Are retirement dreams overshadowed by the looming burden of debt?

The case of Portugal

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Dissertation written under the supervision of Professor Isabel Horta Correia

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Abstract

This thesis proposes a novel and comprehensive analysis of financial vulnerability among indebted households in Portugal, with a specific focus on elderly households. We use data from the Inquérito à Situação Financeira das Famílias (ISFF), which provides detailed information on household finances and consumption, to construct our sample. Our research framework explores the role of households' disposable income, debt payments, non-debt-related expenses, and liquid assets in shaping household financial vulnerability. Our findings reveal that indebted households with an average age of 65 years old or older are significantly more likely to have negative financial buffers, despite their generally lower levels of debt. We also find that these households are more likely to be in financial vulnerability, due to the inability of their liquid assets to cope with the negative buffer, and are less capable of responding to adverse shocks in interest rates and changes in non-debt-related expenses. These results become even more pronounced when considering the sub-sample of indebted households with an average age of 75 years old or older.

Keywords: aging, household aging, financial vulnerability, financial buffers, debt

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Resumo

Esta tese propõe uma nova e abrangente análise no estudo da vulnerabilidade financeira dos agregados familiares endividados em Portugal, com especial enfâse nos agregados familiares envelhecidos. Utilizamos os dados do Inquérito à Situação Financeira das Famílias (ISFF), que fornece informações detalhadas sobre as suas finanças e o seu consumo, para construir a nossa amostra. A nossa abordagem explora o papel do rendimento disponível dos agregados familiares, dos pagamentos de dívida, das despesas correntes e dos ativos líquidos na determinação da vulnerabilidade financeira das famílias. Os nossos resultados revelam que os agregados familiares endividados com idade média igual ou superior a 65 anos, têm maior probabilidade de apresentar "almofadas" financeiras negativas, apesar dos seus níveis de dívida serem tendencialmente inferiores. Constatamos igualmente que estes agregados estão mais suscetíveis a enfrentar situações de vulnerabilidade financeira causadas pela incapacidade dos seus ativos líquidos fazerem face às suas "almofadas" financeiras negativas. Além disso, as famílias envelhecidas têm uma menor capacidade de resposta a choques adversos nas taxas de juro e ao aumento das despesas não relacionadas com dívida. Estes resultados tornam-se ainda mais pronunciados quando consideramos a amostra referente aos agregados familiares endividados com uma idade média igual ou superior a 75 anos.

Palavras-chave: envelhecimento, envelhecimento dos agregados, vulnerabilidade financeira, "almofada" financeira, dívida

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Lastly, but equally important, I would like to dedicate this work to my grandparents, particularly to my grandfather, who always taught me about the beauty of an extended life.

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List of Abbreviations

DSTI - Debt-Service-to-Income Ratio

DTA - Debt-to-Asset Ratio

DTI - Debt-to-Income Ratio

FM - Financial Margin

HBF - Household Financial Buffer

HFBI - Household Financial Buffer to Income Ratio

HFCS - Household Financial and Consumption Survey

ISFF - Inquérito à Situação Financeira das Famílias

LC - Living Costs

OECD - Organisation for Economic Cooperation and Development

PD - Probability of Default

SP - Survival Period

1 Introduction

In the landscape of modern demographics, the phenomenon of far-reaching population aging has emerged as a central concern. From 1980 to 2021, the percentage of older people rose significantly around the globe, a trend that is expected to continue, at least, over the next thirty years. The Portuguese demographics are not an exception and by 2050 nearly one-third of the Portuguese population is projected to be aged 65+[1]. According to this report, the proportion of the Portuguese population aged 65+ is projected to increase from 22.6%, in 2021, to 34.5% by 2050.

These demographic shifts have significant implications, not only for social and healthcare systems, but also in the scope of economics and financial stability, in particular when combined with the upward trend in household borrowing. In Portugal, the proportion of indebted households has been growing over the last decades. This increase has been primarily driven by the low interest rate regime, easy access to credit, and changes in economic conditions. While the financial crisis of 2008 caused a temporary slowdown in household borrowing, the economic recovery and favorable borrowing conditions up to 2022 have once again led to an upward trend in household indebtedness.

Considering this backdrop, at the heart of this demographic change, in an era in which older individuals are more likely to carry out debt than in past generations[2], the key question of financial preparedness comes to light: is the looming burden of debt leading to financial vulnerability in later stages of life? Entering old age burdened by higher levels of debt can cast a shadow over one's golden years and make it more difficult for people to realize their retirement goals.

The purpose of this thesis, hence, aims to evaluate if households' retirement dreams are being postponed due to the burden of debt. In particular, our goal is to understand if elderly indebted households are more exposed to financial vulnerability than to the overall sample used in this study. In other words, if their liquid and solvency means can cope with their short-term needs and obligations.

Sometimes the level of debt burden can become overwhelming, decreasing households' ability to repay the principal of debt and increasing the risk of default. While this underscores the importance of focusing on households burdened by debt when understanding financial vulnerability, understanding the concept of *household financial vulnerability* encompasses more than simply debt. Several factors, such as other expenses like rent, groceries, and utility bills,

[1] These demographic forecasts were released by the United Nations (UN) in 2022. The estimations can be found in the World Social Report 2023,"Leaving No One Behind In An Ageing Population".

[2] Lusardi and Mitchell (2013); Lusardi et al. (2020)

can put households at risk of financial instability or hardship. To evaluate systemic risks, guide policy measures, and comprehend the dynamics of the credit market, it is essential to comprehend the build-up of vulnerabilities over time of heavily indebted families. But to truly comprehend household financial fragility, one must consider a wider range of variables that affect households' capacity to absorb shocks to their finances and continue to be financially stable.

Thus, this thesis intends to contribute to the literature by providing a comprehensive and broader perspective regarding financial vulnerability. Until now, the vulnerability indicators used to measure households' financial vulnerability have focused solely on their inability to meet their debt obligations, without taking into account other expenses. Therefore, this thesis aims to overcome this limitation by including those other expenses in the metric used to assess the financial vulnerability of indebted households. Furthermore, this study brings the novel approach of specifically examining older indebted households, which are often overlooked due to the assumption that debt decreases over the life cycle. On this account, in an era in which the number of elderly continues to grow, understanding where we are becomes crucial to designing a more resilient financial landscape for the future, while understanding their financial vulnerabilities.

To conduct the vulnerability assessment exercise, the *Inquérito à Situação Financeira das Famílias* (ISFF)[3], a dataset with information on socio-demographic variables, assets, debt, income, and consumption for a sample of households that is representative at the national level, is used. This dataset includes four waves, conducted in 2010, 2013, 2017, and 2020. Nevertheless, it is not possible to track whether the same households participated in multiple waves of the survey.

The methodology underpinning our assessment exercise begins by identifying financially vulnerable households throughout the model proposed by Ampudia et al. (2016). Vulnerable households are identified as those with insufficient disposable income to cope with their living costs and debt servicing costs. In other words, are those whose expenditures are greater than their disposable income. Drawing on established literature, we then estimate the vulnerability indicator for each indebted household, considering their respective financial buffer and liquid assets. Lastly, we explore how household financial vulnerability of indebted households responds to various types of adverse shocks.

Our findings reveal that older households, even with lower levels of debt, face greater liquidity constraints as their financial buffers tend to be lower. These results are negatively affected by consumption expenses and debt payments and persist even when liquid assets are considered

[3]Portuguese Household Finance and Consumption Survey (HFCS), in English.

as means to cope with their negative financial buffer. This shed light on the greater financial vulnerability faced by older households. The issue is further compounded by shocks in interest rates and consumption expenditures, reflecting the decreased ability of these households to manage financial pressures.

The remainder of this thesis is organized as follows. Section 2 provides a comprehensive summary of the related literature. Section 3 describes the dataset used in this paper and presents the main summary statistics. Section 4 displays the commonly used measures of vulnerability to assess the financial burden of Portuguese households. Section 5 provides the framework to evaluate the financial vulnerability among indebted households and, in the end, stress tests are conducted. Section 6 presents the robustness analysis of our results and provides additional results. Section 7 highlights the limitations of this paper. Section 8 concludes by summarizing the key findings.

2 Literature Review

Although the notions of *financial vulnerability* and *debt* are related, these two ideas differ from each other, as financial vulnerability encloses a wider range of factors that go beyond the level of debt. Nonetheless, most of the related literature on this matter has focused exclusively on debt as a driver of financial vulnerability.

For example, Albacete et al. (2013) use the debt-to-asset ratio (DTA) and the debt-service-to-income ratio (DSTI) to assess the level of household vulnerability. The same idea is followed by Bańbuła and Żółkiewski (2016) who link financial fragility with the debt-to-income ratio (DTI). On the other hand, Djoudad (2012) and Michelangeli and Pietrunti (2014) look at the DSTI ratio as a measure of household distress. In their approaches, a household is considered to be at risk if the vulnerability indicator exceeds the defined threshold. Even though being above the defined threshold can be seen as a good hint of vulnerability, this approach does not entirely capture the degree of financial vulnerability, mainly for three reasons. First, it only encompasses debt as a driver of financial vulnerability. Second, they only consider either the *solvency definition* or the *liquidity definition*, when employing the indebtedness ratios. Lastly, the vulnerability indicator thresholds are arbitrarily chosen.

As far as Portugal is concerned, all published papers and reports have solely focused on the indebtedness ratios to assess household financial vulnerability. According to Banco de Portugal (2017), this vulnerability is closely tied to high shares of DTI, DSTI, and DTA ratios. Both the DTI and DSTI ratios call attention to the ability of families to service their debt through their income. The DTI reflects dependence on borrowing relative to household income. The DSTI ratio, on the other hand, highlights the proportion of income that is allocated to servicing debt.

These metrics are particularly important in the Portuguese context due to the significant predominance of mortgage debt relative to the share of other household debts in proportion to the total debt. Following the Banco de Portugal (2017), mortgage debts represent a high burden for Portuguese families, making indebtedness ratios critical measures for understanding household financial health.

The literature further emphasizes that household characteristics such as age, employment status, and family composition play a crucial role in shaping indebtedness ratios. Studies consistently show that younger households tend to carry higher DTI ratios as they are more likely to take on significant mortgage loans to finance their first home purchases (Albacete et al. (2013); Chivakul and Chen (2008); Costa and Farinha (2012b)). In Portugal, this pattern is particularly pronounced, as younger households have a greater exposure to mortgage debt, which often translates into high DTI ratios. Moreover, given the widespread use of adjustable mortgage interest rates in Portugal, these households are particularly vulnerable to interest rate increases, which can sharply raise their DSTI ratios, thereby increasing financial stress. Portugal, indeed, ranks at top among the Euro Area countries with a substantial proportion of households with adjustable mortgage interest rates (Ampudia et al. (2016)). International research aligns with this, showing that younger heads of households generally carry a greater financial burden early in life, but as their income increases with age, their DTI, DSTI, and DTA ratios tend to decline (Strzelecka and Zawadzka, 2020).

Household composition and income dynamics also significantly influence indebtedness ratios. Larger households, for instance, often carry greater financial demands, which leads to higher debt levels and, consequently, to higher indebtedness ratios (Magri (2002)). This is closely linked to the fact that younger families with mortgage loans exhibit higher indebtedness ratios, as a reflection of the increased financial needs of larger or growing families. Employment status is another critical determinant of financial vulnerability, as households with unemployed or precariously employed members tend to have substantially higher indebtedness ratios. In the case of Portugal, many of these households already allocate a substantial portion of their income to debt payments, making them more fragile to economic shocks. This is consistent with findings in studies for other countries. They show that unemployment or irregular employment significantly heightens financial strain, particularly in mortgage-dependent households (Chivakul and Chen (2008); Stockhammer and Wildauer (2017)).

In addition to household characteristics, macroeconomic conditions such as real estate prices, interest rates, and access to credit play a significant role in shaping indebtedness ratios (Dynan and Kohn (2007); Jacobsen and Naug (2004); Stockhammer and Wildauer (2017)). The relationship between rising real estate prices and higher household debt levels is well-established, with increasing property prices leading to larger mortgage loans, and consequently,

to higher DTI, DSTI, and DTA ratios. This is particularly relevant in Portugal, where rising housing prices have driven up mortgage borrowing, consequently inflating the indebtedness ratios of many households (Banco de Portugal (2017); Valderrama (2023)). Furthermore, while the low interest rate environment in the last decade has eased the debt servicing burden for many households, the rise that happened in the last two years, significantly increased DSTI ratios, particularly for households with adjustable mortgage interest rate loans. Another key factor relates to the need for prudent lending practices to prevent over-indebtedness, especially in light of expanding credit access. Financial deregulation, while improving access to credit, can sometimes lead to unsustainable debt accumulation, especially among lower-income households, pushing vulnerability to extreme levels (Emiris and Koulischer (2023); Stockhammer and Wildauer (2017)).

This discussion about the Portuguese financial vulnerability assessments made so far highlights the substantial reliance of ratios on debt, without considering additional expenses. Therefore, to overcome some of these limitations, some authors (Anderloni et al., 2012; Disney et al., 2008) consider a broader and comprehensive notion by encompassing other expenses beyond the fragility of debt obligations. Their definition also takes into consideration the households' level of savings, income stability, and expenditure patterns. By doing so, they are able to account for the households' ability to cope with adverse financial events.

More recently, Ampudia et al. (2016) and Leika and Marchettini (2017) have proposed two identical approaches that provide a more complete picture of household financial vulnerability. In their definitions, a household is considered to be at risk of financial distress if its income and liquid assets together cannot entirely cover its expenses for, at least, M months. M can be seen as the minimum buffer period, as it represents the number of months that liquid assets are used to cover the negative financial margin. Following this rationale, one might think that a higher indebtedness level increases the likelihood of being in financial distress, but being indebted is not, neither a necessary, nor a sufficient condition. A household might have a significant level of debt, but be liquidity enough to not be under vulnerability. In the opposite direction, a household might not hold debt and still be in financial distress. Therefore, by using this notion, the authors highlight both liquidity and solvency dimensions, depending on whether the status of financial distress is temporary, that is, associated with transitory issues, or long-lasting, meaning, related to structural imbalances in the households' balance sheets.

In this paper, we will follow a similar approach to the one proposed by Ampudia et al. (2016). In practical terms, their model uses the financial margins (FM) and the level of liquid assets to operate the probability of default (PD) of a given household. The closer is the PD to one, the greater the likelihood that the household will fail to meet its obligations. On the other way around, the closer the result is to 0, the lower the likelihood. This approach was

already applied to some Euro Area countries by Ampudia et al. (2016), to Estonia by Room and Merikull (2017), to Luxembourg by and Giordana and Ziegelmeyer (2020) and to Malta by Abela and Georgakopoulos (2022). In our approach, we will call household financial buffer (HFB) to the FM to operate the vulnerability indicator, rather than the PD.

3 Data and Descriptive Statistics

3.1 Data

This paper leverages on the ISFF, which was provided by *Instituto Nacional de Estatística* (INE), the Portuguese National Statistics Institute.

The ISFF, also known as the Portuguese Household Finance and Consumption Survey (HFCS), is part of a wider initiative coordinated by the European Central Bank (ECB) - the HFCS. The survey aims to gather harmonized and comparable micro-level cross-country data on household wealth in the Eurozone. It also collects individual-level information regarding socio-demographic characteristics. Nation-level surveys are used to conduct the survey.

In Portugal, four waves of the survey have already been conducted by *Banco de Portugal* (BdP), the Bank of Portugal, and INE, in 2010, 2013, 2017, and 2020. The ISFF includes information on household finances and consumption that allows for a detailed characterization of the financial situation of Portuguese families. The main questions in the survey focus on the assets and debt held by families, particularly the non-financial and financial assets. The information collected at the family level is supplemented with questions about any inheritances received, incomes (from businesses, real estate, financial investments, and transfers), and their consumption and savings decisions. The survey also includes questions about the individuals who make up the family, particularly regarding demographic aspects (age, education, etc.), quality of life, risk aversion, employment situation, rights to pensions to be received in the future, and incomes (from work or transfers such as pensions and unemployment benefits).

To ensure the survey's representativeness, weights are assigned to each household. These correspond to the inverse of the probability of selecting a household, adjusted for non-response. To handle the missing data in the survey, the most important variables were imputed by the Bank of Portugal using a stochastic multiple imputation algorithm, as described in Martins (2020). Based on the assumption of "missing at random", five implicates are generated. This imputation method preserves the distribution characteristics and relationships between variables and accounts for imputation uncertainty while improving the reliability of the statistical inference.

3.2 Descriptive Statistics

A total of 22,652 households were interviewed in the four survey waves: 4,404 in 2010, 6,207 in 2013, 5,924 in 2017, and 6,107 in 2020. Given the goal of this paper, and since it is not possible to determine whether the households participated in multiple waves of the survey, we will consider the entire sample without distinguishing between years. A preliminary analysis did not reveal significant differences between the four years for the variables of interest.

Table 1 reflects the composition and characteristics of the households interviewed. Households with two members, as well as households with dependent children, stand out from the sample. In addition, households where the average age of adult members ranges between 35 and 44 years old, and those whose average age is 65+, also stand out, with the latter representing more than a quarter of the sample.

Table 1: Household Characteristics

	All Sample		**Indebted Households**	
	Number	**Percentage**	**Number**	**Percentage**
Number of Household Members				
1 individual	4,444	21.28%	1,087	11.48%
2 individuals	7,967	32.12%	2,534	24.55%
3 individuals	5,116	24.07%	2,960	30.34%
4 individuals	3,926	16.00%	2,718	24.69%
5+ individuals	1,189	6.54%	764	8.94%
Household Type				
1 adult 64- years old old	1,788	8.78%	841	9.37%
1 adult 65+ years old	2,623	12.38%	244	2.04%
2 adults 64- years old	2,710	11.96%	1,352	14.52%
2 adults, at least one aged 65+ years old	4,594	16.68%	772	5.29%
3+ adultos	2,128	9.77%	810	7.99%
Adults 64- years old with dependent children	7,971	37.36%	5,681	57.37%
Other households with dependent children	765	3.07%	363	3.42%
Household Age Groups				
34-	1,878	13.22%	1,234	19.07%
35-44	6,123	29.55%	4,351	46.08%
45-54	3,961	17.16%	2,227	19.67%
55-64	3,863	13.24%	1,385	9.31%
65-74	3,899	13.63%	728	4.91%
75+	2,918	13.21%	138	0.96%
Total	**22,642**	**100%**	**10,063**	**100%**

Source: ISFF
Note: This table presents the number of households and their respective weight in the dataset, categorized by their size, type, and age group. The results are weighted using household weights.

This high share of elderly households in the sample sheds light on the importance of this study. Older households' main source of income relies on pensions, which may not always be

sufficient to meet their needs or preferences. Against this backdrop, carrying out debt into later stages of life can exacerbate the financial pressure and significantly impact the quality of life of the elderly. Although debt levels decrease with age, as displayed in Figure 1, in our sample, 10.09% of older households have debt.

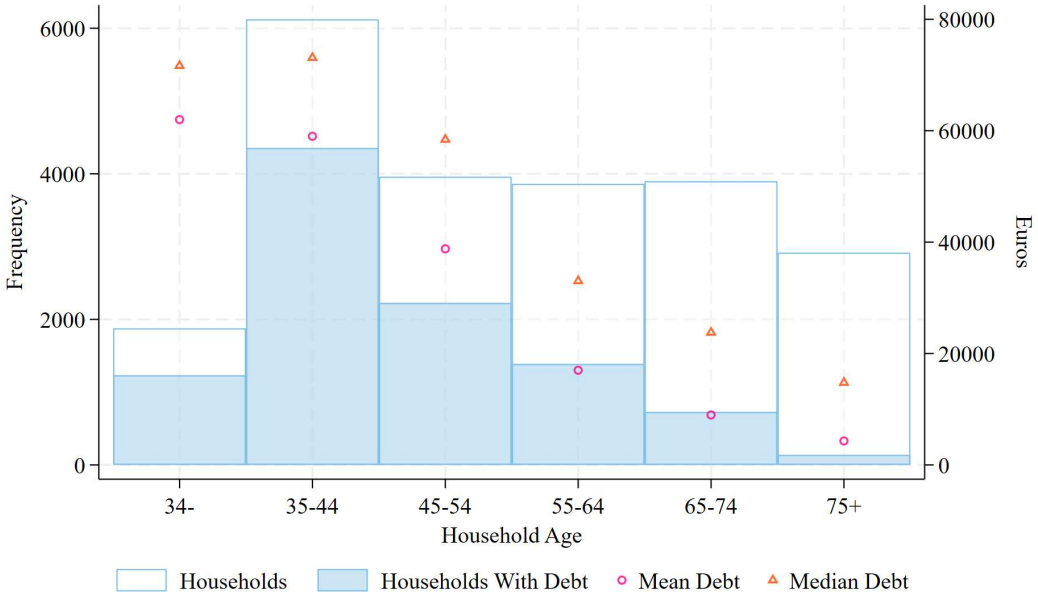

Figure 1: Debt by Household Age Group

Note: This figure displays the distribution of the debt levels across the household age groups.

Given the debt behavior over the life cycle, we want to understand how households with debt are characterized in terms of wealth and income, and how this characterization varies between the total sample with debt and the sub-sample of older indebted households. The summary statistics presented in Table 2 summarize the main statistics for the variables of those household characteristics. It emphasizes disparities across the two samples, regarding their income levels, net wealth, non-financial and financial assets, and debt levels.

Within the scope of debt, real estate accounts for the largest share of the value of loans Portuguese households have taken out. Figure 4 and 5, in Appendix B, show that mortgages make up the largest share of the total debt value for both the entire sample and sub-sample of households aged 65+. Additionally, although way less significant in terms of debt value, a significant proportion of the older families hold non-collateralised debt[4] and credit card debt. The percentage of older households with debt contrasts with the 46.10% of households with debt in the entire sample. Moreover, the average and median debt levels held by elderly households are lower, being its distribution highly concentrated on the left side of the distribution, as displayed in Figure 2.

[4]It doesn't include credit card debt.

Table 2: Indebted Households: Income, Assets and Debt Summary Statistics

	All Sample				65+ Years Old Only			
	Proportion	**Median** (10^3)	**Mean** (10^3)	**Std. Dev.** (10^3)	**Proportion**	**Median** (10^3)	**Mean** (10^3)	**Std. Dev.** (10^3)
Gross Income	-	22.90	29.20	27.27	-	15.80	23.35	24.44
Net Income	-	20.41	24.51	18.78	-	14.31	20.00	18.80
Net Wealth	-	86.49	173.51	452.374	-	107.84	233.60	491.759
Real Assets	97.41%	131.75	215.03	438.792	92.36%	121.45	248.87	492.849
Financial Assets	99.30%	5.00	22.40	67.589	98.89%	2.88	27.05	77.817
Debt	46.10%	44.00	58.58	65.59	10.09%	6.82	23.17	40.49

Source: ISFF

Note: This table presents the summary statistics on household finances for the entire sample and for the sub-sample of households with an average age of 65 years old or over. These summary statistics are conditional on households holding debt. The income values are annualized. The median, mean and standard deviation are in euros. The results are weighted using household weights.

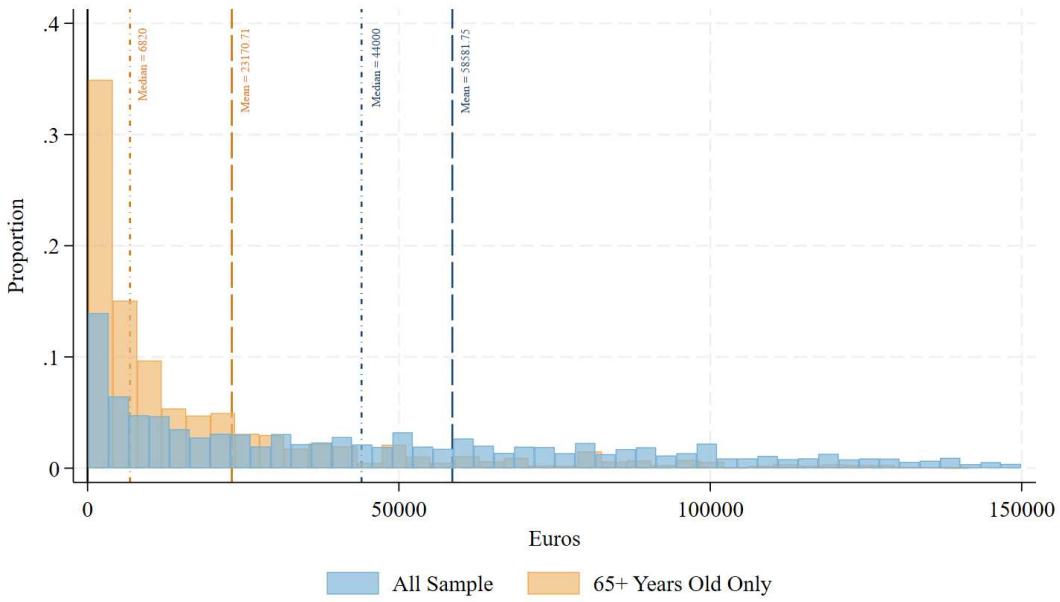

Figure 2: Distribution of Debt

Note: This figure displays the distribution of debt held by indebted households in the entire sample and in the sub-sample of of households with an average age of 65 years old or over.

The median income levels for households aged 65+ are lower than for the overall sample, reflecting reduced income in later years due to retirement. As previously discussed, in Portugal, the main source of income in later years is pensions. This predominance of pension income explains the higher concentration of income levels[5] on the left side of the distribution, as exhibited in Figure 6, in Appendix B. On the other hand, employment income represents the largest

[5]ISFF only provides information on gross income. Procedures followed in the disposable income calculation will be further discussed in section 4.

share of income source, with a special emphasis on employee income, when considering the whole sample, as displayed in Figure 7 and Figure 8, in Appendix B.

Older households tend to have higher mean and median net wealth levels, reflecting the accumulation of wealth and the decline of debt levels over their lifetime. Nonetheless, as shown in Figure 9, Figure 10, Figure 11, and Figure 12, in Appendix B, wealth distribution follows similar patterns between the two groups: the main non-financial asset is the primary household residence, followed by other real estate assets, while the main financial asset is the saving accounts, just ahead of the sight accounts.

4 The Financial Burden of the Elderly Portuguese Households

After having analyzed the debt level disparities across the overall sample and older households, and before delving into the measures of financial burden, we start this section by providing an overview of how different household characteristics influence the level of household debt carried out by Portuguese families. We then explore the DTI, DSTI, and DTA ratios, the three commonly used metrics in the literature on regard to the subject of this thesis as comparability measures to the indicator proposed in section 5.

4.1 Debt

We start by characterizing the indebtedness profile in Portugal. Variables such as the value of the disposable income, the value of the net wealth, the value of household expenses on food and utilities, and the household characteristics, such as the average age of the household and the number of household members, or the existence of dependent children, employed individuals and highly educated individuals in the household, were considered for the purpose.

The rationale behind these variables' choice is closely related to the fundamental idea of economic theory: the decision to demand debt is determined by maximizing utility over lifetime through the smoothing of consumption over the life cycle and shocks, namely income and expenditures shocks, that occur through the life cycle. As the scope of our analysis is the household, we assume a total risk-sharing within each household. This assumption implies that all decisions regarding consumption, savings, and debt are made jointly, based on the aggregate welfare of all its members. Thus, each household's decision to maximize consumption is modeled as if they have a single representative utility function. In other words, this means that their decision to consume over their lifetime is not only determined by the life cycle stage of the family members, but also by their so-called permanent income and wealth, which are

themselves influenced by characteristics such as the level of education and employment status.

In our dataset, income data is reported at the gross level[6]. Therefore, several assumptions were made to obtain the disposable income estimates. The income tax brackets and tax credits from OEDC were applied to the household members' income to determine the household income after tax deductions[7]. In Portugal, income taxes are progressive[8], and, consequently, the overall income dispersion among indebted households is reduced by 31.13% after taxes. In the sub-sample of elderly households, the income dispersion declines by 23.08% after taxes[9].

We estimate, using ordinary least squares estimation, the linear relationship between the economic and demographic characteristics and the level of household debt:

$$ln(Debt_i) = \alpha \mathbf{X}'_{1i} + \beta \mathbf{X}'_{2i} + \epsilon_i \tag{1}$$

where $\mathbf{X}'_{1i}$ is a set of economic variables, where household disposable income, net wealth, and expenses on food and utilities are included. $\mathbf{X}'_{2i}$ is a set that comprises the variables related to the household characteristics, such as the average age of the household and the number of household members, or the existence of dependent children, employed individuals and highly educated individuals in the household. The choice of these two variable sets closely follows the literature on this matter.

This regression is estimated for both the entire sample and the sub-sample of households aged 65+. For the total sample, the results, presented in Table 5, in Appendix A, show that the debt levels depend on disposable income, net wealth, and household characteristics. Disposable income, net wealth, and the dummy variables for having dependent children, employed members, and members with an upper secondary or higher level of education in the household significantly contribute to larger debt levels, with the former and latter two variables being related to a higher borrowing capacity. Conversely, the level of debt decreases with household aging. This negative relation, which is conditional on the other regressors, tells us that, for the same income and wealth, we still find a negative relation as the unconditional one that we previously described. Figure 1 displays the relationship between debt levels and household age. Furthermore, the results shed light on the negative effect of an increase in household size on debt levels. All these results are consistent with the well-established literature.

That said, the results for the households aged 65+ do not entirely reflect the same rela-

[6]The reported income refers to the year prior to the year in which the survey was conducted. All other variables correspond to the year of the interview.

[7]See OECD (2010), OECD (2013), OECD (2017), and OECD (2020).

[8]Although the tax rates applied in Portugal vary for the various types of income presented earlier, we will consider a single tax rate that applies to the aggregated income of the household.

[9]Author's computations.

tionship between the variables. Debt levels in this sub-sample are no longer driven by income variations, likely due to the low variability in income among older households. The presence of dependent children and employed members significantly increases debt levels in this sub-sample, with this last result suggesting that higher debt levels contribute to a delay in retirement age. This idea is supported by the findings in Table 6, in Appendix A.

4.2 Debt-to-Income Ratio, Debt-Service-to-Income Ratio and Debt-to-Asset Ratio

With this paper, we aim to evaluate if households burdened by debt are financially vulnerable and if this exposure to vulnerability changes with age. The majority of the literature has focused on the so-called indebtedness ratios so far. Thus, before beginning to explore the one indicator that we proposed in this thesis, that follows Ampudia et al. (2016)'s work, we investigate the three different metrics commonly used to evaluate the financial burden of indebted households: the DTI, DSTI, and DTA ratios. As suggested by these metrics labels, they compare households' debt levels with their income, their ability to service the debt, and their assets, respectively.

Both the DTI and DSTI ratios pinpoint to the ability of families to service their debt through their income. The DTI, which is given by the ratio between the amount of debt and the gross income of households, reflects how much of a household's income is tied up to debt obligations. It also indicates how many months were needed for a household to pay off all its debt if it would use all its monthly gross income level to repay the principal of the debt. The DSTI ratio, on the other hand, compares the value of monthly debt payments with the household's monthly gross income. A higher DSTI ratio suggests that a larger proportion of monthly income is used to serve debt, leaving less buffer for unexpected expenses or financial shocks and making it harder to make payments on time. The DTA ratio, which corresponds to the ratio between the amount of debt and the value of the assets held by the household, shows the proportion of assets owned by the household that are financed through debt. A larger DTA ratio, therefore, suggests that a greater proportion of assets is financed through debt. In summary, the DSTI allows us to evaluate the liquidity capacity of households, while the DTA ratio assesses the solvency capacity of households. The DTI provides an assessment of households' liquidity and solvency capacities.

The solvency capacity is related to a household's ability to meet its long-term financial obligations. It represents a measure of a household's overall financial stability. The liquidity capacity, on the other hand, refers to the ability of a household to pay its short-term financial obligations by using either contemporaneous flows of income or by selling its liquid assets. This condition captures a household's ability to handle short-term financial needs, such as expenses on food, utilities, and tax payments, among others.

The findings presented in Table 7, in Appendix A, suggest that older household groups present a lower median value for all three measures of financial burden in comparison to younger household age groups. However, while the DTI and DTA ratios substantially decline as household age increases, the same does not happen with the DSTI ratio. For the total sample, the DSTI ratio accounts for 15.65%, and it accounts for 15.26% for the elderly households. Comparing these results and with the conjecture that the implicit tax rate should not be significantly different across age, we can claim that the higher debt service *per* unit of debt results from the higher proportion of principal paid in the later phases of debt life that occurs in more advanced stages of life.

But to better understand which households could potentially be financially burdened, more than looking at the median value of the indebtedness ratios, one must identify which households are above some critical thresholds. The threshold values considered are the ones used in the literature[10]: 3 for the DTI ratio, 40% for the DSTI ratio, and 75% for the DTA ratio. Therefore, and following the existing literature, as these ratios are perceived as indicators of potential financial distress, being above the DTI and DTA thresholds ratios pinpoints a solvency capacity problem, whereas being above the DSTI ratio highlights a liquidity problem[11].

For that matter, we run three identical logit regressions to assess which household characteristics contribute to the household vulnerability being above the critical values:

$$DTI_i = \alpha \mathbf{X}'_{1i} + \beta \mathbf{X}'_{2i} + \epsilon_i \tag{2}$$

$$DSTI_i = \alpha \mathbf{X}'_{1i} + \beta \mathbf{X}'_{2i} + \epsilon_i \tag{3}$$

$$DTA_i = \alpha \mathbf{X}'_{1i} + \beta \mathbf{X}'_{2i} + \epsilon_i \tag{4}$$

where $\mathbf{X}'_{1i}$ is a set of categorical economic variables and $\mathbf{X}'_{2i}$ is a set of categorical variables related to household characteristics. The $\mathbf{X}'_{1i}$ includes the gross income variable and the value of the real and financial assets in logs. The $\mathbf{X}'_{2i}$ comprises the number of household members, household type, household age groups, the number of members in employment, and the number of members with an upper secondary or higher level of education[12].

[10] For example, Costa and Farinha (2012a), Albacete et al. (2013), Abela and Georgakopoulos (2022).

[11] Although we acknowledge this is not a consensual definition, we followed Leika and Marchettini (2017)'s proposed classification.

[12] According to IMF (2017), household variables can be divided into two categories: (i) *core variables* and (ii) *non-core variables*. The core variables are those that have a direct and significant impact on household financial vulnerability, making them essential for determining it. Non-core variables, on the other hand, add depth and context to the analysis and enhance the accuracy of vulnerability estimates, even though they are not essential to the core assessment. In our analysis, the set of variables $\mathbf{X}'_{1i}$ comprises the core-variables, whereas $\mathbf{X}'_{2i}$ contains

The results presented in Table 8, in Appendix A, suggest that the likelihood of facing liquidity problems increases with age. In the opposite direction, the probability of households facing solvency issues is higher among younger households, decreasing with age. This result is consistent in households where there is only an individual aged 65+. Households with 2 adults where at least one is aged 65+ follow the same pattern as well for the DSTI and DTA ratios.

5 Measures of Household Financial Vulnerability

The previously presented financial burden indicators provide a general overview of a household's financial burden with each ratio capturing a different dimension of financial stress. While these metrics can help pinpoint households facing financial stress, they also have limitations that could hide key elements of the issue. One key limitation is that they provide a simplified view of financial health, often failing to account for the liquidity of assets, the stability of income, or other expenses. For instance, a household might have a low DTA ratio but may still be financially vulnerable if its assets are illiquid and cannot be easily converted into cash to meet debt obligations. Similarly, a household with a seemingly manageable DTI ratio could face financial stress if its income is unstable or if it is burdened with significant non-debt-related expenses. Moreover, these metrics fail to take into account non-financial factors, such as socio-demographic characteristics, that can have a substantial impact on a household's financial fragility. For example, two households with identical DTI ratios might experience different levels of financial stress depending on the stability of their employment or the size of the household.

Thus, while the DTI, DSTI, and DTA ratios are essential tools for assessing financial burden, relying solely on them could lead to an incomplete and potentially misleading understanding of household financial vulnerability.

In this chapter, we derive a measure of household financial vulnerability that tries to improve the former. As we cannot follow households over time, we are not able to get into the stability of income or expenses. After defining, computing, and characterizing the new metric of financial vulnerability, it will be employed in some stress test exercises.

5.1 A Measure of Distress

In order to assess financial distress, we start by establishing the HFB indicator. It can be understood as the buffers or surplus resources that help a household absorb shocks. We follow

the non-core variables.

the comprehensive framework presented by Ampudia et al. (2016). This framework represents a measure of a household's overall financial stability.

A household will be considered to be at risk if it doesn't have enough liquid assets to cover its short-term financial needs. In other words, a household with a negative HFB, but enough liquid assets to cover it, won't be considered as vulnerable. As highlighted by IMF (2017), assuming households to be under financial vulnerability by exclusively accounting for the negative HFB may lead to an overestimation of the number of wealthy households that are expected to default.

We start by defining the HFB[13]. For household i, it is defined as follows:

$$HFB_i = Y_i - DP_i - LC_i \tag{5}$$

where Y_i is the annual disposable income of household i, DP_i denotes the annual debt payments paid by the i-th household, and LC_i corresponds to the annual living costs of each household i.

In our dataset, income is reported at the gross level. It encompasses the total regular income received by its members along with the household's income from other sources. The first set of income sources includes employee income, self-employment income, pensions, and other social benefits. Hence, it can be divided into income from work and income from social transfers. The second one covers income from private businesses other than self-employment, financial assets, real estate property, and regular private and public transfers. As the concept of the HFB requires the use of disposable income, we applied the OECD tax brackets and tax credits to obtain the level of income after tax deductions, as previously mentioned in section 4.

To operationalize the concept of HFB, some assumptions were made. The interviewed households are questioned about their average monthly expenses on goods, utilities, and goods and services[14]. To compute the LC for each household i, we assume it to be the household's self-reported monthly amount spent on food and utilities. The question of the amount spent on goods and services[15] includes for sure expenditures on items that are not essential. Therefore, we can conjecture that the viability of this data is low. For example, a household with quarterly, semi-annual, or annual education expenses may not have reported them, whereas

[13] Ampudia et al. (2016) called FM. We changed the name of the concept because we consider the term FM ambiguous.

[14] These questions were only made in 2013, 2017, and 2020. Therefore, from now on, the year 2010 will be disregarded from the analysis.

[15] The question in the survey is formulated as follows: "So overall, about how much does your household spend on average by month on all consumer goods and services? Consider all household expenses including food, utilities, etc. but excluding consumer durables (e.g. cars, household appliances, etc.), rent, loan repayments, insurance policies, renovation, etc."

another household with monthly expenses on education may have reported them. Similarly, households with highly volatile monthly expenses may have under or overestimated their average monthly spending on goods and services. Thus, by choosing the household's average self-reported monthly amount spent on food and utilities, we closely follow the theoretical approach to this model, while ensuring comparability between responses and eliminating possible self-estimation biases, as spending on food and utilities tends to have low variability over time. Here, we depart from the approach proposed by Ampudia et al. (2016), as they assume the LC to be a fixed percentage, ϕ, of the median income needed for a household to fulfill the basic necessities of life and avoid social exclusion. In other words, they assume a common level of expenses for every household. By not assuming a common level of expenses for all households across the different years in our analysis, we can easily interpret our results, while keeping the heterogeneity of the different spending levels incurred by households that, in turn, are a more reliable reflection of their needs and preferences.

Figure 3 underlines the distribution of the HFB within the entire sample and sub-sample of older households with debt. The median and mean values for the HFB of the elderly households are lower than the ones for the whole sample, with the median value of the HFB of the older being very close to the threshold[16]. In addition, there is a large share of households aged 65+ on the left side of the distribution. This result pinpoints to lower capacity of elderly households to respond to shocks and unexpected expenses. In other words, this emphasizes the lower liquidity capacity of older households. This result goes in line with the one obtained in section 4.

With the goal of understanding how this indicator reacts to the changes of the core variables, the following regression was estimated:

$$ln(HFB_i) = \alpha_1 ln(Y_i) + \alpha_2 ln(NW_i) + \alpha_3 ln(LC_i) + \alpha_4 ln(DP_i) + \epsilon_i \tag{6}$$

where Y_i represents the disposable income of the i-*th* household, NW_i the net wealth held by each household, LC_i the annual expenses of the household i on food and utilities and DP_i each household's value of debt payments.

The results of this regression, which are displayed in Table 9, in Appendix A, must be interpreted with caution and as the correlation between the HFB and its components, since we are approximately estimating an identity regression. Nonetheless, the results emphasize the positive relation between disposable income and the HFB, and the negative relation between the net wealth and the HFB across both the entire sample and the sub-sample of older households. The relation between the other two components with the HFB seems to have mixed effects,

[16]The choice for the value of the threshold will be discussed in the next subsection.

as the signal changes when different regressions are tested. We also tested for cyclical and household aging effects and our results pinpointed an absence of these effects on the level of the HFB.

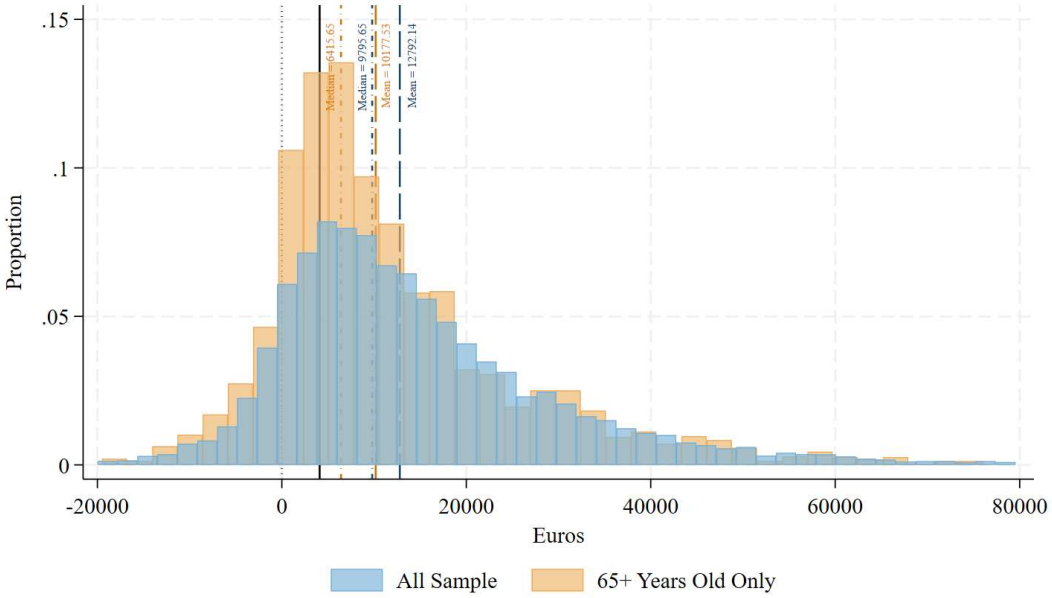

Figure 3: Distribution of the HFB

Note: This figure displays the distribution of the HFB for indebted households in the entire sample and in the sub-sample of households with an average age of 65 years old or over.

To assure comparability with the previously discussed ratios presented in the subsection Debt-to-Income Ratio, Debt-Service-to-Income Ratio, and Debt-to-Asset Ratio, in section 4, we computed the ratio between the HFB and disposable income. The following regression was estimated to evaluate which household characteristics contribute to different levels of HFB:

$$\frac{HFB_i}{Y_i} = \alpha \mathbf{X}'_{1i} + \beta \mathbf{X}'_{2i} + \epsilon_i \tag{7}$$

where $\mathbf{X}'_{1i}$ is a set of categorical economic variables and $\mathbf{X}'_{2i}$ is a set of categorical variables related to household characteristics. The $\mathbf{X}'_{1i}$ includes the disposable income variable and the households' net wealth, the level of expenses on food and utilities, and the value of households' debt payments. The $\mathbf{X}'_{2i}$ comprises the average household age, the number of household members, and the dummy variables for having dependent children, employed members, and members with an upper secondary or higher level of education in the household.

Table 3: OLS: HFBI (disposable income)

	All Sample				**65+ Years Old Only**			
Dependent variable: HFB/Disposable Income	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Ln (Disposable Income)	3.258	4.360	5.237	6.494	0.493***	0.796***	0.602***	0.839***
	(2.462)	(3.206)	(4.119)	(4.966)	(0.084)	(0.093)	(0.116)	(0.134)
Ln(Net Wealth)	-0.798	-0.560	-0.885	-0.758	-0.108***	-0.039*	-0.094***	-0.039
	(0.671)	(0.502)	(0.731)	(0.665)	(0.034)	(0.022)	(0.026)	(0.026)
Ln (Expenses)	-	-2.864	-	-3.390	-	-0.533***	-	-0.512***
		(2.111)		(2.475)		(0.052)		(0.057)
Ln (Debt Payments)	-	-0.776*	-	-0.818*	-	-0.199***	-	-0.190***
		(0.447)		(0.458)		(0.023)		(0.025)
Average household age	-	-	-0.040	-0.029	-	-	-0.002	-0.000
			(0.039)	(0.032)			(0.005)	(0.004)
Number of household members	-	-	-0.722	-0.440	-	-	-0.050	-0.030
			(0.600)	(0.381)			(0.039)	(0.035)
Has dependent children	-	-	0.914	0.964	-	-	0.054	-0.095
			(0.902)	(0.894)			(0.154)	(0.174)
Has employed individuals	-	-	-2.411	-2.313	-	-	-0.114	-0.056
			(2.248)	(2.237)			(0.083)	(0.041)
Has individuals with an upper secondary or higher level of education	-	-	-2.011	-1.786	-	-	-0.128**	-0.044
			(1.821)	(1.678)			(0.059)	(0.046)
Constant	-23.218	-5.129	-34.925	-13.724	-3.219***	-0.716*	-4.128***	-1.288
	(17.079)	(4.250)	(26.697)	(11.842)	(0.653)	(0.394)	(1.037)	(0.986)

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Source: ISFF and author's computations

Note: This table presents the OLS estimates for the relationship between the ratio HFB/disposable income and various financial and socio-demographic characteristics. The results are obtained using the 2013, 2017, and 2020 data. They are conditional on households holding debt. Columns (1)-(4) display the results for the whole sample, while columns (5)-(8) show the results for the sub-sample of households with an average age of 65 years old or over. The results may be biased as the number of observations varies across imputations. The estimates are weighted using household weights and they are conditional on households with debt. Bootstrap standard errors are shown in parentheses.

The results of this regression are presented in Table 3. They point out for heterogeneous effects of the household characteristics in the levels of HFB across the two groups. For the sub-sample of elderly households, disposable income, expenses on food and utilities, and debt payments are statistically significant. While the level of income reduces households' financial stress, an increase in expenses and debt payments increases it. Net wealth and the presence of highly educated individuals in older households increase household financial stress. The negative relationship between these two variables and the dependent variable might be explained by their capacity to demand debt. Wealthier and highly educated households, in theory, have a larger borrowing capacity, which, in turn, might lead to larger debt payments. These results, however, tend to fall apart as we run the entire regression. When taking into consideration the overall sample, only debt payments are statistically significant to explain changes in the share of financial buffer over the household disposable income, with it having a negative effect. This means that greater debt payment levels imply greater financial stress.

5.2 Financial Vulnerability Assessment

As previously discussed, having a HFB below the critical value does not immediately imply a problem of financial vulnerability. When facing liquidity problems, households can sell their liquid assets to cover excess expenses. Therefore, in this subsection, we determine our vulnerability indicator given each HFB and the liquid assets owned by the households.

To evaluate the liquid assets of each household, we divide the assets into liquid and illiquid. The set of liquid assets comprises sight accounts, saving accounts, mutual funds, managed accounts, money owed to households, and other financial assets. Table 10, in Appendix A, presents the summary statistics on the value of these assets held by the indebted households. Following the stated results, older indebted households hold less valuable liquid assets than the overall indebted sample. The comparison between the values of the assets held by the two samples can also be seen in Figure 13, in Appendix B, where there is a high concentration of elderly households with a low value of liquid assets. On the other hand, the set of illiquid assets includes assets such as real estate, vehicles, valuable items (e.g., jewelry, artwork, antiques), bonds, publicly traded shares, and voluntary pension or life insurance plans. They are disregarded from the assessment as they are hard to convert into cash quickly without incurring a significant loss in value. This means that, if a household needs to sell its illiquid assets in the short term to cover excess or unexpected expenses, the sale price will likely be lower than the assets' actual value.

To estimate the number of households at risk of being financially vulnerable, we depart from the approach proposed by Ampudia et al. (2016). Their approach presents a main funda-

mental problem, as it aims to assess the PD[17] on something that already happened. Given the interviewed households' answers to the questionnaire, we can only evaluate whether they were in a situation of default and, therefore, financially vulnerable, or not.

In our approach, we correct this specification problem by either considering a household to be financially healthy if its HFB is above the threshold or if it is below the threshold but has enough liquid assets to cover the negative buffer, or financially vulnerable, otherwise. This relation can be expressed as follows:

$$VulnerabilityIndicator_i = \begin{cases} 0, & \text{if } HFB_i \geq 4,100 \\ 0, & \text{if } HFB_i < 4,100 \wedge |HFB_i| \cdot M \leq LIQ_i \\ 1, & \text{if } HFB_i < 4,100 \wedge |HFB_i| \cdot M > LIQ_i \end{cases} \tag{8}$$

From here, two main differences pop out between ours and Ampudia et al. (2016)'s approach. The most clear one is the value of the critical threshold below which a household is considered financially vulnerable. Just considering the spending on food and utilities would allow us to understand which households experience financial stress when only accounting for basic necessities. Indeed, this was the goal of the model proposed by the authors. However, focusing solely on these expenses substantially narrows the scope of analysis and it may lead to an overestimation of the number of households with a positive financial buffer. Therefore, we moved the threshold below which a household is considered to be in financial stress from 0 to 4,100 euros. According to the results from the *Inquérito às Despesas das Famílias*[18], the average annual spending on food and utilities represents approximately 30% of the total expenditures of Portuguese families. The threshold of 4,100 euros allows us to account for those households that would be below the threshold of 0 euros if we would consider expenses other than the ones on food and utilities.

The second difference relies on the meaning of *M*. In their model, *M* stands for the number of months in which the negative margin is covered by the liquid assets. In our approach, *M* stands for the remaining average household life expectancy. The average household life ex-

[17] In their model, they combine the HFB with the liquid assets held by each household to estimate the probability at which the household i-th is at risk of default. This is given by the PD of each household i:

$$PD_i = \begin{cases} 0, & \text{if } HFB_i \geq 0 \vee |HFB_i| \cdot M \leq LIQ_i \\ 1 - \frac{LIQ_i}{|HFB_i| \cdot M}, & \text{if } HFB_i < 0 \wedge |HFB_i| \cdot M > LIQ_i \end{cases}$$

where LIQ_i stands for the value of the liquid assets and *M* for the number of months in which the negative margin is covered by the liquid assets.

[18] See Instituto Nacional de Estatística (2024).

pectancy considers the individual life expectancy of its members according to their sex and age by the time of the survey, and the year in which the survey was taken[19]. By doing this, we make a strong assumption as we assume the value of the liquid assets and income to be a constant stream for the remaining household life expectancy years.

The change in the meaning of M aims to understand whether households have sufficient liquid assets to mitigate the adverse effects of a negative financial buffer throughout the remainder of their lives. In other words, whether they can cope with the effects of negative shocks by using their available resources without falling into a vulnerable situation.

5.3 Stress Tests: the Impact on Household Financial Vulnerability

In this subsection, we present the results of the stress tests which aim to assess how household financial vulnerability of indebted households responds to various types of adverse shocks. We consider two main shocks: a rise in interest rates and an increase in households' expenses *ceteris paribus*, which are thus combined for a more holistic approach. We didn't consider a shock in income, since the main income source of the elderly households is pensions, which earnings tend to be stable over time. The considered scenarios are based on instantaneous shocks.

When evaluating the financial resilience of households, we will account for two distinct survival periods (SP). Our goal is to evaluate to which extent liquid assets can cover the HFB below the threshold "today", by assuming a SP of 0 years, and in the remaining households' life cycle[20], by considering a SP equal to the remaining household life expectancy years. An important assumption is that income and liquid assets are assumed to remain constant. The results[21] that will be discussed below are presented in Table 4.

The baseline scenario assumes no shock is performed. According to our computations, in this scenario, 20.39% of households experience financial stress across the entire sample. This number rises to 27.10% when clustering the analysis to the of households with an average age of 65+. This distribution can be seen in Figure 3. When assuming households to sell all their liquid assets "today" to cover the excess of expenses, the share of households in a vulnerable situation drops to 11.42% across the entire sample and to 15.64% in older households. However, if we split their liquid assets over the remaining household life expectancy years, the proportion of vulnerable households rises to 19.05% for the entire sample and 22.16% for those aged 65+.

[19] We followed the Instituto Nacional de Estatística (2023) for the reference.
[20] The method applied is explained in the previous subsection.
[21] The results are conditional on households with debt.

According to these results, although older indebted households hold lower debt levels, their retirement dreams seem to be overshadowed by the looming burden of debt. This analysis reveals that older households tend to experience higher levels of financial stress and vulnerability even before any shock takes place.

In the next subsections, we will evaluate how the two groups respond to the shocks.

Rise in Interest Rate

In the scope of this simulation, we perform two distinct shocks both at the same magnitude: a real estate interest rate shock and a credit card interest rate shock. The former is assumed to affect only mortgage loans with adjustable interest rates. In our sample, 88.81% of households have a household main residence adjustable mortgage debt and 82.39% hold an adjustable interest rate mortgage on other real estate property. Among the elderly households, the share of households with main residence adjustable mortgage debt drops to 81.91% and it rises to 88.53% when considering the share of households with adjustable interest rate mortgage on other real estate property. This puts Portugal among the group of countries with the highest proportion of adjustable rate loans in the Euro Area [22].

Although the survey does not collect information on the interest rates paid on the non-collateralised loans, we assumed the interest rates paid on the credit card expenses to be flexible. Credit cards usually have a one-year maturity and are re-issued with an interest rate adjusted to the one of reference.

To perform these shocks, we consider a 4 p.p. increase in the interest rate. Our goal is to mimic the increase in the Euribor that occurred in the last two years after a long period of low interest rate regime, as mortgage loans with adjustable interest rates are highly tied up to this base rate. We also assume the same rise to be applied to the credit card interest rate shock.

In the first stress test scenario, the proportion of households in financial stress increases to 30.32% for the entire sample and 36.56% for older households. This result is easily understandable given the share of households that report to have an adjustable interest rate regime. 17.35% households in the entire sample and 21.22% for the 65+ age group turn out to be financially vulnerable after selling all their liquid assets ”today”. When considering the remaining years of the households' life cycle, the numbers increase to 23.25% for the entire sample and 31.44% for older households.

In the second scenario where credit card interest rates increase, 24.74% of households in

[22] See Ampudia et al. (2016).

the full sample and 28.72% of older households are in financial stress. The share of vulnerable households drops to 11.54% in the full sample and 17.95% among older households if they sell all their liquid assets "today". If we consider them to be sold over the remaining years of the households' life cycle, the proportion of households in a vulnerable situation rises to 17.5% in the entire sample and 22.16% in the older households.

Rise in Living Costs

To perform a shock in consumption expenses, we assumed expenses to increase by 20%, in real terms. Once again, our goal is to closely follow the increase in expenditures in the last two years.

When a shock in consumption expenses is introduced, the proportion of households in financial stress increases to 28.38% in the full sample and 32.10% in the sub-sample of older households. These proportions fall to 13.58% for the full sample and 17.64% for older households when considering the scenario in which they sell all their liquid assets "today". However, these results increase to 23.94% for the full sample and 29.26% for older households if we assume households sell them over the remaining household life expectancy years.

Rise in Interest Rate and Living Costs

The combined scenario of a real estate interest rate shock and a consumption expense shock results in 34.89% of the full sample and 40.60% of older households being in financial stress. By considering households to sell all their liquid assets "today", the percentage of households in a situation of financial vulnerability drops to 19.64% for the entire sample and 21.61% for older households. These numbers rise to 33.98% for the entire sample and 34.91% for the sub-sample of older households if we assume the case in which the liquid assets are sold in the same proportion over the remaining household life expectancy years.

On the other hand, if we combine the scenario of a credit card interest rate shock with the shock in consumption expenses, 25.15% of the full sample and 33.79% of older households experience financial stress. The share of vulnerable households is 11.69% across the full sample and 13.35% among the households aged 65+, when we assume they are to sell all their liquid assets "today". If we assume them to sell them over the remaining years of the households' life cycle, these results increase to 24.81% for the full sample and 26.58% for the older age group.

Table 4: Vulnerable Households Under Different Stress Test Scenarios

		Households in Financial Stress		**Vulnerable Households** (SP = 0)		**Vulnerable Households** (SP = remaining years)	
	Shock	**All Sample**	**65+ Years Old Only**	**All Sample**	**65+ Years Old Only**	**All Sample**	**65+ Years Old Only**
Baseline Scenario	-	20.39%	27.10%	11.42%	15.46%	19.00%	22.26%
Real Estate Interest Rate Shock	4 p.p.	30.52%	36.56%	17.35%	21.22%	28.52%	31.14%
Credit Card Interest Rate Shock	4 p.p.	20.74%	28.72%	11.51%	17.53%	19.28%	24.22%
Shock in Consumption Expenses	20.00%	24.37%	32.30%	13.67%	17.65%	23.49%	27.22%
Real Estate Interest Rate Shock x Shock in Consumption Expenses	-	34.98%	40.60%	19.66%	23.18%	33.08%	34.83%
Credit Card Interest Rate Shock x Shock in Consumption	-	25.15%	33.79%	13.69%	20.53%	22.81%	28.95%

Source: ISFF and author's computations

Note: This table presents the proportion of indebted and vulnerable households under different stress test scenarios for the entire sample and the sub-sample of households with an average age of 65 years old or over. Households are considered to be in financial stress if their HFB is lower than 4,100 euros. SP stands for survival period and it refers to the number of years liquid assets are supposed to cover for the excess of expenses. The estimates are weighted using household weights. Data is multiply imputed.

All in all, this analysis reveals that older households tend to experience higher levels of financial stress and vulnerability in response to shocks. Regardless of this result, a closer look underlines similar patterns of vulnerability between the two groups in response to the shocks. This, in turn, suggests that the value of the liquid assets held by indebted older households is not significantly different from the value of the ones held by the overall sample. Table 10, displayed in Appendix A, presents the summary statistics on the liquid assets held by households. It indeed highlights the lower value of the liquid assets held by the older households. Therefore, the advantage that they could take from being closer to the upper bound of their life expectancy, in comparison to the entire sample that comprises younger households, falls apart as the value of their liquid assets decliness.

6 Robustness Analysis and Additional Results

In this section, we conduct several exercises to test the robustness of our results. First, we assess the validity of our HFB indicator through different measures of credit denied. Second, we evaluate the robustness of the results obtained in the regression 7 by performing the same exercise with the DSTI. Third, we estimate our main results considering alternative definitions of elderly households. Lastly, we construct an alternative measure of distress, by assuming different living costs.

6.1 Credit Denied

In the survey, households are questioned about their self-perception of vulnerability and if in the last three years, any lender or creditor has turned down any credit request, or has not given them as much credit as they applied for. This can be understood as both a symptom and a cause of weakened financial buffers. It signals that a household may already be in a vulnerable financial position.

Based on the responses to the survey, we compared the probability of a household below the threshold of 4,100 euros experiencing a self-perception of financial vulnerability and having their credit request denied or reduced with the probability of this happening to households above the threshold. The results are presented in Table 11, in Appendix A. For all vulnerability indicators, households below the critical threshold have a higher probability of perceiving themselves as vulnerable and facing credit denials or reductions in the amount requested.

6.2 Liquidity Strain

In section 5, regression 7 was estimated. To assess the robustness of our results, we regressed the same regression with DSTI as the dependent variable, as both HFB and DSTI are

measures of financial liquidity.

We began by regressing the DSTI ratio, where the denominator is the households' gross income. The results of this regression are presented in Table 12, in Appendix A. The results are heterogeneous between the two groups. Additionally, several variables became statistically significant in explaining different outcomes in the total sample. In the sub-sample of older households, only the value of expenses ceased to be statistically significant compared to the results obtained in section 5.

It is important to note that regression 7 used the ratio between the HFB and disposable income (not gross income) as the dependent variable. In this context, we adjusted the dependent variable to the DSTI ratio, where the denominator is the households' disposable income. The results are presented in Table13, in Appendix A. For the total sample, once again, none of the households' characteristics are statistically significant in explaining different households' liquidity capacities. In the sub-sample of elderly households, there are variables statistically significant. Both income and debt payments are statistically significant. The results suggest that an increase in disposable income reduces the proportion of debt payments relative to disposable income *ceteris paribus*. Conversely, increases in debt payments reduce the liquidity capacity of households. Compared to the results obtained by estimating the regression 7, in section 5, only expenses no longer explain variations in the households' liquidity capacity.

The differences between the two regressions results pinpoint a low correlation between the two metrics, due to the effect of progressive taxes. Figure 14, in Appendix B, plots the correlation between the variables.

6.3 Alternative Definitions of Elderly Households

Households Aged 75+ Years Old

Throughout the paper, we have been assuming a household to be older if the average age of its adult members is at least equal to 65 years old. Within this sub-sample, there is some heterogeneity in household characteristics between the youngest and oldest households. For example, the households aged 75 years or over in our sample don't have dependent children, while some of the others have. Therefore, to understand whether our main results hide some heterogeneity, we estimated our main results for this sub-sample.

Table 14, in Appendix A, shows that only the dummy variables related to employment and education have a strong and significant effect explaining differences in the value of debt, with both positively contributing to higher levels of debt. These results contrast with the ones obtained for the sub-sample of households aged 65+, as there were other variables explaining

differences within this sub-sample.

The results for these households' liquidity capacity, on the other hand, turn out to be identical to the sub-sample of households aged 65+. The results presented in Table 15, in Appendix A, emphasize strong and similar effects coming from disposable income, expenses, and the value of debt payments. Following the results obtained for the sub-sample of households aged 65+, only net wealth becomes significant in decreasing households' liquidity capacity.

We also assessed the percentage of households that follow below the threshold of 4,100 euros. The results are displayed in Table 15, in Appendix A. They underline a larger share of households in financial stress and vulnerability in both baseline and stress test scenarios. The trend, on the other hand, is very identical between the groups.

Age of the Reference Person of the Household

In this subsection, we evaluate if our results have turned out to be different if we had followed the usual procedure in the literature and considered the age of the reference person of the household. With this in mind, we will consider a household to be old if the age of the reference person of the household is at least 65 years old.

Table 17, in Appendix A, highlights the strong and significant effect of disposable income, net wealth, and the dummy variable for employment in explaining differences in the value of debt, with all of them being positively contributing to higher levels of debt. These results also contrast with the ones obtained for the sub-sample of households aged 65+. Given the previously obtained results, income now explains variations in debt levels, while age is no longer statistically significant, nor is the presence of children in the household.

Once again, the results for these households' liquidity capacity, turn out to be identical to the sub-sample of households aged 65+. The results presented in Table 18, in Appendix A, stress strong effects with identical magnitudes coming from disposable income, expenses, and value of debt payments. Following the results obtained for the sub-sample of households aged 65+, the dummy for employment and the value of net wealth become statistically significant, by contributing to a decrease in households' liquidity capacity.

The evaluation of the percentage of households below the threshold of 4,100 euros is displayed in Table 18, in Appendix A. These results emphasize a slightly smaller share of households in financial stress and vulnerability in both baseline and stress test scenarios. Nonetheless, the trend is very identical between the groups.

6.4 Alternative Measure of Distress

Most studies aimed to evaluate household financial vulnerability consider the expenses on basic living costs, meaning, expenses on the essential consumption, rather than the whole set of expenses. Different approaches have already been taken in this regard, with some authors defining it as the subsistence minimum or poverty line (for example, Ampudia et al. (2016)), while others defining it as the household self-reported minimum subsistence level (for example, Albacete and Fessler (2010)). We follow the second approach to define an alternative measure of distress. Following this approach, a household is considered to be categorized as financially vulnerable according to the following relation:

$$VulnerabilityIndicator_i = \begin{cases} 0, & \text{if } HFB_i \geq 0 \\ 0, & \text{if } HFB_i < 0 \wedge |HFB_i| \cdot M \leq LIQ_i \\ 1, & \text{if } HFB_i < 0 \wedge |HFB_i| \cdot M > LIQ_i \end{cases} \tag{9}$$

Table 20, in Appendix A, presents the results. Indebted older households continue to have a larger proportion of households falling below the threshold in comparison to the whole sample. Despite these results, in the baseline scenario, a smaller number of older households is considered to be financially vulnerable when introducing the value of the liquid assets. However, as shocks are performed, a larger number of older households turn to be financially vulnerable.

7 Limitations

Despite the contributions this thesis offers to the study of financial vulnerability among Portuguese households, particularly within elderly households, this work presents some limitations stemming from the database used and certain assumptions that had to be made to overcome the constraints arising from it. Therefore, in this section, we explore the limitations of our study.

The first limitation arises from the type of database used. Although the method of multiple stochastic imputation is employed to estimate the missing values and household weights are used to make our results representative of the Portuguese population, the reliability of the data may be affected by self-reporting bias. Either intentionally or unintentionally, respondents sometimes provide inaccurate information to the questions, due to their limited knowledge of the matters in question, memory gaps, and errors in reporting, as respondents often round up the reported numbers.

Other several challenges are found by using the ISFF. First, it is not possible to track whether the same households participated in multiple waves of the survey, limiting the ability

to follow long-term household behavior trends. Second, there were reformulations in question formats, and the inclusion/exclusion of certain questions across the four years of the survey. An example of this is the exclusion of the 2010 wave data from our vulnerability assessment, due to the lack of information on expenses on utilities that only started to be included in the following surveys. Finally, the 2010 wave used a different method for imputing data compared to the remaining years, which may affect the consistency of our results.

In addition, we assume food and utility expenses to account for 30% of total household expenditures, which may hide heterogeneous spending patterns across households. We also assumed household income and liquid assets to remain constant throughout the remaining life expectancy, overlooking potential changes over time. Additionally, income is reported at a gross level in the survey. To calculate the disposable income, we considered a single tax rate to be applied over the household total income, disregarding its different sources, when tax rates applied in Portugal vary for the various types of income. This simplification might not fully capture the effects of taxation or other deductions on household finances and may introduce inaccuracies in assessing the true financial vulnerability of households with diverse income sources.

8 Conclusion

By using the ISFF, this research paper sheds light on the complex interplay between disposable income, debt payments, non-debt-related expenses, and liquid assets in determining household financial vulnerability among indebted households in Portugal, with a particular focus on the elderly.

According to our results, retirement dreams seem to be overshadowed by the looming burden of debt. Despite their lower levels of debt, older households have a smaller liquidity capacity, which is negatively affected by consumption expenses and debt payments. The lower liquidity of these households persists when liquid assets are introduced as a means to address the negative HFB, since the liquid assets held by these households are not sufficient to cover the entire negative financial buffer due to their low values, which, in turn, are highly concentrated around 0. This insufficiency of assets to cover the excess expenses becomes even more evident when considering the remaining years of the households' life cycle. This result remains consistent when shocks in interest rates and consumption expenditures occur, highlighting the reduced capacity of these households to absorb such shocks. The results show that these households are particularly vulnerable to consumption expenditure shocks, a somewhat surprising outcome given that more than 80% of indebted households have variable interest rate debt.

These results become even more interesting when narrowing the sample to households with debt aged 75+. For this group, the proportion of households in financial vulnerability is even more pronounced than for the group of households aged 65+. This suggests that, for indebted households, vulnerability increases with advancing age.

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Appendix A: Tables

Table 5: OLS: Debt

	All Sample		65+ Years Old Only	
Dependent variable: Ln(Debt)	**(1)**	**(2)**	**(3)**	**(4)**
Ln (Disposable Income)	0.538***	0.371***	0.573***	0.128
	(0.055)	(0.062)	(0.213)	(0.245)
Ln(Net Wealth)	0.205***	0.254***	0.360***	0.352***
	(0.026)	(0.028)	(0.078)	(0.084)
Ln (Expenses)	-0.103	0.029	-0.288	-0.414
	(0.085)	(0.096)	(0.276)	(0.291)
Average household age	-	-0.038***	-	-0.075***
		(0.004)		(0.025)
Number of household members	-	-0.207***	-	0.134
		(0.050)		(0.204)
Has dependent children	-	0.510***	-	0.908**
		(0.120)		(0.402)
Has employed individuals	-	0.551***	-	0.628***
		(0.126)		(0.233)
Has individuals with an upper secondary or higher level of education	-	0.167**	-	0.380
		(0.082)		(0.251)
Constant	3.385***	4.695***	1.475	11.666***
	(0.622)	(0.752)	(1.622)	(2.537)

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Source: ISFF and author's computations

Note: This table presents the OLS estimates for the relationship between the value of household debt and various financial and socio-demographic characteristics. The results are obtained using the 2010, 2013, 2017, and 2020 data. Columns (1)-(2) display the results for the whole sample, while columns (3)-(4) show the results for the sub-sample of households with an average age of 65 years old or over. The results may be biased as the number of observations varies across imputations. The estimates are weighted using household weights. Bootstrap standard errors are shown in parentheses.

Table 6: OLS: Relation Between Employment and Debt in Older Households

	(1)	(2)	(3)	(4)
Ln (Debt)	0.091***	-	-	0.079***
	(0.016)	-	-	(0.017)
Ln (Net Wealth)	-	0.057**	-	0.001
	-	(0.022)	-	(0.026)
Ln (Expenses)	-	-	0.224***	0.154**
	-	-	(0.060)	(0.063)
Constant	-0.398***	-0.257	-1.578***	-1.661***
	(0.128)	(0.258)	(0.518)	(0.556)

Source: ISFF and author's computations

Note: This table presents the relation between the number of employed individuals and the level of debt, net wealth, and expenses in the sub-sample of households with an average age of 65 years old or over. The results are weighted using household weights. Bootstrap standard errors are shown in parentheses.

Table 7: Indebtedness Ratios: Median Values

	All Sample			65+ years old Old Only		
	(1) DTI	(2) DSTI	(3) DTA	(4) DTI	(5) DSTI	(6) DTA
Total	169.28%	15.65%	31.80%	46.92%	15.26%	7.98%
Total gross income quintile						
0%-20%	383.74%	54.21%	35.42%	63.02%	34.02%	9.09%
20%-40%	219.78%	27.76%	33.57%	45.75%	19.45%	9.70%
40%-60%	217.16%	19.89%	36.81%	41.67%	13.58%	5.68%
60%-80%	166.72%	14.04%	33.52%	39.68%	14.14%	11.81%
80%-90%	168.60%	11.52%	31.51%	52.68%	11.19%	9.83%
90%-100%	110.39%	8.49%	21.16%	50.00%	7.95%	6.67%
Net wealth quintile						
0%-25%	96.77%	18.57%	88.89%	17.70%	12.84%	97.09%
25%-50%	239.71%	17.34%	49.02%	45.84%	14.72%	8.03%
50%-75%	155.38%	14.36%	23.77%	54.89%	15.69%	6.47%
75%-90%	137.08%	13.04%	15.79%	41.81%	12.11%	2.95%
90%-100%	149.81%	13.89%	8.98%	114.86%	18.92%	5.43%
Total real assets quintile						
0%-25%	22.05%	11.19%	63.24%	17.70%	11.19%	70.18%

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Table 7 – *Continued from previous page*

	(1)	(2)	(3)	(4)	(5)	(6)
25%-50%	168.34%	17.50%	41.24%	42.49%	16.00%	6.92%
50%-75%	225.93%	16.04%	36.04%	59.02%	15.48%	6.46%
75%-90%	214.17%	15.07%	26.32%	46.95%	15.16%	3.51%
90%-100%	217.32%	16.39%	13.71%	114.86%	18.95%	6.32%
Total financial assets quintile						
0%-25%	136.07%	20.57%	48.11%	41.25%	20.57%	14.26%
25%-50%	188.68%	16.64%	39.60%	41.49%	14.14%	7.42%
50%-75%	195.44%	14.67%	33.02%	44.25%	13.42%	7.71%
75%-90%	165.82%	12.84%	22.12%	87.83%	15.64%	5.91%
90%-100%	144.79%	11.19%	15.28%	72.76%	10.56%	5.75%
Household members						
1 individual	185.19%	19.97%	37.04%	46.35%	17.33%	9.24%
2 individuals	129.09%	15.44%	25.43%	38.98%	12.82%	6.86%
3 individuals	189.25%	15.56%	34.29%	72.84%	13.66%	9.65%
4 individuals	197.54%	15.35%	32.97%	182.03%	11.06%	20.45%
5+ individuals	141.63%	13.95%	27.87%	114.86%	1.37%	6.87%
Household type						
1 adult 64- years old	245.83%	20.00%	40.51%	-	-	-
1 adult 65+ years old	46.35%	17.33%	9.24%	-	-	-
2 adults 64- years old	144.51%	14.98%	30.23%	-	-	-
2 adults. at least one aged 65+ years old	35.71%	11.73%	8.06%	-	-	-
3+ adultos	69.29%	12.05%	13.64%	-	-	-
Adults 64- years old with dependent children	217.43%	16.35%	37.30%	-	-	-
Other households with dependent children	68.07%	13.22%	14.99%	-	-	-
Household age groups						
34-	275.94%	17.63%	51.38%	-	-	-
35-44	210.10%	15.70%	35.01%	-	-	-
45-54	125.64%	14.24%	22.32%	-	-	-
55-64	68.66%	14.12%	12.92%	-	-	-
65-74	51.89%	15.58%	8.71%	-	-	-
75+	29.27%	12.84%	3.67%	-	-	-
Members in employment						
None	61.08%	19.22%	14.59%	39.54%	16.26%	6.45%
1 individual	206.90%	18.60%	34.79%	80.66%	13.58%	13.84%
2 individuals	196.83%	14.45%	34.53%	87.83%	11.98%	10.07%
3+ individuals	92.84%	12.17%	19.77%	-	-	-
Members with an upper secondary or higher level of education						
None	149.97%	19.75%	33.38%	45.52%	17.00%	8.93%
1 individual	186.10%	16.78%	33.34%	68.18%	14.07%	7.74%
2+ individuals	169.75%	12.55%	29.07%	50.00%	7.89%	6.87%

Source: ISFF

Note: This table presents the median values of the households' indebtedness ratios categorized by different household characteristics. The results are obtained using the 2010. 2013. 2017. and 2020 data. Columns (1)-(3) display the results for the whole sample. Columns (4)-(6) show the results of the sub-sample of households with an average age of 65 years old or over. The results are weighted using household weights and they are conditional on households with debt.

Table 8: Indebtedness Ratios: Probability of Being Above the Threshold

	(1) DTI	(2) DSTI	(3) DTA
Total gross income quintile			
20%-40%	-0.999***	-1.215***	-0.220
	(0.180)	(0.133)	(0.185)
40%-60%	-1.618***	-1.911***	-0.113
	(0.180)	(0.130)	(0.182)
60%-80%	-2.428***	-2.391***	0.032
	(0.189)	(0.134)	(0.184)
80%-90%	-2.949***	-2.656***	0.154
	(0.210)	(0.147)	(0.232)
90%-100%	-4.010***	-3.008***	0.413
	(0.226)	(0.152)	(0.274)
Total real assets quintile			
25%-50%	3.701***	-1.218***	-0.799***
	(0.304)	(0.094)	(0.134)
50%-75%	4.372***	-1.518***	-1.452***
	(0.308)	(0.093)	(0.146)
75%-90%	4.933***	-1.317***	-2.248***
	(0.313)	(0.109)	(0.225)
90%-100%	5.650***	-1.083***	-3.810***
	(0.330)	(0.118)	(0.345)
Total financial assets quintile			
25%-50%	-0.219*	0.224**	-0.448***
	(0.117)	(0.089)	(0.123)
50%-75%	-0.227*	0.366***	-0.985***
	(0.119)	(0.086)	(0.143)
75%-90%	-0.346**	0.782***	-1.924***
	(0.141)	(0.094)	(0.365)
90%-100%	-0.299*	1.134***	-2.208***
	(0.165)	(0.105)	(0.402)

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Table 8 – *Continued from previous page*

	(1)	(2)	(3)
Household members			
2 individuals	-1.253***	0.390*	-0.333
	(0.384)	(0.229)	(0.401)
3 individuals	-0.859**	0.777***	0.042
	(0.364)	(0.187)	(0.358)
4 individuals	-0.996***	0.800***	-0.264
	(0.367)	(0.186)	(0.363)
5+ individuals	-0.849**	0.814***	0.117
	(0.365)	(0.189)	(0.358)
Household type			
1 adult 65+ years old	-1.088**	0.143	-0.139
	(0.495)	(0.230)	(0.474)
2 adults 64- years old	0.744*	-0.110	-0.202
	(0.389)	(0.231)	(0.413)
2 adults, at least one aged 65+ years old	0.352	0.330	-0.266
	(0.456)	(0.249)	(0.470)
3+ adultos	-0.220	0.409**	-0.494
	(0.390)	(0.173)	(0.373)
Adults 64- years old with dependent children	0.590*	-0.448***	-0.349
	(0.337)	(0.164)	(0.334)
Household age groups			
35-44	-0.690***	-0.165*	-0.529***
	(0.110)	(0.088)	(0.128)
45-54	-1.500***	0.105	-1.538***
	(0.140)	(0.108)	(0.176)
55-64	-2.044***	0.603***	-1.583***
	(0.203)	(0.123)	(0.214)
65-74	-2.012***	0.875***	-1.533***
	(0.409)	(0.188)	(0.401)
75+	-2.527***	2.430***	-1.014*
	(0.691)	(0.280)	(0.564)
Members in employment			
1 individual	0.375**	-0.564***	0.224
	(0.182)	(0.095)	(0.184)
2 individuals	0.237	-0.741***	0.026
	(0.190)	(0.106)	(0.196)
3+ individuals	-0.799***	-0.456***	-0.842***
	(0.261)	(0.139)	(0.310)
Members with an upper secondary or higher level of education			
1 individual	0.076	-0.179**	-0.371***
	(0.100)	(0.072)	(0.128)
2+ individuals	0.000	-0.381***	-0.061
	(0.118)	(0.089)	(0.152)
Constant	-1.651***	2.670***	1.415***

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Table 8 – *Continued from previous page*

	(1)	(2)	(3)
	(0.356)	(0.174)	(0.256)

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Source: ISFF and author's computations

Note: This table presents the Logit estimates for the probability of being above the reference threshold for each indebtedness ratio, according to different household characteristics. The results are obtained using the 2010, 2013, 2017, and 2020 data, and the whole sample. The results should be interpreted with reference to the omitted categories in the regression, which correspond to households with income below the 20^{th} percentile, with net wealth below the 25^{th} percentile, with real wealth below the 25^{th} percentile, with financial wealth below the 25^{th} percentile, with only one member, with only one adult aged 64 years old old or less, with average age below 35 years old old, with no members employed and with no members with upper secondary or higher level of education. The level "Other households with dependent children" within the variable "Household type" is omitted due to an insufficient number of observations to compute the bootstrap standard errors. The coefficients presented correspond to the regression coefficients, whose magnitude should not be interpreted as the marginal effect of the explanatory variable on the dependent variable. Moreover, they may be biased as the number of observations varies across imputations. The results are weighted using household weights and they are conditional on households with debt. Bootstrap standard errors are shown in parentheses.

Table 9: OLS: HFB

	All Sample				65+ Years Old Only			
Dependent variable: Ln(HFB)	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Ln (Disposable Income)	1.710***	-	-	2.165***	1.629***	-	-	2.284***
	(0.029)			(0.057)	(0.062)			(0.110)
Ln(Net Wealth)	-0.064***	-	-	-0.022***	-0.130***	-	-	-0.048**
	(0.009)			(0.008)	(0.026)			(0.019)
Ln (Expenses)	-	0.923***	-	-0.706***	-	1.046***	-	-0.941***
		(0.047)		(0.047)		(0.128)		(0.089)
Ln (Debt Payments)	-		0.302***	-0.338***	-	-	0.440***	-0.294***
			(0.035)	(0.021)			(0.078)	(0.045)
Constant	-7.261***	1.006**	6.740***	-3.315***	-5.617***	-0.302	5.445***	-2.436***
	(0.292)	(0.422)	(0.285)	(0.209)	(0.536)	(1.134)	(0.623)	(0.455)

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Source: ISFF and author's computations

Note: This table presents the OLS estimates for the relationship between the household financial buffer and various financial characteristics. The results are obtained using the 2013, 2017, and 2020 data. Columns (1)-(4) display the results for the whole sample, while columns (5)-(8) show the results for the sub-sample of households with an average age of 65 years old or over. The results may be biased as the number of observations varies across imputations. The estimates are weighted using household weights and they are conditional on households with debt. Bootstrap standard errors are shown in parentheses.

Table 10: Liquid Assets Held by Indebted Households: Summary Statistics

	Mean	**25th Percentile**	**Median**	**75th Percentile**	**Min.**	**Max.**	**Std. Dev.**
				(10^3)			
All Sample	17.66	0.701	4.00	16.00	-	5680.00	54.96
65+ Years Old Only	22.26	0.421	2.00	15.00	-	2402.50	73.97

Source: ISFF

Note: This table presents the value of the liquid assets for the indebtedness households in the entire sample and the sub-sample of households with an average age of 65 years old or over. All results are in euros. The results are weighted using household weights.

Table 11: Logit: Credit Constraint

	(1) Credit Constrained	(2) Self-Percieved Credit Constraint	(3) Credit Refusal or Reduction	(4) Credit Refused or Reduced
Household Financial Buffer				
Below 4,100	0.700***	0.704***	0.654***	0.857**
	(0.129)	(0.138)	(0.218)	(0.318)
Constant	-2.500***	-2.725***	-2.456***	-3.358***
	(0.083)	(0.094)	(0.126)	(0.191)

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Source: ISFF and author's computations

Note: This table presents the Logit estimates for the probability of being credit constraint, according to different household characteristics. The results are obtained using the 2010, 2013, 2017, and 2020 data, and the whole sample. The results should be interpreted with reference to the omitted category in the regression, which corresponds to households with an HFB above the threshold of 4,100 euros. The coefficients presented correspond to the regression coefficients, whose magnitude should not be interpreted as the marginal effect of the explanatory variable on the dependent variable. Moreover, they may be biased as the number of observations varies across imputations. The results are weighted using household weights and they are conditional on households with debt. Bootstrap standard errors are shown in parentheses.

Table 12: OLS: DSTI (gross income)

	All Sample				65+ Years Old Only			
Dependent variable: DSTI (gross income)	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Ln (Disposable Income)	-18.738**	-33.468**	-23.824**	-43.210**	-0.341	-0.552	-0.296***	-0.308***
	(9.410)	(16.567)	(11.693)	(21.045)	(0.251)	(0.596)	(0.082)	(0.111)
Ln(Net Wealth)	4.265*	3.253*	5.938*	5.470*	0.099	0.048	0.063***	0.025
	(2.198)	(1.860)	(3.119)	(3.089)	(0.068)	(0.048)	(0.017)	(0.016)
Ln (Expenses)	-	18.037**	-	20.155**	-	0.311	-	0.020
		(8.483)		(9.442)		(0.571)		(0.035)
Ln (Debt Payments)	-	12.338**	-	17.344*	-	0.218*	-	0.178***
		(6.275)		(9.040)		(0.108)		(0.019)
Average household age	-	-	-0.493*	-0.755*	-	-	-0.005	-0.000
			(0.293)	(0.439)			(0.004)	(0.003)
Number of household members	-	-	3.922*	5.225*	-	-	0.017	0.032
			(2.028)	(2.864)			(0.029)	(0.026)
Has dependent children	-	-	2.603	0.789	-	-	-0.101	0.022
			(2.018)	(2.218)			(0.153)	(0.143)
Has employed individuals	-	-	-35.813	-49.401	-	-	0.111*	0.020
			(22.056)	(30.464)			(0.065)	(0.026)
Has individuals with an upper secondary or higher level of education	-	-	-1.041	-7.468	-	-	0.061	0.019
			(2.120)	(5.495)			(0.039)	(0.036)
Constant	140.818**	39.467	214.172**	120.000*	2.405	0.615	2.644***	1.267
	(70.193)	(25.280)	(108.191)	(68.668)	(1.722)	(0.627)	(0.729)	(0.808)

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Source: ISFF and author's computations

Note: This table presents the OLS estimates for the relationship between the DSTI (gross income) and various financial and socio-demographic characteristics. The results are obtained using the 2010, 2013, 2017, and 2020 data. Columns (1)-(4) display the results for the whole sample, while columns (5)-(8) show the results for the sub-sample of households with an average age of 65 years old or over. The results may be biased as the number of observations varies across imputations. The estimates are weighted using household weights and they are conditional on households with debt. Bootstrap standard errors are shown in parentheses.

Table 13: OLS: DSTI (disposable income)

	All Sample				65+ Years Old Only			
Dependent variable: DSTI (disposable income)	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Ln (Disposable Income)	-1.472	-2.737	-1.921	-3.356	-0.301	-0.520	-0.235***	-0.254***
	(0.948)	(1.941)	(1.339)	(2.339)	(0.248)	(0.594)	(0.052)	(0.049)
Ln(Net Wealth)	0.287	-0.013	0.349	0.012	0.094	0.042	0.059***	0.018
	(0.289)	(0.395)	(0.333)	(0.462)	(0.068)	(0.047)	(0.013)	(0.011)
Ln (Expenses)	-	2.331	-	3.127	-	0.307	-	0.032
		(2.254)		(3.264)		(0.571)		(0.026)
Ln (Debt Payments)	-	1.082	-	1.291	-	0.235*	-	0.198***
		(0.963)		(1.310)		(0.107)		(0.017)
Average household age	-	-	-0.003	-0.017	-	-	-0.006*	0.001
			(0.019)	(0.043)			(0.003)	(0.002)
Number of household members	-	-	0.204	-0.140	-	-	-0.017	-0.003
			(0.398)	(0.508)			(0.029)	(0.018)
Has dependent children	-	-	0.223	0.299	-	-	-0.072	0.073
			(0.811)	(1.038)			(0.125)	(0.098)
Has employed individuals	-	-	0.976	1.282	-	-	0.108*	0.023
			(0.838)	(1.093)			(0.056)	(0.019)
Has individuals with an upper secondary or higher level of education	-	-	-0.147	-1.017	-	-	0.061*	0.005
			(1.247)	(2.590)			(0.033)	(0.020)
Constant	11.935	-1.546	14.337	-3.814	2.091	0.294	2.234***	0.554
	(8.276)	(7.070)	(9.984)	(14.746)	(1.698)	(0.594)	(0.440)	(0.382)

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Source: ISFF and author's computations

Note: This table presents the OLS estimates for the relationship between the DSTI (disposable income) and various financial and socio-demographic characteristics. The results are obtained using the 2010, 2013, 2017, and 2020 data. Columns (1)-(4) display the results for the whole sample, while columns (5)-(8) show the results for the sub-sample of households with an average age of 65 years old or over. The results may be biased as the number of observations varies across imputations. The estimates are weighted using household weights and they are conditional on households with debt. Bootstrap standard errors are shown in parentheses.

Table 14: OLS Regression for the Sub-Sample of Households 75+ Years Old: Debt

Dependent variable: Ln(Debt)	**(1)**
Ln (Disposable Income)	-0.205
	(0.512)
Ln(Net Wealth)	0.181
	(0.177)
Ln (Expenses)	-0.248
	(0.538)
Average household age	-0.084
	(0.058)
Number of household members	-0.451
	(0.605)
Has employed individuals	0.966*
	(0.545)
Has individuals with an upper secondary or higher level of education	1.420***
	(0.420)
Constant	16.977***
	(5.372)

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Source: ISFF and author's computations

Note: This table presents the OLS estimates for the relationship between the value of household debt and various financial and socio-demographic characteristics for the sub-sample oof households with an average age of 75 years old or over. The results are obtained using the 2010, 2013, 2017, and 2020 data. The results may be biased as the number of observations varies across imputations. The estimates are weighted using household weights. Bootstrap standard errors are shown in parentheses.

Table 15: OLS: HFBI (disposable income) for the Sub-Sample of Households 75+ Years Old

Dependent variable: HFB/Disposable Income	**(1)**	**(2)**	**(3)**	**(4)**
Ln (Disposable Income)	0.556***	0.880***	0.706***	0.897***
	(0.062)	(0.078)	(0.130)	(0.078)
Ln(Net Wealth)	-0.146***	-0.073**	-0.166***	-0.066***
	(0.031)	(0.027)	(0.055)	(0.022)
Ln (Expenses)	-	-0.634***	-	-0.627***
		(0.092)		(0.095)
Ln (Debt Payments)	-	-0.179***	-	-0.171***
		(0.035)		(0.036)
Average household age	-	-	0.027	0.010
			(0.018)	(0.009)
Number of household members	-	-	-0.056	-0.071
			(0.115)	(0.077)
Has employed individuals	-	-	-0.197	0.049
			(0.269)	(0.064)
Has individuals with an upper secondary or higher level of education	-	-	-0.109	-0.033
			(0.121)	(0.065)
Constant	-3.402***	-0.404	-6.601***	-1.414*
	(0.517)	(0.491)	(2.088)	(0.725)

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Source: ISFF and author's computations

Note: This table presents the OLS estimates for the relationship between the ratio HFB/disposable income and various financial and socio-demographic characteristics for the sub-sample of households with an average age of 75 years old or over. The results are obtained using the 2013, 2017, and 2020 data. They are conditional on households holding debt. The results may be biased as the number of observations varies across imputations. The estimates are weighted using household weights and they are conditional on households with debt. Bootstrap standard errors are shown in parentheses.

Table 16: Vulnerable Households Under Different Stress Test Scenarios: Average Household Age 75+ Years Old

		Households in Financial Stress	**Vulnerable Households (SP = 0)**	**Vulnerable Households** (SP = remaining years)
Baseline Scenario	-	31.65%	20.14%	23.74%
Real Estate Interest Rate Shock	4 p.p.	41.01%	27.34%	33.09%
Credit Card Interest Rate Shock	4 p.p.	39.57%	25.90%	30.22%
Shock in Consumption Expenses	20.00%	39.57%	24.46%	29.50%
Real Estate Interest Rate Shock x Shock in Consumption Expenses	-	44.60%	28.35%	33.81%
Credit Card Interest Rate Shock x Shock in Consumption	-	43.17%	28.06%	33.09%

Source: ISFF and author's computations

Note: This table presents the proportion of indebted and vulnerable households under different stress test scenarios for the sub-sample of households with an average age of 75 years old or over. Households are considered to be in financial stress if their HFB is lower than 4,100 euros. SP stands for survival period and it refers to the number of years liquid assets are supposed to cover for the excess of expenses. The estimates are weighted using household weights. Data is multiply imputed.

Table 17: OLS Regression for the Sub-Sample of Households Whose Head is 65+ Years Old: Debt

Dependent variable: Ln(Debt)	**(1)**	**(2)**
Ln (Disposable Income)	0.545***	0.444**
	(0.155)	(0.205)
Ln(Net Wealth)	0.278***	0.305***
	(0.062)	(0.074)
Ln (Expenses)	0.040	-0.056
	(0.205)	(0.225)
Average household age	-	-0.025
		(0.015)
Number of household members	-	-0.221
		(0.165)
Has dependent children	-	0.386
		(0.388)
Has employed individuals	-	0.467*
		(0.267)
Has individuals with an upper secondary or higher level of education	-	-0.150
		(0.213)
Constant	-0.260	3.237
	(1.429)	(2.388)

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Source: ISFF and author's computations

Note: This table presents the OLS estimates for the relationship between the value of household debt and various financial and socio-demographic characteristics for the sub-sample of households whose head is aged 65 years old or over. The results are obtained using the 2010, 2013, 2017, and 2020 data. The results may be biased as the number of observations varies across imputations. The estimates are weighted using household weights. Bootstrap standard errors are shown in parentheses.

Table 18: OLS: HFBI (disposable income) for the Sub-Sample of Households Whose Head is 65+ Years Old

Dependent variable: HFB/Disposable Income	**(1)**	**(2)**	**(3)**	**(4)**
Ln (Disposable Income)	0.446***	0.707***	0.522***	0.748***
	(0.058)	(0.064)	(0.087)	(0.097)
Ln(Net Wealth)	-0.076***	-0.032**	-0.079***	-0.038*
	(0.018)	(0.014)	(0.020)	(0.021)
Ln (Expenses)	-	-0.468***	-	-0.455***
		(0.032)		(0.038)
Ln (Debt Payments)	-	-0.178***	-	-0.163***
		(0.017)		(0.021)
Average household age	-	-	-0.002	-0.001
			(0.002)	(0.002)
Number of household members	-	-	-0.022	-0.015
			(0.024)	(0.018)
Has dependent children	-	-	0.006	0.034
			(0.063)	(0.062)
Has employed individuals	-	-	-0.068	-0.057*
			(0.065)	(0.033)
Has individuals with an upper secondary or higher level of education	-	-	-0.051	-0.036
			(0.037)	(0.025)
Constant	-3.155***	-0.678**	-3.639***	-1.110*
	(0.443)	(0.298)	(0.677)	(0.631)

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Source: ISFF and author's computations

Note: This table presents the OLS estimates for the relationship between the ratio HFB/disposable income and various financial and socio-demographic characteristics for the sub-sample of households whose head is aged 65 years old or over. The results are obtained using the 2013, 2017, and 2020 data. They are conditional on households holding debt. The results may be biased as the number of observations varies across imputations. The estimates are weighted using household weights and they are conditional on households with debt. Bootstrap standard errors are shown in parentheses.

Table 19: Vulnerable Households Under Different Stress Test Scenarios: Reference Person Aged 65+ Years Old

		Households in Financial Stress	**Vulnerable Households (SP = 0)**	**Vulnerable Households** (SP = remaining years)
Baseline Scenario	-	23.58%	12.70%	20.26%
Real Estate Interest Rate Shock	4 p.p.	32.88%	18.37%	28.57%
Credit Card Interest Rate Shock	4 p.p.	24.87%	14.74%	21.47%
Shock in Consumption Expenses	20.00%	28.87%	14.89%	25.02%
Real Estate Interest Rate Shock x Shock in Consumption Expenses	-	37.04%	20.63%	32.50%
Credit Card Interest Rate Shock x Shock in Consumption	-	30.16%	17.54%	27.89%

Source: ISFF and author's computations

Note: This table presents the proportion of indebted and vulnerable households under different stress test scenarios for the sub-sample of households whose head is aged 65 years old or over. Households are considered to be in financial stress if their HFB is lower than 4,100 euros. SP stands for survival period and it refers to the number of years liquid assets are supposed to cover for the excess of expenses. The estimates are weighted using household weights. Data is multiply imputed.

Table 20: Vulnerable Households Under Different Stress Test Scenarios: Alternative Threshold

		Households in Financial Stress		**Vulnerable Households** (SP = 0)		**Vulnerable Households** (SP = remaining years)	
	Shock	**All Sample**	**65+ Years Old Only**	**All Sample**	**65+ Years Old Only**	**All Sample**	**65+ Years Old Only**
Baseline Scenario	-	9.77%	10.84%	5.56%	5.54%	9.04%	8.88%
Real Estate Interest Rate Shock	4 p.p.	19.08%	19.38%	11.57%	10.96%	18.04%	16.61%
Credit Card Interest Rate Shock	4 p.p.	10.35%	15.69%	6.18%	9.23%	9.68%	13.03%
Shock in Consumption Expenses	20%	12.97%	14.65%	7.45%	7.27%	12.20%	12.11%
Real Estate Interest Rate Shock x Shock in Consumption Expenses	-	22.43%	23.30%	13.73%	13.84%	21.52%	20.42%
Credit Card Interest Rate Shock x Shock in Consumption	-	13.30%	19.49%	7.88%	11.53%	12.47%	16.61%

Source: ISFF and author's computations

Note: This table presents the proportion of indebted and vulnerable households under different stress test scenarios for the entire sample and the sub-sample of households with an average age of 65 years old or over. Households are considered to be in financial stress if their HFB is lower than 0 euros. SP stands for survival period and it refers to the number of years liquid assets are supposed to cover for the excess of expenses. The estimates are weighted using household weights. Data is multiply imputed.

Appendix B: Figures

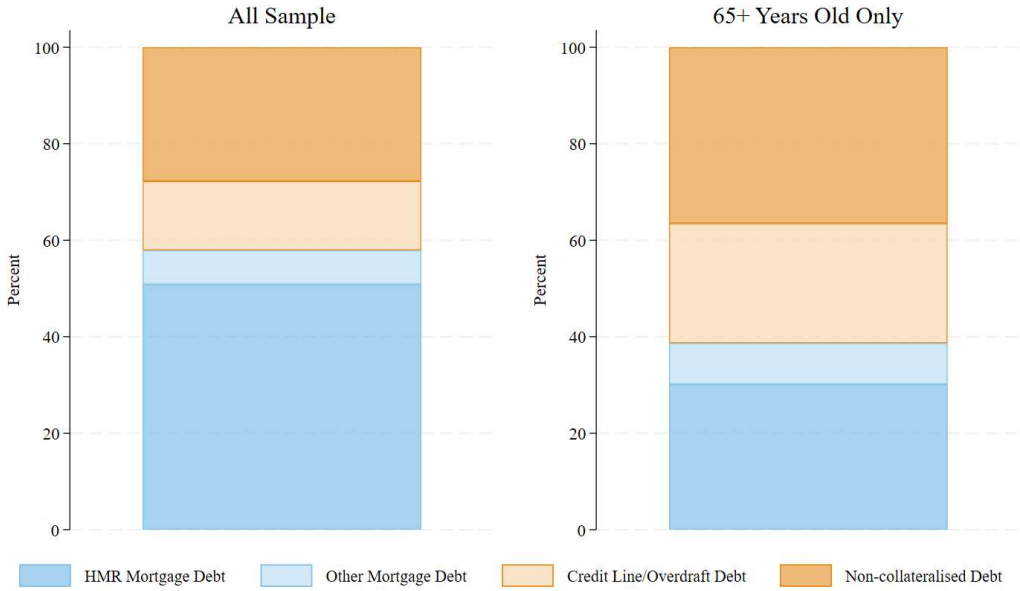

Figure 4: Proportion of Debt Held by Indebted Households by Type

Note: This figure displays the proportion of debt held by households in the entire sample and in the sub-sample of of households with an average age of 65 years old or over, by type.

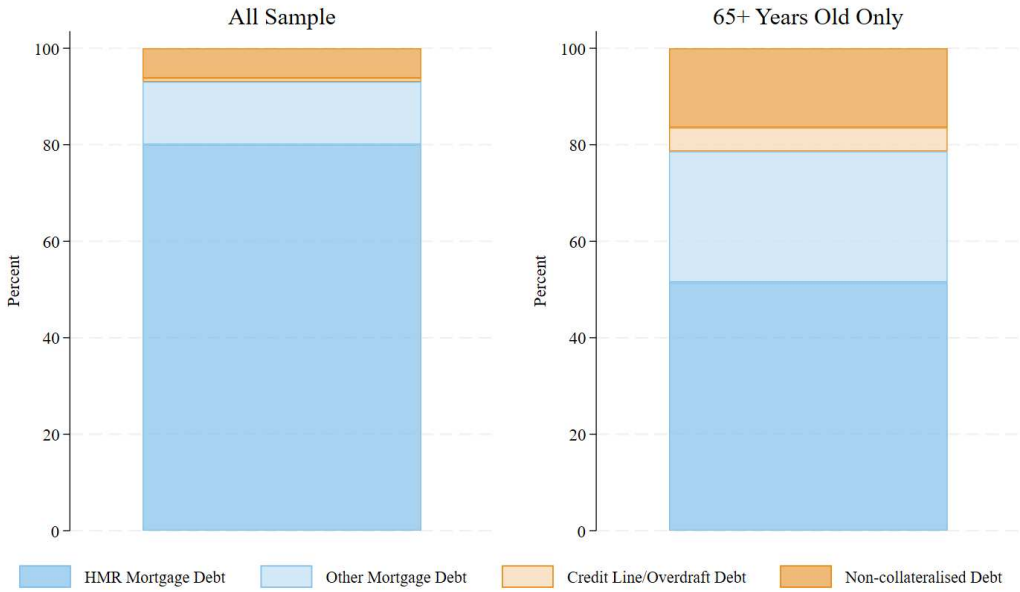

Figure 5: Value of the Debt Held by Indebted Households by Type

Note: This figure displays the proportion of the value of debt held by households in the entire sample and in the sub-sample of of households with an average age of 65 years old or over relative to the total value of debt in the sample.

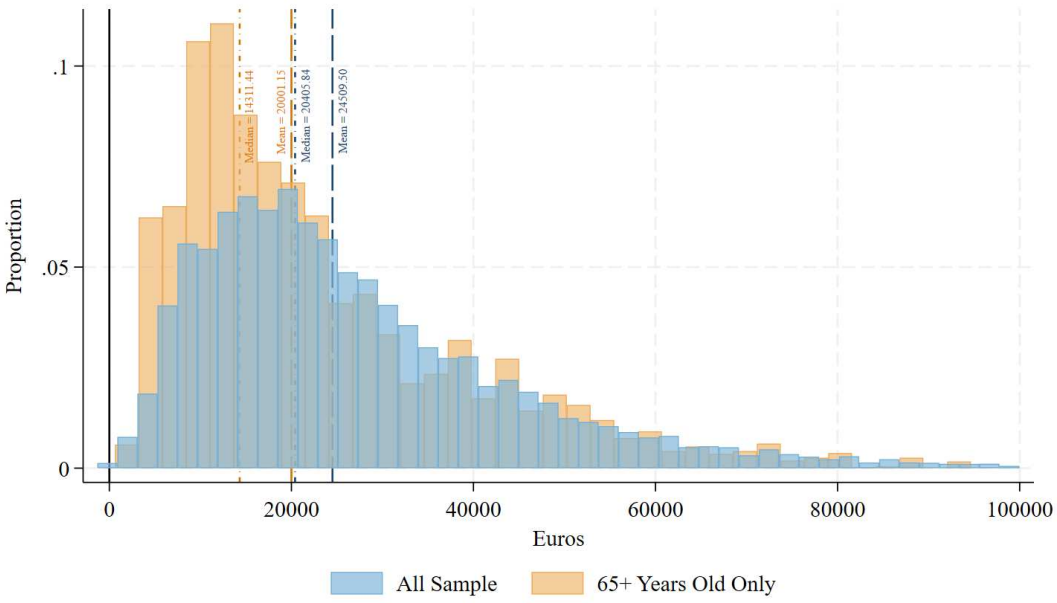

Figure 6: Distribution of the Disposable Income

Note: This figure displays the distribution of the disposable income of indebted households for the entire sample and for the sub-sample of households with an average age of 65 years old or over.

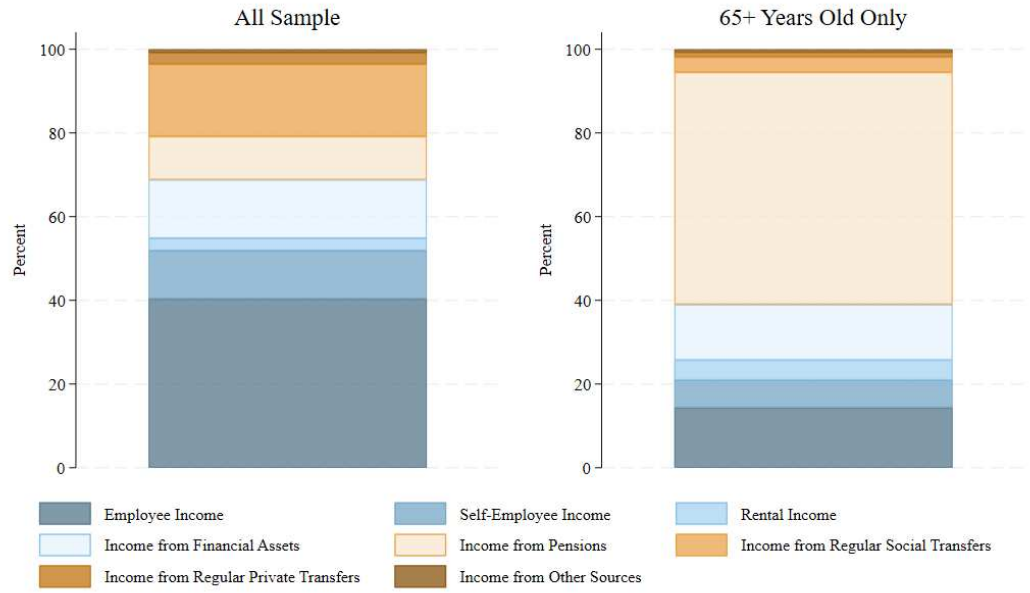

Figure 7: Value of the Disposable Income of Indebted Households by Type

Note: This figure displays the value, in proportion, of indebted households' disposable income in the entire sample and in the sub-sample of of households with an average age of 65 years old or over by income source.

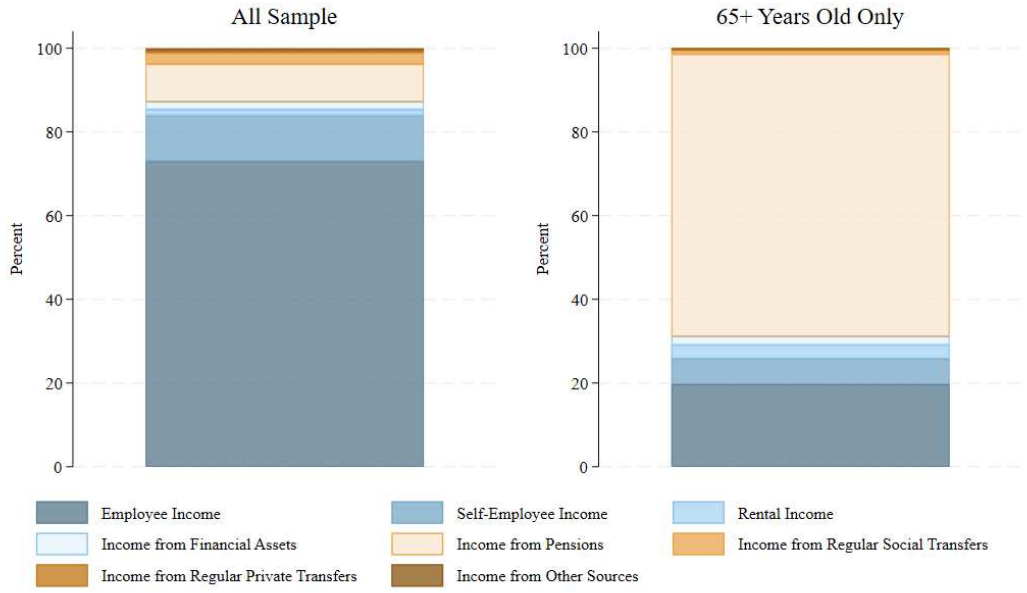

Figure 8: Value of the Disposable Income of Indebted Households by Income Source

Note: This figure displays the proportion of the value of indebted households' disposable income in the entire sample and in the sub-sample of of households with an average age of 65 years old or over relative to the total value of disposable in the sample by income source.

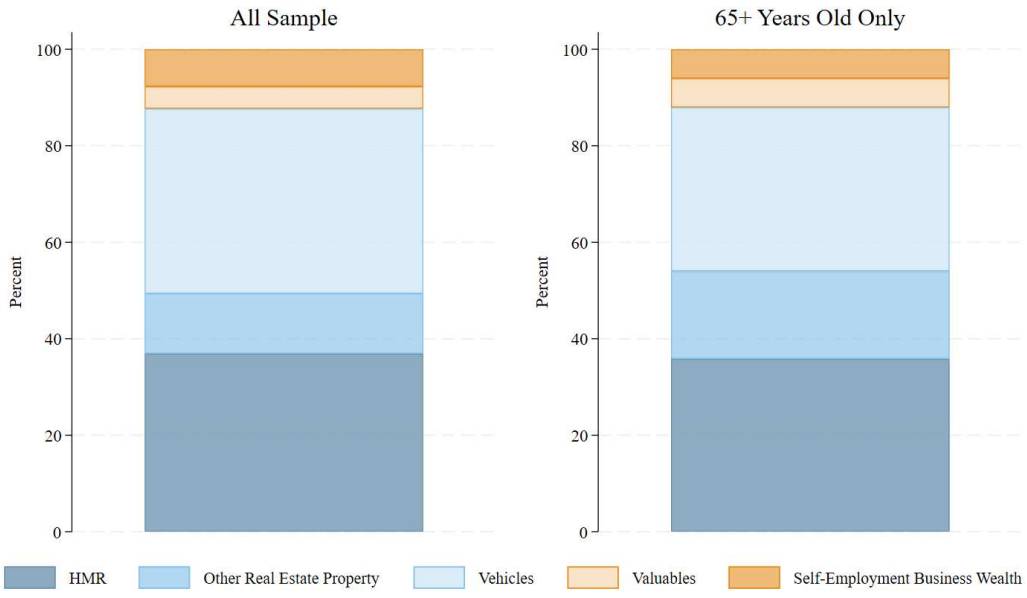

Figure 9: Proportion of Real Assets Held by Indebted Households by Type

Note: This figure displays the proportion of real assets held by indebted households in the entire sample and in the sub-sample of of households with an average age of 65 years old or over, by type.

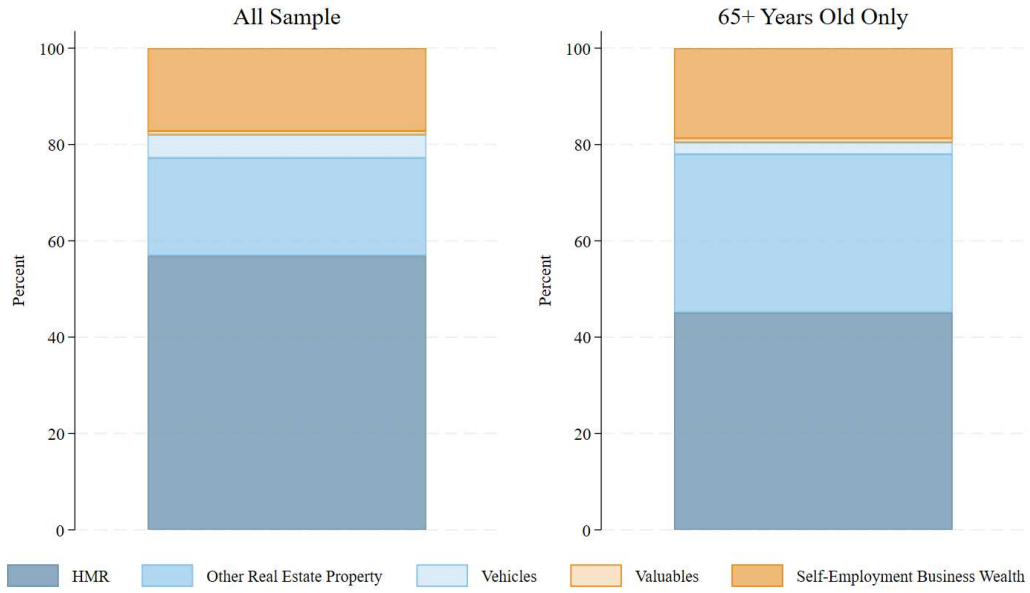

Figure 10: Value of the Real Assets Held by Indebted Households by Type

Note: This figure displays the proportion of the value of each type of real asset held by indebted households in the entire sample and in the sub-sample of of households with an average age of 65 years old or over relative to the total value of real assets in the sample.

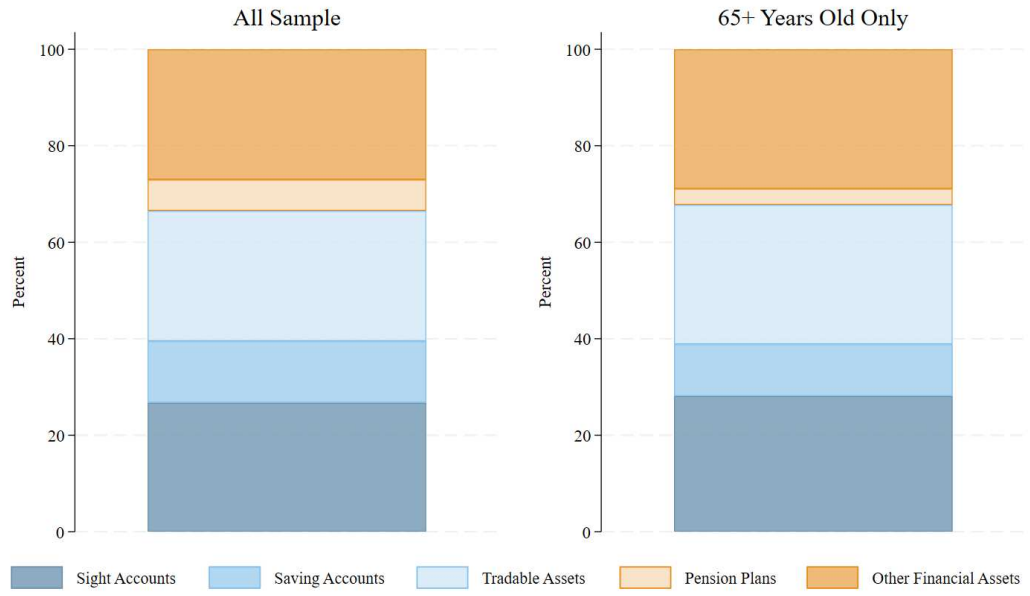

Figure 11: Proportion of Financial Assets Held by Indebted Households by Type

Note: This figure displays the proportion of financial assets held by indebted households in the entire sample and in the sub-sample of of households with an average age of 65 years old or over, by type.

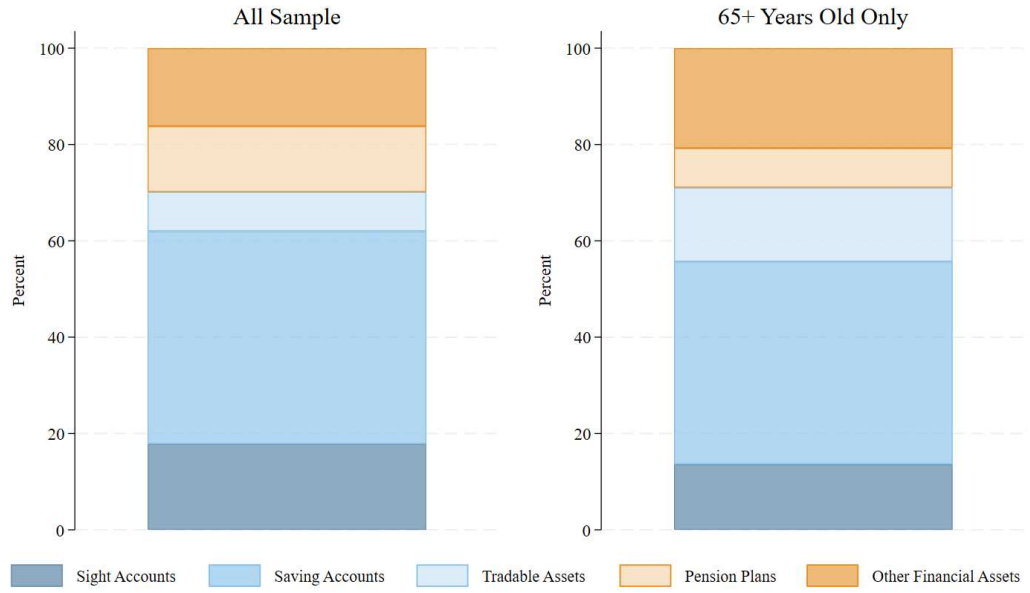

Figure 12: Value of the Financial Assets Held by Indebted Households by Type

Note: This figure displays the proportion of the value of each type of financial asset held by indebted households in the entire sample and in the sub-sample of of households with an average age of 65 years old or over relative to the total value of financial assets in the sample.

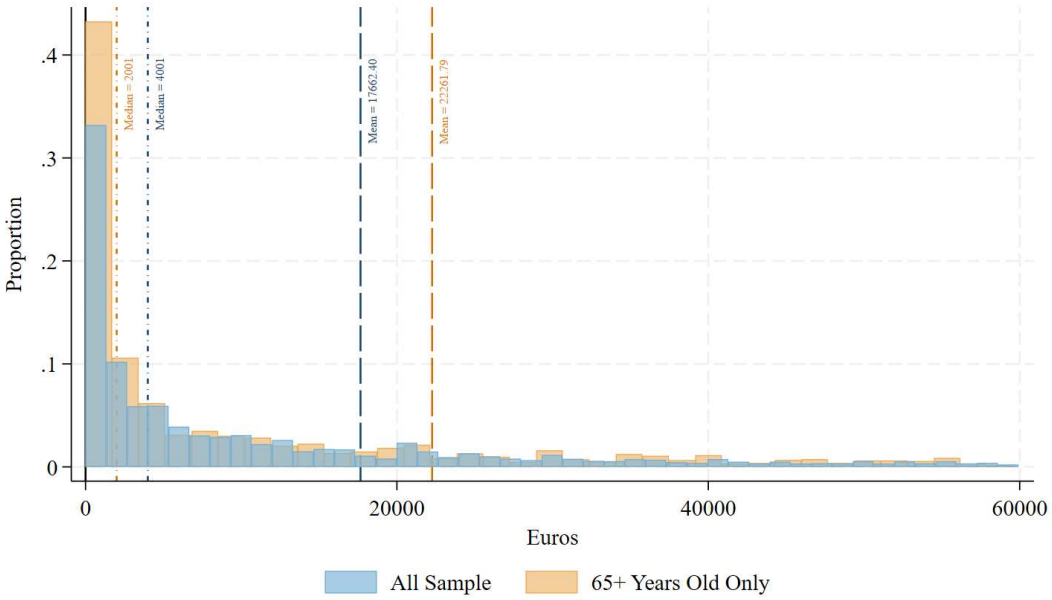

Figure 13: Distribution of the Liquid Assets Held by Indebted Households

Note: This figure displays the distribution of the liquid assets held by indebted households in the entire sample and in the sub-sample of of households with an average age of 65 years old or over.

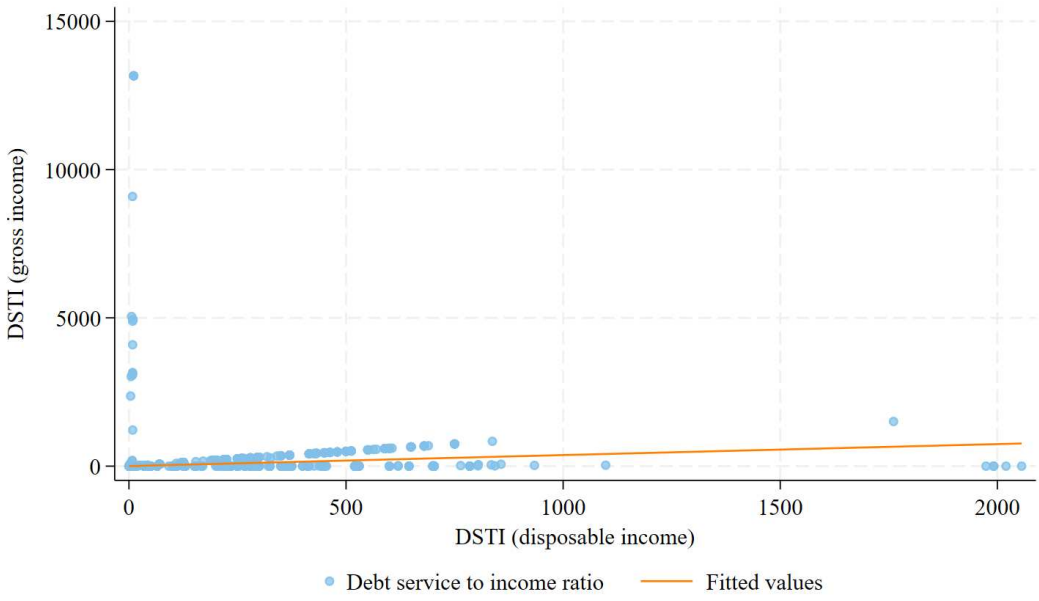

Figure 14: Correlation Between the Two DSTI Mestrics

Note: This figure displays the correlation between the DSTI (gross income) and the DSTI (disposable income) for the sub-sample of indebted households.