agerefperson	−0.003*** (0.0002)	−0.003*** (0.0003)	−0.003*** (0.0003)	−0.003*** (0.0003)
femalerefperson	−0.010 (0.006)	−0.008 (0.006)	−0.009 (0.006)	−0.010 (0.006)
insurance	−0.047*** (0.006)	−0.047*** (0.006)	−0.047*** (0.006)	−0.047*** (0.006)
factor_be	−0.073 (0.038)	−0.104** (0.039)	−0.103** (0.039)	−0.097* (0.039)
factor_cz	0.018 (0.043)	0.008 (0.044)	0.009 (0.044)	−0.002 (0.044)
factor_de	−0.022 (0.039)	−0.044 (0.040)	−0.044 (0.040)	−0.036 (0.040)
factor_ee	−0.122* (0.047)	−0.133** (0.048)	−0.133** (0.048)	−0.122* (0.048)
factor_es	−0.081 (0.042)	−0.095* (0.043)	−0.094* (0.043)	−0.085* (0.043)
factor_fi	0.073** (0.025)	0.047 (0.026)	0.047 (0.026)	0.055* (0.025)
factor_fr	−0.120*** (0.020)	−0.126*** (0.020)	−0.126*** (0.020)	−0.120*** (0.020)
factor_hu	−0.119** (0.043)	−0.122** (0.044)	−0.123** (0.044)	−0.121** (0.044)
factor_it	−0.043 (0.041)	−0.054 (0.042)	−0.053 (0.042)	−0.045 (0.042)
factor_lv	−0.212*** (0.043)	−0.218*** (0.044)	−0.218*** (0.044)	−0.213*** (0.044)
factor_nl	0.095** (0.036)	0.114** (0.036)	0.113** (0.036)	0.109** (0.036)
factor_pt	−0.087 (0.045)	−0.097* (0.046)	−0.096* (0.046)	−0.101* (0.046)
factor_si	−0.146*** (0.043)	−0.158*** (0.044)	−0.158*** (0.044)	−0.144*** (0.044)
factor_sk				
Constant	0.565*** (0.068)	0.406*** (0.070)	0.406*** (0.070)	0.588*** (0.070)
Observations	10,664	10,664	10,664	10,664
R ²	0.211	0.220	0.220	0.220
Adjusted R ²	0.209	0.218	0.218	0.218
Residual Std. Error	0.288 (df=10638)	0.287 (df=10634)	0.287 (df=10633)	0.285 (df=10632)
F Statistic	113.793*** (df=25;10638)	103.713*** (df=29;10634)	100.251*** (df=30;10633)	103.571*** (df=31;10632)

Data: HFCS 2021 wave and OECD Affordable Housing Database. *p<0.1; **p<0.05; ***p<0.01

If we now focus on the remaining explanatory variables, we can observe how the coefficients of variables such as the logarithm of the debt-service-to-income ratio, the inverse hyperbolic sine transformation of the gross annual income, the dummy variables indicating self-employed reference persons, the presence of unsecured debt and the impatience levels in specification (5) all remain statistically significant and with the same sign. The coefficients for variables indicating households with reference persons in consensual union, divorced, retired and of female gender have lost statistical significance after the introduction of country fixed-effects. However, the coefficient for the number of children in the household has gained statistical significance. This suggests that, although some degree of robustness can be observed, many of the estimated effects are likely to be driven by between-country differences and not within-country variation.

Table 7.
OLS Regression Results with Country Fixed-Effects for Specification (5)

<i>Dependent variable:</i> DODARATIO			
srds_percentage_total	−0.128*	married	−0.016 (0.021)
log_dodstotal	0.128***	consensualunion	−0.065* (0.032)
edurefperson	−0.005 (0.007)	widowed	0.035 (0.048)
selfemployed	−0.070** (0.023)	divorced	0.016 (0.026)
unemployed	−0.020 (0.054)	numofchildren	0.010 (0.011)
retired	0.021 (0.030)	agerefperson	−0.002** (0.001)
other	0.062 (0.047)	femalerefperson	−0.043** (0.016)
imp10percent	0.011 (0.028)	insurance	−0.064*** (0.017)
imp5percent	−0.024 (0.025)	factor_ee	−0.380 (0.208)
imp2percent	−0.051 (0.031)	factor_it	−0.225 (0.127)
impnothing	−0.088*** (0.021)	factor_nl	3.944* (1.901)
unsecdebt	−0.070*** (0.021)	factor_pt	−0.397 (0.209)
networth	−0.00000*** (0.00000)	Constant	0.827* (0.340)
ihs_grossincome	0.067*** (0.014)	Observations	1,439
		R ²	0.288
		Adjusted R ²	0.275
		Residual Std. Error	0.274 (df = 1412)
		F Statistic	21.929*** (df = 26; 1412)

Data: HFCS 2021 wave and OECD Affordable Housing Database.

Note: *p<0.1; **p<0.05; ***p<0.01

With regards to the country fixed-effects coefficients, we can see how, although not all of them are statistically significant across specifications, the fact that many of them are, justifies their inclusion and reaffirms our belief that there exists some degree of unobserved country heterogeneity. Figures 3 to 7 (see appendix) plot the coefficients for the country fixed effects for an easier overview.

6 Robustness Tests

Heteroskedasticity

In order to confirm that our model delivers reliable estimates, the Breusch-Pagan (BP) test has been carried out to test for the presence of linear forms of heteroskedasticity. This test examines whether or not the squared residuals from a regression are systematically related to the independent variables (Breusch and Pagan, 1979). The results for the BP test in all our considered specifications are displayed in table 8 below:

Table 8. Breusch-Pagan Test Results for all Model Specifications

Specification	Without Country FE		With Country FE	
	BP Statistic	P-value	BP Statistic	P-value
(1)	437.71	2.2e-16	485.89	2.2e-16
(2)	380.51	2.2e-16	494	2.2e-16
(3)	378.85	2.2e-16	494.92	2.2e-16
(4)	364.24	2.2e-16	494.33	2.2e-16
(5)	121.15	1.077e-15	143.43	2.2e-16

Own calculations.

The results of the BP test clearly suggest the presence of heteroskedasticity across all our model specifications. In order to address this circumstance, all the models in this study have been estimated using heteroskedasticity-consistent (HC) standard errors of the first type (HC1) to correct for standard error bias (Wooldridge, 2010).

Specification (4) estimated using the Sample of Specification (5)

To further assess the robustness of the estimated coefficients in tables 5, 6 and 7, specification (4) of our model has been re-estimated using the reduced sample size of specification (5), for which data on the household's impatience level is available. By holding the econometric specification constant and altering the sample, we can check whether changes in sample size and the inclusion of country fixed-effects have an effect on our results. Table 9 below shows a side-to-side comparison of the estimation results with the different sample sizes without including country fixed-effects.

Table 9.
Specification (4) estimated on Different Samples - Without Country FE

	Dependent variable: DODARATIO	Dependent variable: DODARATIO			
srds_percentage_total	0.003*** (0.001)	-0.002*** (0.0004)	married	-0.016* (0.020)	-0.013* (0.008)
log_dodstotal	0.128*** (0.009)	0.062*** (0.003)	consensualunion	-0.092*** (0.030)	-0.076*** (0.013)
edurefperson	-0.008*** (0.007)	0.0004 (0.002)	widowed	0.033 (0.050)	-0.001 (0.019)
selfemployed	-0.044*** (0.023)	-0.042*** (0.011)	divorced	0.024** (0.025)	0.028** (0.009)
unemployed	-0.009 (0.057)	0.008 (0.014)	numofchildren	0.003 (0.011)	0.001 (0.004)
retired	0.020 (0.028)	0.068*** (0.012)	agerefperson	-0.002*** (0.001)	-0.004*** (0.0003)
other	0.053*** (0.045)	0.175*** (0.014)	femalerefperson	-0.046*** (0.016)	-0.011* (0.006)
unsecdebt	-0.072*** (0.021)	-0.139*** (0.011)	insurance	-0.083*** (0.016)	-0.064*** (0.006)
networth	-0.00000*** (0.00000)	-0.00000*** (0.00000)	Constant	0.287*** (0.151)	0.231*** (0.056)
ihg_grossincome	0.064*** (0.013)	0.063*** (0.005)	Observations	1,439	10,664
			R ²	0.271	0.192
			Adjusted R ²	0.262	0.190
			Residual Std. Error	0.276	0.292
			F Statistic	29.355***	140.230 ***

Data: HFCS 2021 wave and OECD Affordable Housing Database.

Note: *p<0.1; **p<0.05; ***p<0.01

If we observe the estimated coefficients of our main variable of interest we can see how, although both of them are statistically significant, they change in sign after altering the sample composition. However, the standard deviation of the coefficient obtained with the larger sample size is 2.5 times lower and is therefore more precise. The estimated coefficients for all the other independent variables seem to also be more precise and, except for two variables, have mostly kept their statistical significance.

Table 10 depicts the same side-to-side comparison of the OLS estimation results using the different sample sizes after controlling for country heterogeneity. If we observe our main coefficients of interest we can tell that, although they have kept their sign, they substantially differ in size, statistical significance and precision, with the standard deviation of the coefficient obtained with the larger sample being 32 times smaller than the coefficient with the smaller sample. In the context of the larger sample, a 1% increase in the stock of social rental housing is correlated with a 0.4% decrease in the debt-to-asset ratio whereas, with the smaller sample, that same percentage increase in the stock of social rental housing correlates with a 10.5% decrease in the debt-to-asset ratio, an effect which is roughly 26 times larger and which doesn't seem plausible from an economic point of view. The results regarding the remaining independent variables also seem to be less robust, with a higher amount of variables changing in sign and statistical significance in between estimations.

Table 10.
Specification (4) estimated on Different Samples - With Country FE

	Dependent variable: DODARATIO	Dependent variable: DODARATIO			
srds_percentage_total	-0.105*** (0.064)	-0.004* (0.002)	married	-0.014 (0.021)	0.006 (0.007)
log_dodstotal	0.129*** (0.009)	0.076*** (0.003)	consensualunion	-0.052*** (0.032)	-0.019 (0.013)
edurefperson	-0.006*** (0.007)	-0.001 (0.002)	widowed	0.038* (0.049)	-0.00003 (0.017)
selfemployed	-0.055*** (0.023)	-0.048*** (0.010)	divorced	0.030*** (0.026)	0.019* (0.009)
unemployed	-0.017 (0.057)	-0.007 (0.014)	numofchildren	0.006 (0.011)	0.012*** (0.004)
retired	0.028* (0.030)	0.058*** (0.012)	agerefperson	-0.002*** (0.001)	-0.003*** (0.0003)
other	0.062*** (0.047)	0.115*** (0.015)	femalerefperson	-0.047*** (0.016)	-0.010 (0.006)
unsecdebt	-0.069*** (0.021)	-0.136*** (0.010)	insurance	-0.074*** (0.017)	-0.047*** (0.006)
networth	-0.00000*** (0.00000)	-0.00000*** (0.00000)	Constant	0.669*** (0.339)	0.588*** (0.070)
ihs_grossincome	0.067*** (0.014)	0.039*** (0.005)	Observations	1,439	10,664
			R ²	0.276	0.232
			Adjusted R ²	0.264	0.230
			Residual Std. Error	0.276	0.285
			F Statistic	24.498***	103.571***

Data: HFCS 2021 wave and OECD Affordable Housing Database.

Note: *p<0.1; **p<0.05; ***p<0.01

On the one hand, the above exposed findings suggest that our results regarding the effect of the stock of social rental housing in an economy on the financial vulnerability of its renters may not be completely generalizable across countries given the sample-dependence evidences. On the other hand, when the sample size increases, while they are not as equally statistically significant, the obtained coefficients in specifications with and without

fixed-effects are more precise and are also comparable in both size and sign (-0.2% and -0.4% respectively), which is a reason to believe that our estimates are consistent.

Regarding the remaining independent variables, we have observed how their coefficients have remained mostly robust in tables 9 and 10, a basis for thinking that it is most likely the sample size what may be driving the differences in our coefficients of interest.

7 Discussion

Motivated by the housing affordability crisis that is currently taking place in most Western economies, this master's thesis has investigated whether European renters benefit in terms of their financial vulnerability from the stock of social rental housing present in their economies even if their dwellings don't fall into this category. Although there are several papers in the literature which study the determinants of financial vulnerability using survey data, to the best of our knowledge, this is the first paper that has tried to explore and get a measure of this interdependence. Our results indicate a possible negative correlation between the social rental housing stock in a country and the financial vulnerability of its households through the lens of the debt-to-asset ratio as indicator of financial vulnerability. Without controlling for country heterogeneity, a 1% increase in the stock of social rental housing is correlated with a statistically significant decrease in the debt-to-asset ratio of between 0.1% and 0.2%. When country fixed-effects are introduced, the effect is statistically significant only at the 10% level in 3 out of 5 specifications and stays at -0.4%. After introducing the impatience level of the households as independent variable, we lose 86.50% of the observations, which is a reason to believe that the estimates for our main variable of interest are in this setting, though statistically significant, biased and difficult to interpret from an economic point of view.

There are a number of factors we need to consider in order to interpret the size of this effect. Firstly, the data we have collected for the social rental dwellings as a share of the total housing stock has not allowed us to reflect the within-country variability of this metric and has restricted us to having just one data point for every household of each country. There are regions or cities in which the percentage of social rental dwellings is higher than in others and households may therefore be affected differently depending on where their residences are located. This circumstance gains more relevance when we take the nature of housing rental markets into account, as rents are mostly but not entirely determined at the local and not at the country level. For these reasons and considering the data we have used, if the amount of social rental dwellings in an entire country was to affect the financial vulnerability of the renters in the economy in some way, it would be reasonable to expect the size of the effect to be rather small, which is in essence the type of effect we have obtained, specially if compared to the effect that other variables have. However, had we had access to more geographically disaggregated data, we would have probably obtained different results.

Put into perspective, if the increment in the stock of social rental housing was to be higher than 1%, let's

say of 10%, then the decline in the debt-to-asset ratio would be of between 1% and 2% in the models without country fixed-effects and of around 4% in the estimates that account for country heterogeneity. Nevertheless, increases of this size in the stock of social rental housing would require considerable amounts of public and private spending, which may not be justifiable in terms of the outcomes they would lead to and are also hard to conceive them as feasible in the short and mid-term given the trends in social housing we have observed in section 3.2. This way, even if our results support the idea that a higher amount of social rental dwellings in the economy could lead to lower financial vulnerability levels among its renters, the spending that would be required to increase the housing supply would most likely not compensate the welfare gains in the form of systemic risks reduction in the economy.

Another circumstance that needs to be taken into account when interpreting our results is the fact that the survey data from the HFCS only allows us up to a certain extent to draw conclusions for the entire population. In total and as a result of the followed methodology, we have used data for 2477 households from 17 different countries. This number of households goes roughly in line with the amount of households that other papers such as the ones from Anderloni et al. (2012) and Daud et al. (2019) used in their studies. That said, their researches were conducted using single-country samples. For this reason, the conclusions we have reached in this study have to be interpreted as preliminary evidences and with the necessary caution when it comes to extrapolating the conclusions to the entire European population.

Now turning our attention to the results regarding the remaining independent variables of our model, we have obtained a mixture of expected and unexpected results. The positive correlation between the debt-service-to-income ratio and the level of financial vulnerability of the household goes in line with the findings of Anderloni et al. (2012), as households who allocate a higher share of their income to repaying their debt obligations tend to be more exposed to financial hardships due to their exposure to interest rate fluctuations (Albacete et al., 2022) or their demeaned capabilities to cope with other unexpected expenses. However, this result comes at odds with the negative correlation we have obtained between holding unsecured debt and the financial vulnerability of the individual. A reason we may have obtained this finding could be that the dummy variable we have used doesn't capture the size of the uncollateralized debt or that it is the more trustworthy households who are being given access to this form of debt.

We have found the age of the reference person to be negatively correlated with the financial vulnerability of the individual. This result aligns with what Mauser and Voith (2024), Fernández-López et al. (2023) and Daud et al. (2019) obtained. Also, with respect to being employed, we have found being retired to be positively correlated with the level of financial vulnerability. Both of these findings can be explained by resorting to the life-cycle asset accumulation and the life-cycle income and consumption paths described by Kaplan and Violante (2014). At the beginning of their life, individuals earn little income and it's only after the beginning of their working life that they start to accumulate wealth and increase their consumption, lowering in that sense

their chances of experiencing financial hardships. At the end of their working life, individuals typically suffer a decrease in their income and resort to withdrawing resources from their illiquid assets to finance current consumption.

Two results that also seem to complement each other are the negative correlation between holding a whole life insurance and the financial vulnerability level of the household, and the positive correlation between the impatience level and the financial vulnerability of the household. These results are consistent with the findings of Anderloni et al. (2012) and Daud et al. (2019) and highlight the relevance of the implications of risk preferences and forward-looking attitudes when it comes to determining the chances of experiencing financial hardships (Fernández-López et al., 2023).

Regarding the effect of the family structure of the household, without controlling for country heterogeneity and with respect to being single, we have obtained significant coefficients for the dummy variables related to being divorced (positively correlated) and being in a consensual union (negatively correlated). The reason for obtaining this result could be that being divorced normally comes with a reduction in the income of the household, a circumstance that doesn't occur in a consensual union, in which both partners can provide the household with income. However, when we introduce country heterogeneity none of the variables related to the marital status of the individual retain statistical significance, suggesting that this phenomenon may be relevant within countries but not across them. There's some heterogeneity in the literature with respect to these results. Other authors such as Fernández-López et al. (2023) and Anderloni et al. (2012) also didn't find all the variables related to the marital status of the reference person to be statistically significant, although Mauser and Voith (2024) did find all the categories to be statistically significant. Additionally, the number of children in the household was only found to have a positive effect after controlling for country heterogeneity, a result that does go in line with the findings of Anderloni et al. (2012) and Fernández-López et al. (2023) and that is to be expected from an economic point of view, as children ultimately represent a burden to the household from a financial point of view.

Contrary to what we had anticipated, we found the total gross annual income of the household to be positively correlated with its financial vulnerability level, the net worth to have no effect at all and the education of the reference person to have no statistically significant effect. On the one hand, finding the education attainment of the reference person to have a statistically non-significant effect is something that can be expected, given that we have used this variable as a proxy for the level of financial literacy of the household. On the other hand, when it comes to the other two variables, these results deserve a further analysis, as they are counterintuitive from an economic point of view. The sample size and the presence of high variability in our data could be behind this result.

8 Conclusion

The increasing availability of high-quality micro-level survey data on the socioeconomic characteristics of households has given rise to a wide body of literature that studies the determinants of financial vulnerability among this institutional sector of the economy. Motivated by the current housing affordability crisis, this thesis uses data from the latest available 2021 wave of the Eurosystem Household Finance and Consumption Survey and also from the OECD Affordable Housing Database to explore the role that the stock of social rental housing in European economies plays in determining the financial vulnerability of its renters. Using the debt-to-asset ratio as an indicator of financial vulnerability, we have found a negative statistically significant correlation between the level of financial vulnerability of the renters in an economy and the stock of social rental housing. Without controlling for country heterogeneity, a 1% increase in the stock of social rental housing is correlated with a decrease in the debt-to-asset ratio of between 0.1% and 0.2%. When country fixed-effects are introduced, the correlation is also negative and takes a value of around 0.4% in three out of five model specifications, but only statistically significant at the 10% level.

These results give support to the idea that in countries where there is a higher provision of social rental housing, all renters in the economy may be less likely to experience financial hardships. However, the rather small size of the effect that has been obtained and the limited robustness of the results are reasons to consider whether increasing the stock of social rental housing in an economy only for the purposes of decreasing the systemic risks associated with household indebtedness is advisable from a policy recommendation point of view, as the costs required to increase the housing stock in an economy may outweigh the benefits that would be obtained related to this particular aspect. Further research using more geographically disaggregated data on the stock of social rental housing, a larger sample of households and models that include other financial vulnerability indicators as dependent variables would be necessary in order to obtain a clearer, more robust and comprehensive picture of the size of this effect at the macro level.

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Appendix

Table 11. Debt to Asset Ratio
Summary Statistics

Country	Mean	Median	SD	Min	Max	N
Austria	700.51	0.25	13879.40	0.00	419512.33	5655
Belgium	133.43	0.35	1307.14	0.00	17000.00	2720
Czechia	1116.56	1.19	5000.31	0.00	38993.65	2265
Germany	195.57	0.28	1895.91	0.00	35000.00	7705
Estonia	9.37	0.49	48.37	0.00	428.00	980
Spain	312.79	0.47	2766.24	0.00	53800.00	4600
Finland	116.76	0.87	1162.35	0.00	20000.00	9845
France	1.21	0.26	11.55	0.00	318.18	12950
Hungary	72.58	0.30	817.41	0.00	10168.21	3145
Ireland	43.04	0.56	390.34	0.00	11600.00	4556
Italy	58.14	0.31	353.00	0.00	3800.00	3925
Lithuania	1.40	0.17	3.11	0.01	10.00	242
Latvia	8.40	0.39	30.51	0.00	200.00	625
Netherlands	739.95	0.97	6071.09	0.00	71653.95	4644
Portugal	238.01	0.39	1601.10	0.00	15500.00	2231
Slovenia	71.97	0.48	702.95	0.01	9091.00	736
Slovakia	28.19	0.32	158.22	0.00	1000.00	565
All	188.51	0.45	3689.65	0.00	419512.33	67389

Data: HFCS 2021 wave. Own calculations.

Table 12. Debt to Income Ratio
Summary Statistics

Country	Mean	Median	SD	Min	Max	N
Austria	0.42	0.08	3.05	0.00	90.61	5655
Belgium	0.36	0.12	0.71	0.00	4.71	2720
Czechia	0.87	0.28	1.36	0.00	6.88	2265
Germany	178.93	0.14	2987.40	0.00	60250.00	7705
Estonia	64.82	0.09	584.47	0.00	5351.00	980
Spain	41.23	0.30	491.91	0.00	7000.00	4600
Finland	0.58	0.29	0.81	0.00	7.88	9845
France	18.48	0.19	270.22	0.00	7170.00	12950
Hungary	2.47	0.12	23.34	0.00	290.52	3145
Ireland	2322.01	0.11	85474.75	0.00	3161988.00	4556
Italy	4.25	0.20	42.67	0.00	530.66	3925
Lithuania	0.04	0.04	0.03	0.00	0.08	242
Latvia	0.28	0.06	0.52	0.00	2.69	625
Netherlands	943.20	0.35	7759.78	0.00	100000.00	4644
Portugal	0.47	0.16	1.01	0.00	7.31	2231
Slovenia	0.28	0.07	0.50	0.00	2.96	736
Slovakia	31.27	0.09	190.09	0.00	1200.00	565
All	328.22	0.19	28588.77	0.00	3161988.00	67389

Data: HFCS 2021 wave. Own calculations.

Table 13. Debt Service to Income Ratio
Summary Statistics

Country	Mean	Median	SD	Min	Max	N
Austria	0.08	0.00	0.77	0.00	12.20	5655
Belgium	0.06	0.02	0.08	0.00	0.51	2720
Czechia	0.08	0.06	0.10	0.00	0.54	2265
Germany	0.06	0.02	0.11	0.00	1.48	7705
Estonia	0.53	0.04	3.93	0.00	36.00	980
Spain	0.96	0.09	15.24	0.00	360.00	4600
Finland	0.06	0.03	0.09	0.00	1.14	9845
France	2.02	0.09	30.01	0.00	829.25	12950
Hungary	0.12	0.03	0.31	0.00	2.54	3145
Ireland	0.20	0.04	5.16	0.00	268.00	4556
Italy	0.11	0.05	0.26	0.00	2.59	3925
Lithuania	0.00	0.00	0.00	0.00	0.00	242
Latvia	0.09	0.05	0.11	0.00	0.58	625
Netherlands	4.50	0.00	34.31	0.00	555.56	4644
Portugal	0.07	0.05	0.07	0.00	0.29	2231
Slovenia	0.07	0.07	0.08	0.00	0.30	736
Slovakia	0.06	0.00	0.14	0.00	1.17	565
All	0.73	0.04	15.53	0.00	829.25	67389

Data: HFCS 2021 wave. Own calculations.

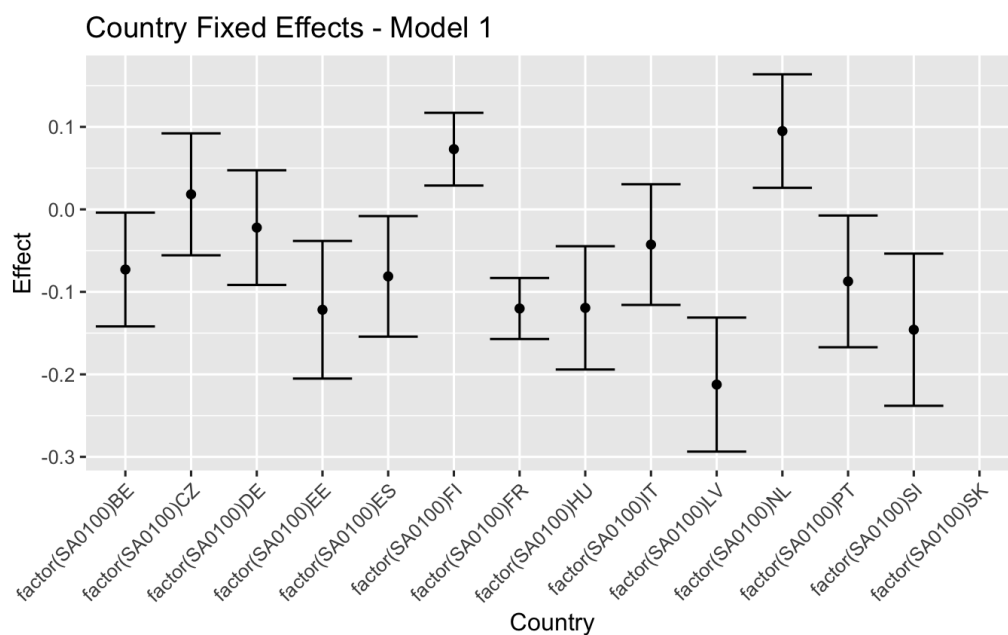


Figure 3. Plotted Country Fixed-Effects for Model (1)

Data: HFCS 2021 wave. Own calculations.

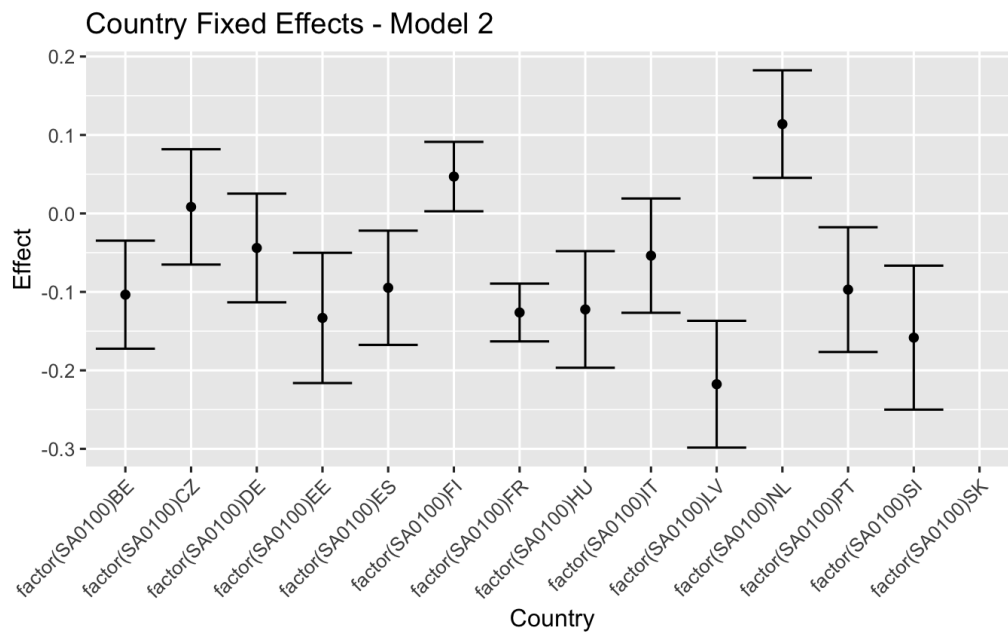


Figure 4. Plotted Country Fixed-Effects for Model (2)

Data: HFCS 2021 wave. Own calculations.

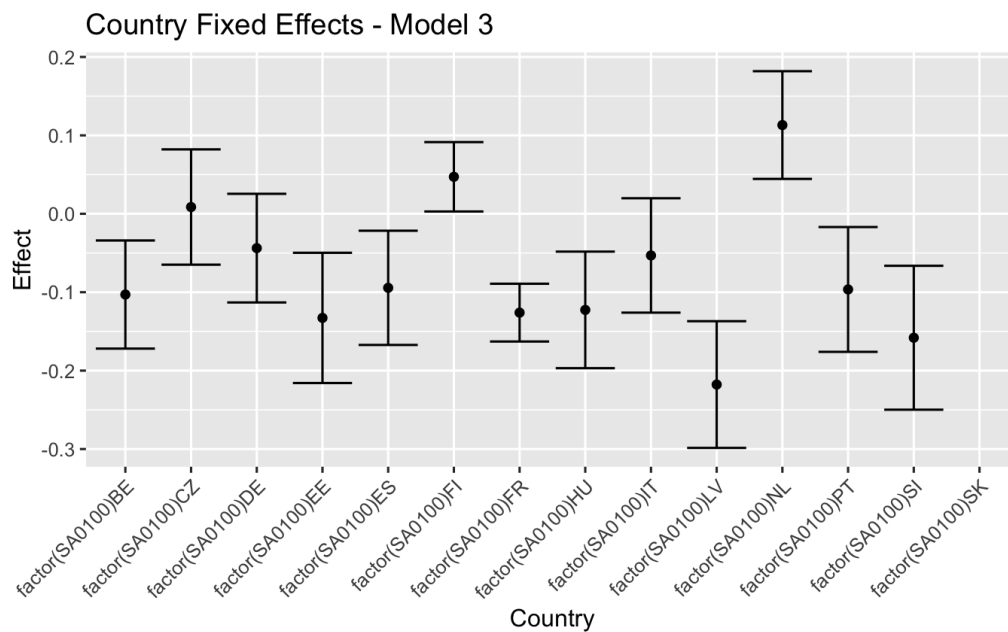


Figure 5. Plotted Country Fixed-Effects for Model (3)

Data: HFCS 2021 wave. Own calculations.

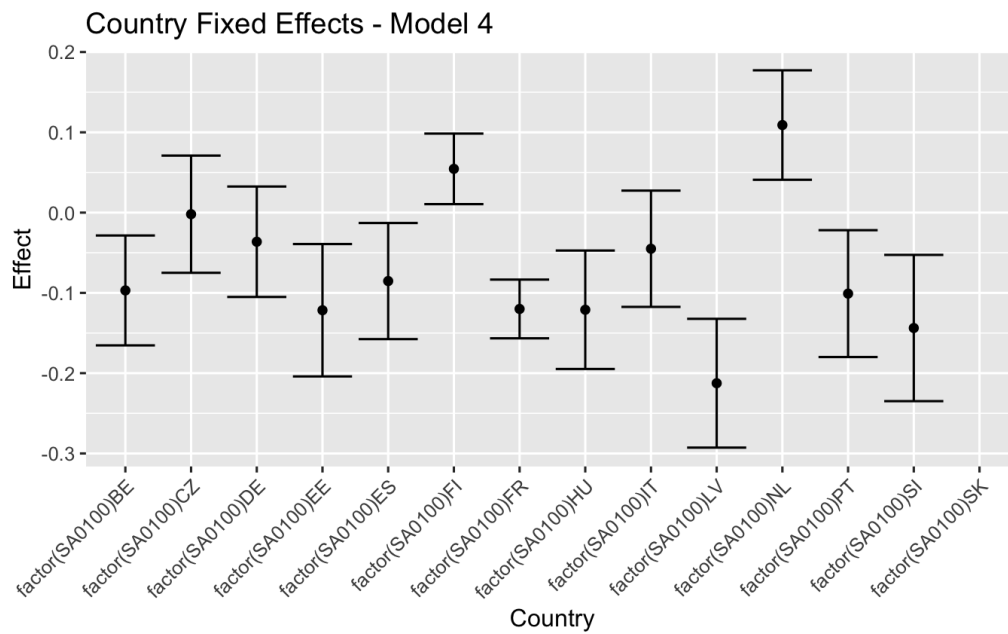


Figure 6. Plotted Country Fixed-Effects for Model (4)
Data: HFCS 2021 wave. Own calculations.

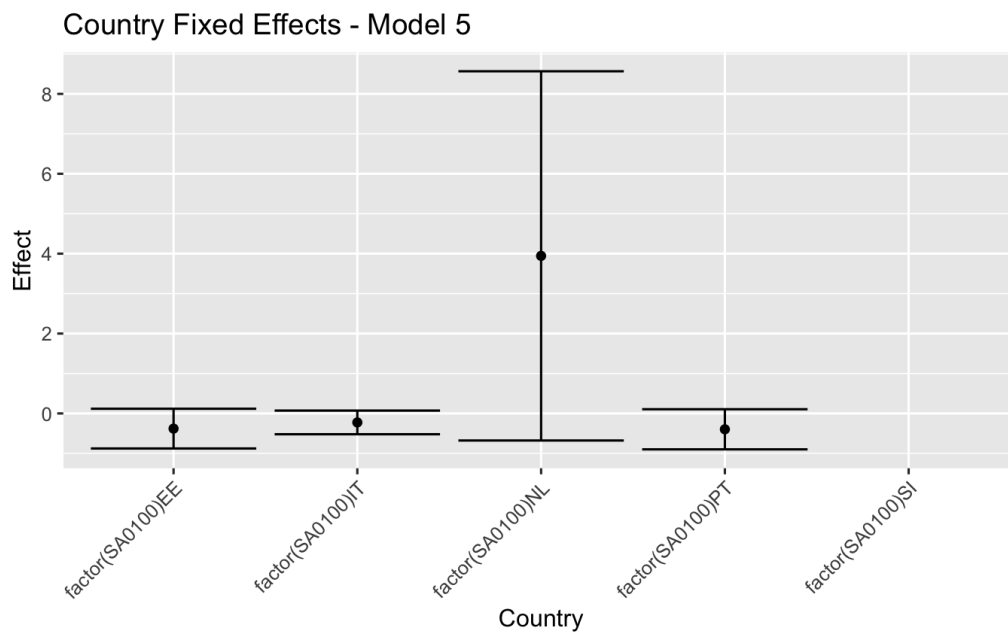


Figure 7. Plotted Country Fixed-Effects for Model (5)
Data: HFCS 2021 wave. Own calculations.