Drivers of household arrears: an euro area country panel data analysis

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Abstract

This paper aims to explore how mortgage and consumer loans arrears are affected by household financial and social status as well as macroeconomic situation and banking standards and restrictions. In general, arrears could pose an elevated risk to the financial stability of banks and could consequently limit households' access to credit in the future. At the same time, the arrears may decrease households' well-being. From both perspectives, it is important to determine the drivers of both types of arrears in order to address the issue by applying appropriate economic policies. We find that affordability problems, such as housing costs and financial burdens, income inequality, employment status and credit standards are utterly important in determining the arrears.

Keywords: Mortgage arrears, arrears of consumer loans, income inequality, housing cost, financial burden, credit standards, macroprudential policy.

JEL Classification: C33, D14, D31, E21.

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1 Introduction

The start of the global financial crisis in 2007 has brought an increased focus of different economic policies with the intention to tackle the negative effects of the economic downturn, while housing markets had a central role in the development and effects of the crisis. In this respect, one of the most intriguing research questions was studying the interplay between the housing market volatility and the households' welfare dynamics. Understanding the determinants between the latter could help to explain the phenomenon of mortgage arrears, how they form and what are the consequences for the banking sector and households. Furthermore, from the policy-maker's point of view, it is important to apply policies that would have significant effects for supporting financial and macroeconomic stability of an economy in play.

European Survey on Income and Living Conditions (henceforth EU-SILC) represents a survey- and registry-based source for comparative statistics on income distribution and social exclusion of private households and their current members residing in the territory of the Member States (MS) at the EU level. Its intention is to monitor and combat social exclusion of households by producing key policy indicators on social cohesion for the follow up of the EU2020 main target on poverty and social inclusion and flagship initiatives in related domains (European Commission, 2018).

The results show that households in paying off their debt face detrimental factors, such as employment, high housing and financial costs, income inequality and to some extent stricter credit standards and/or macroprudential policy tightening. Against this backdrop it is important to distinguish between types of households based on their level of income. It seems that for households with lower income their social and especially economic status matters more in the occurrence of arrears (mortgage and/or consumer loans). On the other hand, for households with above average income the economic status plays a lesser role in determining the arrears dynamics, while credit standards and macroprudential policy stance are significant as well.

The rest of the paper is organized as follows. Section 2 provides the literature review,

while the stylised facts based on the international and aggregated data are presented in the Section 3. The methodology and discussion of the results of the analysis are presented Section 4. Section 5 concludes.

2 Literature review

The literature studying the wealth of households, especially through the housing market, on a household-level data is relatively vast. Part of the literature examines the inequality of households. Anghel *et al.* (2018) analyse the evolution of inequality in Spain over the course of the past global financial crisis and at the beginning of the economic recovery. They link the households' inequality *via* different dimensions, such as wage, income, consumption and wealth inequality. Similarly Blundell (2011) studies different dimensions of inequality in United States and United Kingdom, but with the intention to understand the functioning of various insurance mechanisms available to individuals and households. Arellano *et al.* (2017) and Basso *et al.* (2018), for instance, search income and consumption asymmetries. Wolff (2017), on the other hand, shows that wealth inequality grew significantly during the global financial crisis due to the drop in the average value of real assets as it seems that are in relative terms more concentrated in the lower part of the income distribution.

Moving towards the housing wealth of households literature, Kindermann and Kohls (2016) and Kaas *et al.* (2017) show that homeownership represents a significant factor in leading to lower wealth inequality between households. Furthermore, with respect to the homeownership, Norris *et al.* (2007) find that subsidization of home purchase, especially low-income one, may have negative conclusions about their efficacy as it may later on lead to an emerging affordability gap which has forced many prospective purchasers to remain in the private-rented sector. Borg (2015) and to some extent Carliner and Marya (2016) find a negative relationship between the size of the rental sector and the prevalence of housing deprivation. Figari *et al.* (2019a) and Figari

et al. (2019b) explore the effects of housing policies, especially in the form of tax relieves, on housing markets and the consequent distributional impacts. Ronald *et al.* come to a conclusion that a home has become even more central as an asset base of individual welfare since the global financial crisis. The latter conclusion is even more important as Lutz (2020) finds that housing affordability crisis disproportionally and negatively affects younger people. Salvi del Pero *et al.* (2016) provide an overview housing policies that intend to increase access to housing and housing quality across OECD countries. In this respect, Scanlon *et al.* (2011) and Scanlon and Elsinga (2013) study the effects of policy changes on housing and mortgage markets as a response to the global financial crisis. Homeownership is also important from a security aspect, as security through homeownership seems to be mitigated through low housing expenditures in older age, as a result of debt repayments at an earlier age (Turner and Yang, 2006).

Other household-level studies focus on linking household indebtedness and household finance. Ampudia *et al.* (2016) devise a framework that identifies distressed households by examining their solvency and liquidity situation. Linking the household indebtedness and household finances was done also by Gomez-Salvador *et al.* (2011) and compares the results between the Euro area and United States. On a more general matter, Nkusu (2011) shows that sharp rises in the level of non-performing loans point to long-lived and potentially self-reinforcing negative effects on aggregate economic activity. In their work Japelli *et al.* (2013) mainly focus on the determinants of international differences in household indebtedness, and inquires whether indebtedness is associated with increased financial fragility. At the same time, they study the association between household lending and arrears.

To our interest, a large stream of literature studies a more direct link between housing and financial aspects of households. Whitley *et al.* (2004), Lydon and McCarthy (2013) and Aristei and Gallo (2016) estimate the factors driving the households' mortgage repayment difficulties in United Kingdom, Ireland and Italy , respectively, while Diaz-Serrano (2005) and Doling *et al.* (2007) investigate the determinants of mort-

gage delinquency and difficulties in a panel of EU countries. They contribute to the literature by assessing socio-demographic factors, households' loan characteristics and other institutional variables on the probability of mortgage insolvency and on the intensity of mortgage arrears. Similarly, Duygu-Bump and Grant (2009), Georgarakos and Fürth (2015) and Gerlach-Kristen and Lyons (2017) estimate the determinants of mortgage arrears in a panel of European countries using either European Community Household Panel or EU-SILC data. They find that affordability problems, such as unemployment, low income and high mortgage payments, do matter in determining the mortgage arrears. Aron and Muellbauer (2010) also estimate the factors of mortgage arrears and but they additionally develop a conditional forecasting model to determine mortgage arrears and possessions. Based on the unemployment rate dynamics, Blanco & Gimeno (2012) estimate the dynamic behaviour of the default ratios of housing loans for Spanish households. They find that the increase of unemployment rate due to the global financial crisis lead to a sharp increase in default ratios. Similarly McCarthy (2014) studies the role of various factors on mortgage arrears during a crisis, but in the case of Ireland. Brown (2015) examines the mortgage repayment behaviour with neighbourhood effects, while Figueira *et al.* (2005) use a dynamic model to estimate mortgage arrears, both on United Kingdom data. By applying a probit model May and Tudela (2005) estimate the probability of households having mortgage payment problems. Also in the case of United Kingdom, Dawson and Henley (2012) investigate the relationship between over-confidence in financial expectations (unrealistic optimism) and mortgage repayment difficulties. They have built upon the work of Livingstone and Lunt (1992), as they examined the psychological, social and economic determinants of debt and its repayment. Borgersen (2015), on the other hand, studies the dynamic interrelation between house prices and mortgage supply.[1]

[1]There are also other studies that might be of interest, but focus more on mortgage default decisions, evictions, negative equity, institutional settings or judicial efficiency. We will just name a few: Elmer and Seelig (1999), Böheim and Taylor (2000), Claessens and Klapper (2005), Gerhardt (2009), Hellebrandt *et al.* (2009), Parkinson *et al.* (2009), Bhutta *et al.* (2010), Demyanyk *et al.* (2010), Elul *et al.* (2010), Ghent and Kudlyak (2011), Li *et al.* (2011), Connor and Flavin (2013), Gerardi *et al.* (2013), Guiso *et al.* (2013) and Haffner *et al.* (2015).

3 Stylised facts and data

This section is dedicated to the presentation of the stylised facts of the aggregated EU-SILC database that is publicly available at European Commission's Eurostat database. The publicly available database makes it possible to compare the main EU-SILC variables from Slovenia with other EU countries and position the Slovene household characteristics in the international perspective accordingly.

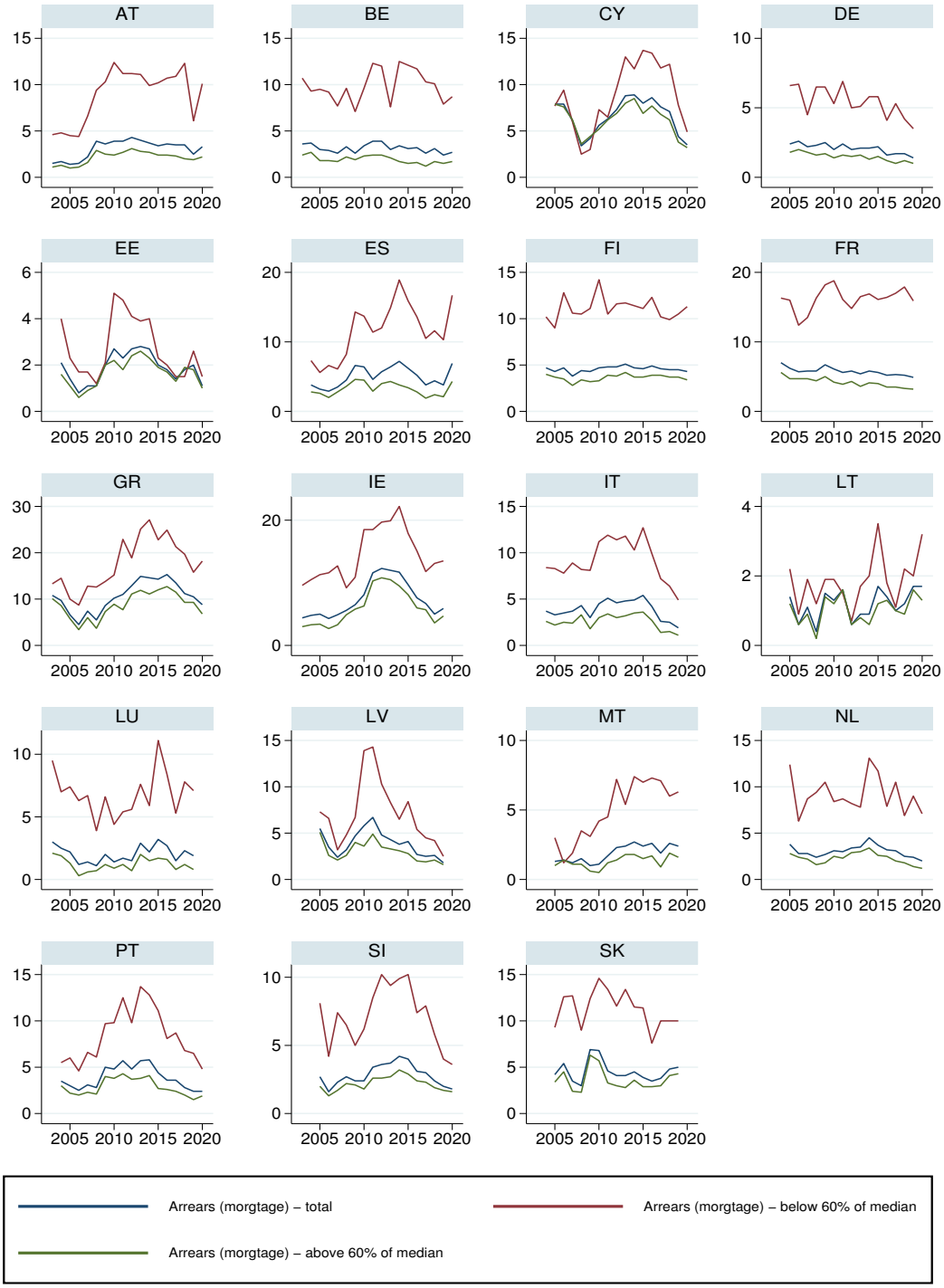
The EU-SILC dataset provides two types of data. First, the cross-sectional dimension relates to a given time period with variables on income, poverty, social exclusion and other living conditions, while secondly, the longitudinal annual data relates to individual-level changes in variables over time that is observed periodically (European Commission, 2018). Furthermore, in more detail, the cross-sectional data is collected in two steps. With the first step, the early subset of variables is collected by a register or an interview in order to assess poverty trends. Then, a full set of variables is provided alongside with the longitudinal data with the intention to produce the main key policy indicators on social cohesion. The longitudinal data is therefore aimed at identifying the incidence and dynamic processes of the persistence of poverty and social exclusion amongst different subgroups of the population. Typically for survey data, the longitudinal component is more limited in sample size compared to the cross-sectional component. For any given set of individuals, micro-level changes are followed up only for a limited duration, such as a period of four years (European Commission, 2018).

Figure 1 shows mortgage arrears of households across euro area countries. Mortgage arrears are shown by three different categories: (i) total mortgage arrears of all households, (ii) mortgage arrears of households that are below 60% of median equivalised income, and (iii) mortgage arrears of households that are above 60% of median equivalised income. Typically, in most euro area countries the mortgage arrears rate of

households that are below 60% of median equivalised income significantly exceeds the rate of mortgage arrears of households that are above 60% of median equivalised income or total mortgage arrears rate, thus suggesting that households with lower income are more likely to be faced with mortgage arrears and making them more vulnerable to economic downturns and rising social inequality compared to an average household or households with higher incomes.

Despite the notable differences between the rate of households that are below and above the 60% of median equivalised income, the dynamics of mortgage arrears seem to follow a similar (counter-cyclical) pattern over time in majority of euro area countries. A relatively stable period from 2003 until the beginning of the global financial crisis was followed by a sizeable increase in mortgage arrears rate as, most probably, a result of the crisis. From about 2015 on, the mortgage arrears rates have started to decrease back to the pre-crisis levels.

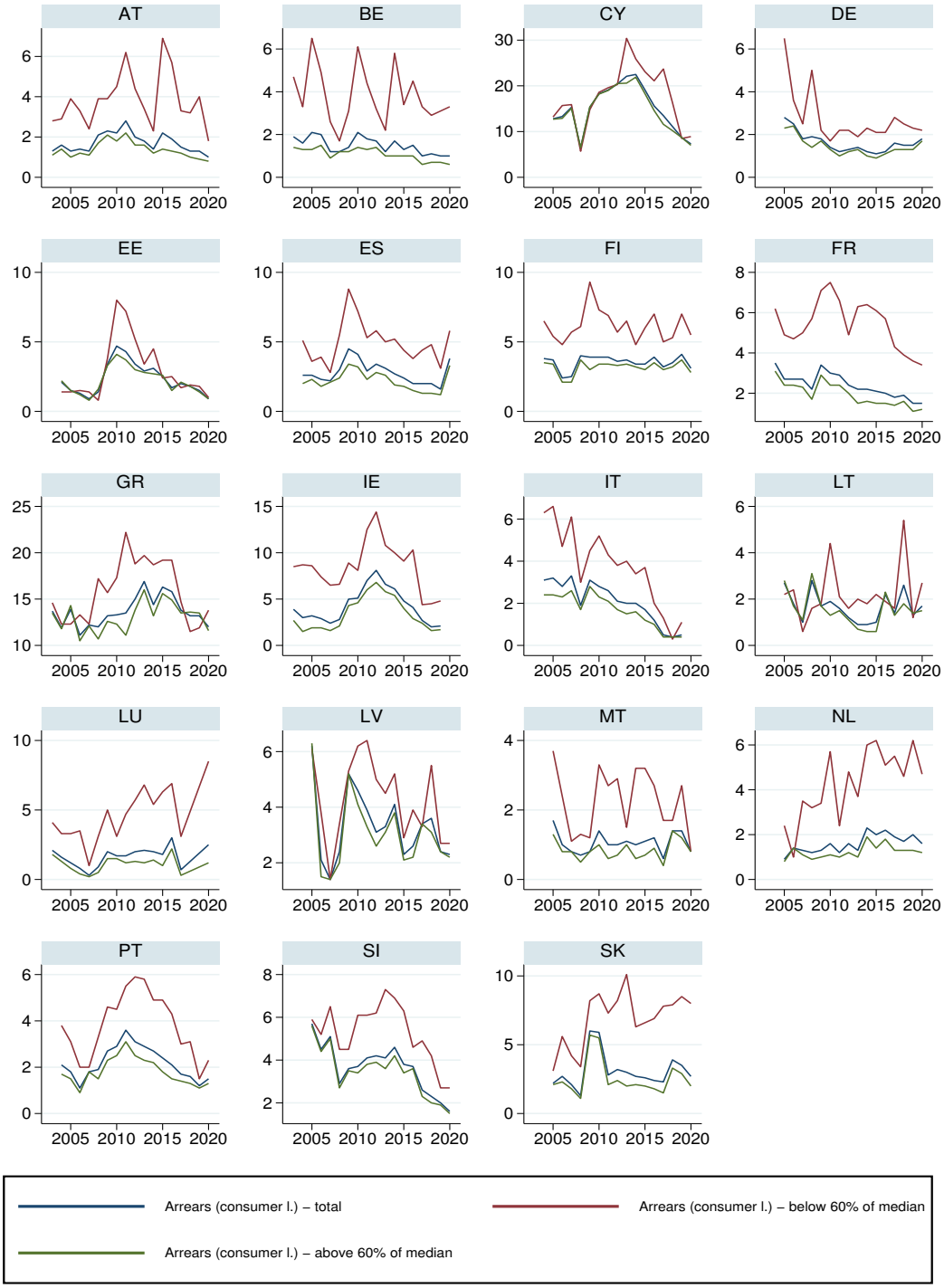
Figure 1: Mortgage arrears across euro area countries



Source: EU-SILC.

Similar to mortgage arrears the arrears related to consumer loans are shown by three different categories: (i) total arrears of consumer loans of all households, (ii) arrears of consumer loans of households that are below 60% of median equivalised income, and (iii) arrears of consumer loans of households that are above 60% of median equivalised income. As presented in Figure 2, the arrears of consumer loans of households that are below 60% of median equivalised income exceed those of households that are above 60% of median equivalised income, again, suggesting that households with lower income on average are more susceptible to arrears compared to households with higher income on average. The dynamics of arrears of consumer loans of all types of households is also subject to a similar pattern over time in most of the euro area countries. This is especially evident during the period of the global financial crisis.

Figure 2: Arrears of consumer loans across euro area countries



Source: EU-SILC.

In Figure 3 we present the total mortgage arrears of households and try to anecdotically tie them up with the dynamics of housing cost overburden rate[2], income inequality[3] and credit standards rate[4]. We assume that these may be the main factors that drive the dynamics of mortgage arrears of households in euro area countries. Similar factors were utilized in the relevant literature.[5] Nevertheless, if the mortgage arrears in most countries counter-cyclical dynamics in most of the euro area countries, the patterns of explanatory variables is not that straightforward, especially the credit standards variable, which may be affected by other, more institutional factors as well.

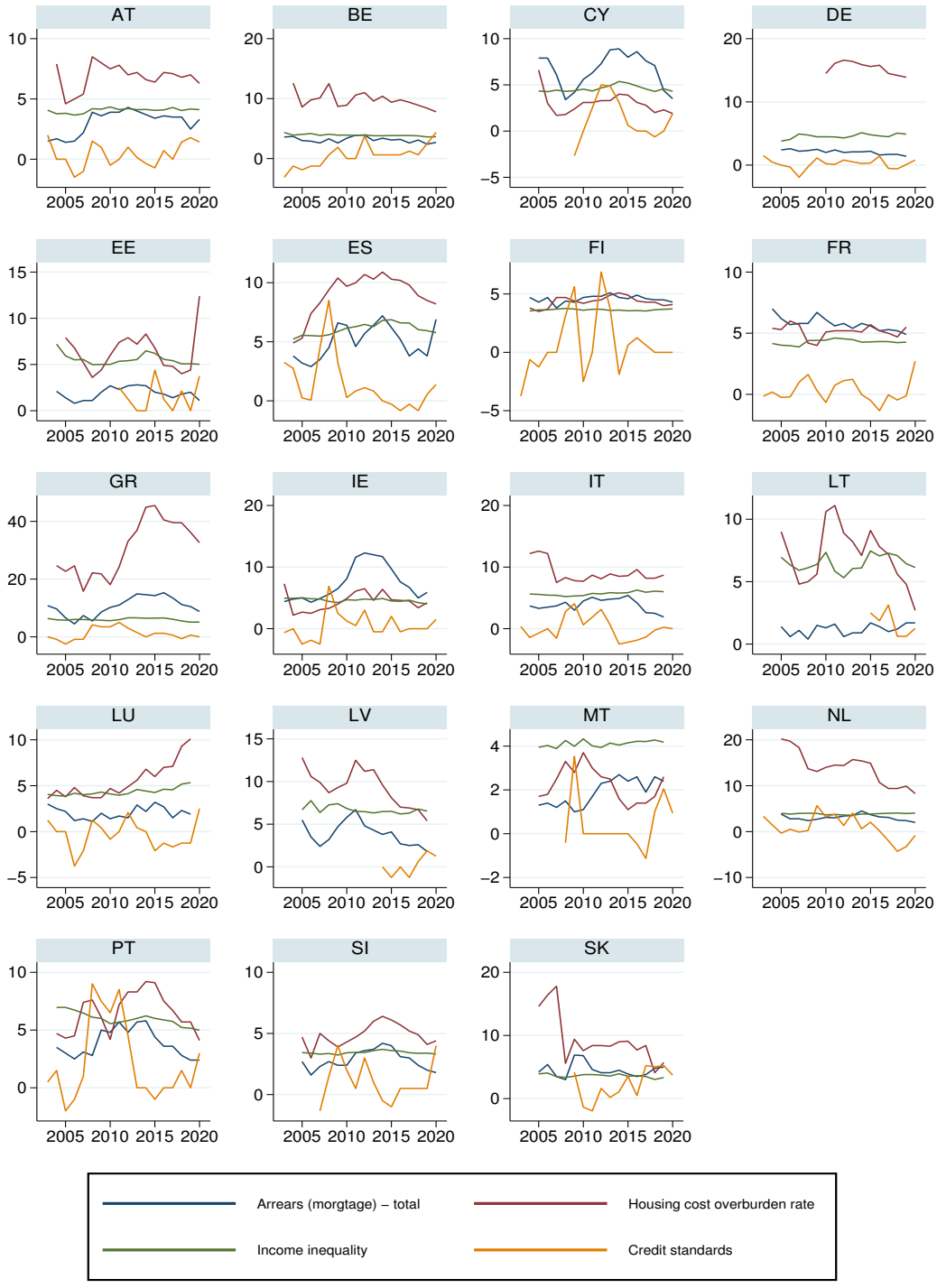
[2]According to European Commission's definition the housing cost overburden rate is the percentage of the population living in households where the total housing costs (net of housing allowances) represent more than 40% of disposable income (net of housing allowances).

[3]The income inequality is defined as the income quintile share ratio S80/S20 for disposable income of households.

[4]The credit standards rate is obtained from a Bank Lending Survey (BLS) provided by the ECB. It provides information on the lending policies of euro area banks with information on loan supply for house purchases of households. The rate is given as a net percentage value so that it represents the frequency of tightened credit standards minus that of eased or reversed. The net percentage rate is then transformed into index values.

[5]For the sake of robustness checks, we also utilize additional variables that may affect the dynamics of mortgage arrears, such as the in-work at-risk-of-poverty rate, wages in the form of labour costs and two composite macroprudential indexes. Both indicators are derived from Hristov, Hülsewig and Kolb (2021) methodology and are expressed as indexes with 2003 taking the value 100. The next variable used for robustness checks is the in-work at-risk-of-poverty indicator, which measures the share of persons who are employed and have an equivalised disposable income below the risk-of-poverty threshold, which is set at 60% of the national median equivalised disposable income (after social transfers). The in-work at-risk-of-poverty rate is set for the 18-64 years age group.

Figure 3: Mortgage arrears (total), housing cost overburden, income inequality and credit standards rate across euro area countries

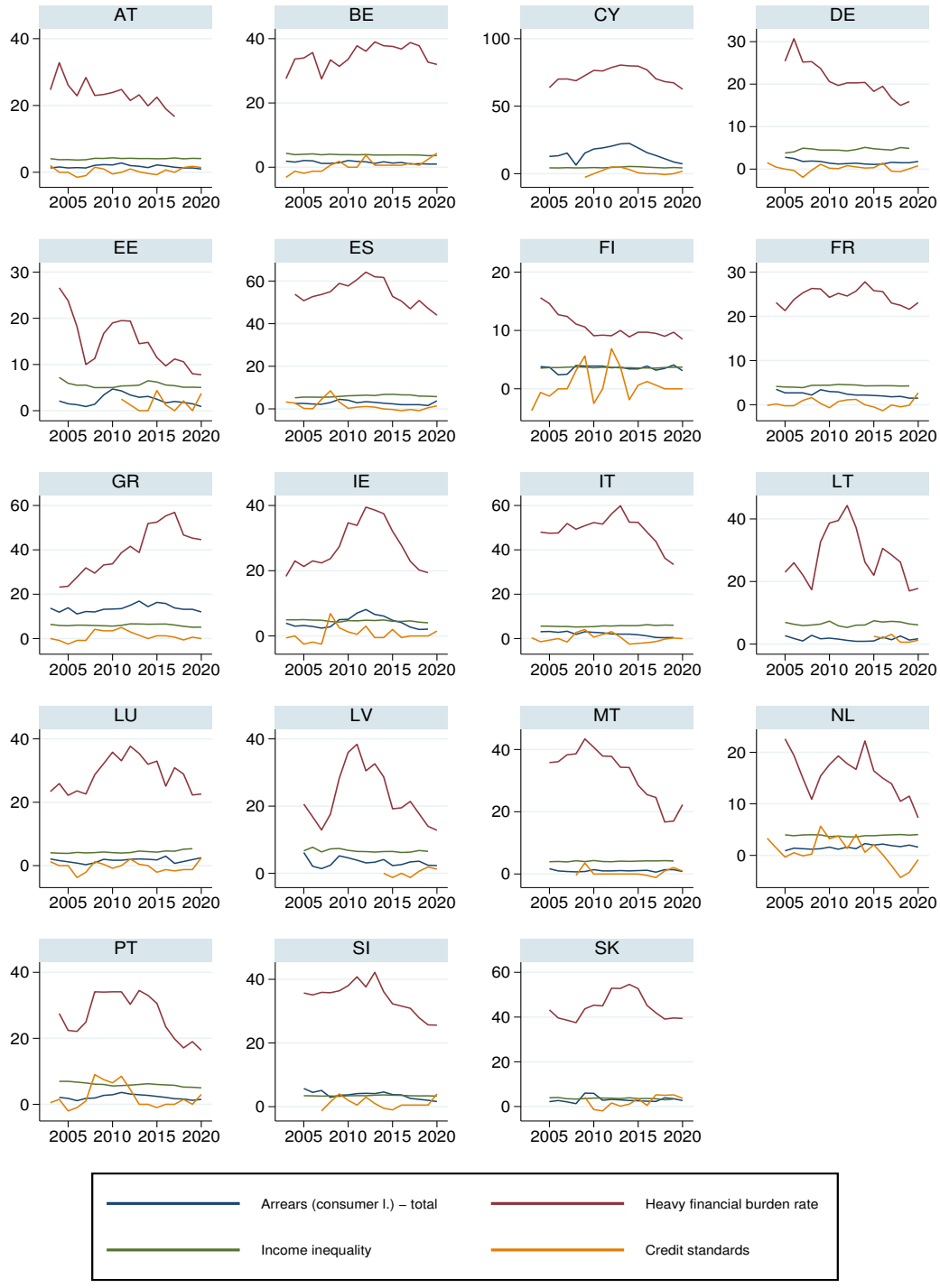


Note: Credit standards rate is for simplicity depicted as an index rate divided by 10.
Source: Eurostat, ECB.

We compare the arrears of consumer loans with heavy financial burden of households due to housing cost[6], income inequality and credit standards rate across euro area countries in Figure 4. Similarly the heavy financial burden rate displays a similar counter-cyclical pattern as the housing cost overburden rate across euro area countries. However, compared to the housing cost overburden rate, the heavy financial burden rate exhibits higher share values on average, since it methodologically accounts for heavier financial strain for households. We do not show it in the chart, but the EU-SILC database offers statistics of the heavy financial burden rate variable for three different categories (similar to arrears variables): (i) all households, (ii) households that are below 60% of median equivalised income, and (iii) households that are above 60% of median equivalised income. In this respect, we consider the respective heavy financial burden rate variable when we estimate the effects of the main factors on different types of arrears, i.e. total arrears of all households, arrears of households that are below 60% of median equivalised income, and arrears of households that are above 60% of median equivalised income.

[6]The variable of households with heavy financial burden due to housing cost is a subgroup variable of a financial burden of the repayment of debts from hire purchases or loans section in the EU-SILC survey database.

Figure 4: Arrears of consumer loans (total), heavy financial burden due to housing cost (total), income inequality and credit standards rate across euro area countries

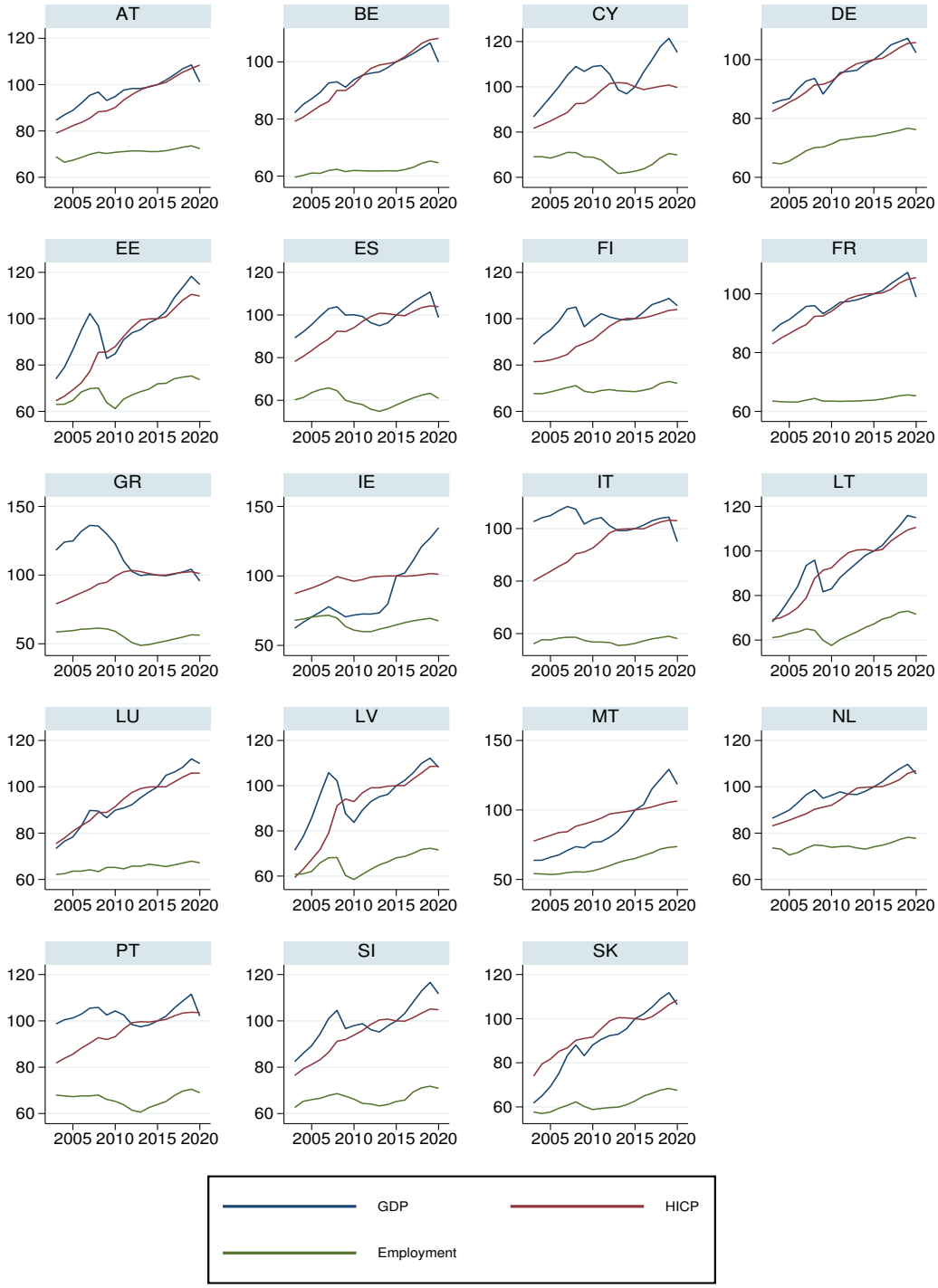


Note: Credit standards rate is for simplicity depicted as an index rate divided by 10.
Source: Eurostat, ECB.

We also consider other types of control variables that influence the dynamics of mortgage arrears of households; namely GDP, HICP, and employment[7]. With the exception of employment, they are shown as statistical indexes in the Figure 5.

[7]The employment variable is defined as a percentage of total population and covers the age class from 15 to 64 years.

Figure 5: GDP, HICP and employment across euro area countries



Source: Eurostat.

Before moving to the methodology section of the paper, let us swiftly focus on the descriptive statistics of the above mentioned variables as well. In Table 1 we show the correlation matrix of the variables we consider to be the main factors in driving the mortgage arrears dynamics. As seen from the table, based on the correlation results an increase in housing cost overburden rate and to a much lesser extent income inequality, credit standards rate and HICP positively affect the increase in mortgage arrears. On the other hand, as expected, an increase in mortgage arrears is achieved by a decrease in employment, while the GDP seems to be uncorrelated with mortgage arrears.

Table 1: Correlation matrix of the mortgage arrears model related variables

	Arrears total	Arrears below 60% of income	Arrears above 60% of income	Housing cost overburd.	Income inequal.	Credit std.
Arrears total	1.00					
Arrears bel. 60%	0.86	1.00				
Arrears abo. 60%	0.98	0.76	1.00			
Housing cost overb.	0.51	0.42	0.47	1.00		
Income inequality	0.16	-0.05	0.14	0.29	1.00	
Credit standards	0.10	-0.01	0.14	0.02	0.03	1.00

Source: EU SILC, Eurostat, ECB, own calculations.

In Table 2 we show the correlation matrix of the variables we consider to be the main factors in driving the consumer loans arrears dynamics. The correlation matrix indicates that an increase in heavy financial burden rate due to housing cost and to a much lesser extent income inequality, credit standards rate and HICP positively affect the increase in arrears of consumer loans. On the other hand, as expected, an increase in arrears of consumer loans is achieved by a decrease in employment, while the GDP seems to be uncorrelated with arrears of consumer loans.

Table 2: Correlation matrix of the consumer loans arrears model related variables

	Arrears total	Arrears below 60% of income	Arrears above 60% of income	Fin. burd. total	Income below 60% of income	Credit above 60% of income	Income inequal.	Credit std.
Arrears total	1.00							
Arrears bel. 60%	0.94	1.00						
Arrears abo. 60%	1.00	0.90	1.00					
Financ. burd. total	0.55	0.54	0.54	1.00				
Financ. burd. bel. 60%	0.41	0.43	0.40	0.93	1.00			
Financ. burd. abo. 60%	0.57	0.55	0.56	1.00	0.90	1.00		
Income inequality	0.16	0.05	0.16	0.13	0.05	0.12	1.00	
Credit standards	0.11	0.13	0.11	0.11	0.05	0.12	0.03	1.00

Source: EU SILC, Eurostat, ECB, own calculations.

The following table (Table 3) offers standard descriptive statistics of the variables entering the mortgage arrears and consumer loans arrears models. Comparing variables of mortgage arrears and consumer loans arrears for households that are below and above 60% of median equivalised income it is evident that the arrears of both types of loans for households that are below 60% of median equivalised income are around two times more volatile, while their maximum value significantly exceed the maximum value of mortgage arrears of households that are above 60% of median equivalised income. Taking into account the next two variables we see that housing cost overburden rate seems to be more volatile over time, while the income inequality variable is rather stable. On the other the heavy financial burden rate variables are in comparison to the housing cost overburden rate somewhat more volatile. The credit standards rate displays higher variability, while both macroprudential indexes are more stable as they display only institutional changes in the macroprudential policy across countries, which are by definition more slow and lag behind.

Table 3: Descriptive statistics of the variables

Variable	Number of observations	Mean	Standard deviation	Minimum	Maximum
Mortgages					
Arrears total	312	4.11	2.64	0.40	15.30
Arrears below 60% of median income	312	9.18	4.84	0.70	27.10
Arrears above 60% of median income	312	3.15	2.30	0.20	12.70
Housing cost overburden rate	303	8.49	6.87	1.10	45.50
Income inequality	312	4.82	1.09	3.03	7.76
Credit standards	290	107.90	20.84	57.11	190.00
Consumer loans					
Arrears total	316	3.66	4.06	0.30	22.50
Arrears below 60% of median income	316	5.78	4.64	0.30	30.40
Arrears above 60% of median income	316	3.26	3.99	0.20	21.90
Heavy financial burden rate total	312	31.82	15.81	7.30	80.50
Heavy financial burden rate below 60%	312	49.44	18.86	11.60	93.60
Heavy financial burden rate above 60%	312	29.26	15.49	5.80	79.40
Controls					
GDP	342	97.42	12.68	61.77	136.22
HICP	342	94.18	9.48	59.39	110.63
Employment	342	65.29	5.71	48.80	78.20
Additional variables					
Wages	326	93.05	18.05	30.70	183.80
MPI index	323	100.46	1.51	91.00	107.00
MacroPru index	323	100.58	1.74	91.00	108.00
Without financial burden rate total	312	21.46	14.95	1.60	59.90
Without financial burden rate below 60%	312	13.05	12.56	0.00	48.70
Without financial burden rate above 60%	312	22.64	15.41	1.70	61.90

Source: EU SILC, Eurostat, ECB, own calculations.

4 Methodology and results

In this section we offer a review of the methodology used in the analysis. We deal with a panel-type of data set with yearly frequency from a time-wise perspective. The second dimension is represented by the number of countries, i.e. 19 euro area countries. From this perspective, it is natural to assume that a panel data model with fixed effects is best to be utilized.

4.1 Mortgage arrears model

The fixed effects panel regression mortgage arrears model we estimate takes the following basic form[8]

[8]For the sake of robustness checks, we consider different combinations of explanatory variables, especially the control variables such as GDP, HICP and employment and thus omitting variables from the basic equation.

$$Arrears_{it}^{M} = \beta_1 Overburden_{it} + \beta_2 Inequality_{it} + \beta_3 Credit_{it} + \beta_4 GDP_{it} + \beta_5 Employment_{it} + \beta_6 HICP_{it} + \alpha_i + u_{it} \quad (1)$$

where α_i are entity-specific intercepts that capture heterogeneities across countries. The variable $Overburden_{it}$ represents the housing cost overburden rate, $Inequality_{it}$ the income inequality, $Credit_{it}$ the BLS survey credit standards, GDP_{it} the gross domestic product, $Employment_{it}$ the employment rate, and $HICP_{it}$ the inflation index. We estimate three variants of models, which differ in the usage of different type of the dependant variable mortgage arrears, depicted in equation (1) as $Arrears_{it}^{M}$. In the first variant of the panel data model we estimate the effects of the independent variables on total mortgage arrears. In the second variant of the panel data model we estimate the effects by taking into account mortgage arrears of households that are below 60% of median equivalised income, while in the third variant of the model mortgage arrears of households that are above 60% of median equivalised income are utilized as the dependent variable.

The results of the first model variant with total mortgage arrears of households are shown in Table 4. We see that housing cost overburden rate and income inequality play a statistically significant role in determining the mortgage arrears of households. Increase in both, the housing cost overburden rate and income inequality, increases mortgage arrears. Credit standards variable has in comparison with the housing cost overburden rate and income inequality a much lower effect but nevertheless it is statistically significant. The positive sign (i.e. positive and slight effect on mortgage arrears) may be an extra effect that both variables (credit standards and mortgage arrears) share, especially in times of economic distress.[9] With respect to the control

[9]In order to test this statement, we run a Granger causality test in order to prove that there is no causality between the credit standards and mortgage arrears. Based on this we assume that tightened credit standards or even more, tightened macroprudential policy, should have negative or

variables, as expected, higher inflation rate also increases the mortgage arrears but not to the extent of main factors such as the housing cost overburden rate and the income inequality. On the other hand, the coefficients of employment and GDP take a negative sign as we predicted in the stylised facts section.

Table 4: Panel data model with fixed effects results for total mortgage arrears as a dependent variable

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
$Overburden_{it}$	0.1231***	0.1149***	0.1810***	0.1169***	0.1735***	0.2395***	0.1105***	0.2329***
	(0.027)	(0.027)	(0.030)	(0.027)	(0.029)	(0.027)	(0.027)	(0.027)
$Inequality_{it}$	0.2965	0.4411**	0.5674**	0.3238	0.6903***	0.5377**	0.4547**	0.7068***
	(0.220)	(0.208)	(0.245)	(0.219)	(0.231)	(0.253)	(0.208)	(0.240)
$Credit_{it}$	0.0069**	0.0093***	0.0077*	0.0071**	0.0098***	0.0069*	0.0093***	0.0098***
	(0.003)	(0.003)	(0.004)	(0.003)	(0.004)	(0.004)	(0.003)	(0.004)
$HICP_{it}$	0.0586*		0.0505	0.0545*		0.0691**		
	(0.030)		(0.034)	(0.030)		(0.035)		
$Employment_{it}$	-0.2736***	-0.2714***		-0.2516***			-0.2541***	
	(0.034)	(0.034)		(0.027)			(0.027)	
GDP_{it}	0.0119	0.0093	-0.0412***		-0.0432***			
	(0.011)	(0.011)	(0.010)		(0.010)			
Time trend	-0.0116	0.0733***	0.005	0.0033	0.0782***	-0.0684	0.0805***	0.0287*
	(0.047)	(0.017)	(0.053)	(0.045)	(0.020)	(0.052)	(0.015)	(0.017)
Constant	12.3200***	16.3343***	-1.5831	12.2065***	1.9741	-6.9963***	16.0226***	-2.3962*
	(3.075)	(2.281)	(2.871)	(3.075)	(1.572)	(2.644)	(2.249)	(1.260)
Number of obs.	265	265	265	265	265	265	265	265
Number of groups	19	19	19	19	19	19	19	19
R^2_{within}	0.5124	0.5048	0.3791	0.5100	0.3735	0.3343	0.5033	0.3258
F	35.88	40.78	24.43	41.64	28.73	24.21	48.85	29.23
$Prob > F$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; standard deviations are in brackets.

What is more interesting is to compare the results of the model variants, where we consider mortgage arrears of households that are above 60% of median equivalised income (Table 5) and mortgage arrears of households that are below 60% of median equivalised income (Table 6). Based on the results of the fixed effects panel model we see that mortgage arrears of both type of households are affected by the housing cost overburden rate. The crucial difference between the two types of households is in the magnitude of the effect as the coefficient of the housing cost overburden rate is almost twice as large for households that are below 60% of median equivalised income in comparison to households that are above 60% of median equivalised income. The employment variable affects the mortgage arrears of both types of households as well, except the sign is, expectingly, negative. Again, the effect is around twice as large for households that are below 60% of median equivalised income, suggesting that the

at least statically insignificant effects on mortgage arrears, especially for lower income households, as tightened credit policies would already push out the households with a bigger probability to be subject to arrears by being eligible of getting mortgage loans in the first place.

employment status of the lower income households matters more in preventing possible mortgage arrears. An important factor of mortgage arrears of households that are below 60% of median equivalised income is also the income inequality. On the other hand, as expected, the income inequality variable does not influence households that are above 60% of median equivalised income. We have also checked the effect of credit standards tightening. In comparison to other factors, the variable of credit standards plays a lesser role in determining the mortgage arrears. Even more, for households with lower income it is statistically insignificant. This can be explained by the fact, that for the households, especially the ones with lower income, the access to mortgage loans is truncated when credit standards are tightened. Consequently it prevents the households that might have the most potential to be subject of mortgage arrears of getting mortgage loans in the first place. We obtain similar results, when we consider two types of macroprudential indexes (based on MAPPED database) instead of the credit standards variable.

Table 5: Panel data model with fixed effects results for mortgage arrears above 60% of median equivalised income

	Model 1a	Model 2a	Model 3a	Model 4a	Model 5a	Model 6a	Model 7a	Model 8a
$Overburden_{it}$	0.1087***	0.1041***	0.1552***	0.1040***	0.1512***	0.2029***	0.1005***	0.1989***
	(0.026)	(0.025)	(0.027)	(0.025)	(0.027)	(0.024)	(0.025)	(0.024)
$Inequality_{it}$	0.0348	0.1167	0.2524	0.0555	0.3173	0.2282	0.1277	0.3306
	(0.208)	(0.195)	(0.224)	(0.206)	(0.211)	(0.230)	(0.195)	(0.217)
$Credit_{it}$	0.0094***	0.0108***	0.0101***	0.0096***	0.0112***	0.0094***	0.0108***	0.0111***
	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)
$HICP_{it}$	0.0332		0.0267	0.0301		0.0418		
	(0.029)		(0.031)	(0.028)		(0.032)		
$Employment_{it}$	-0.2197***	-0.2185***		-0.2031***			-0.2045***	
	(0.032)	(0.032)		(0.026)			(0.026)	
GDP_{it}	0.009	0.0075	-0.0337***		-0.0347***			
	(0.010)	(0.010)	(0.009)		(0.009)			
Time trend	-0.0064	0.0417**	0.007	0.0049	0.0456**	-0.0530	0.0475***	0.0058
	(0.045)	(0.016)	(0.049)	(0.043)	(0.018)	(0.047)	(0.014)	(0.015)
Constant	11.5193***	13.7925***	0.3534	11.4334***	2.2323	-4.0669*	13.5397***	-1.2804
	(2.898)	(2.139)	(2.625)	(2.895)	(1.433)	(2.401)	(2.109)	(1.139)
Number of obs	265	265	265	265	265	265	265	265
Number of groups	19	19	19	19	19	19	19	19
R^2_{within}	0.4327	0.4295	0.3201	0.4309	0.3180	0.2809	0.4282	0.2757
F	26.04	30.11	18.83	30.29	22.47	18.83	36.10	23.03
$Prob > F$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; standard deviations are in brackets.

Table 6: Panel data model with fixed effects results for mortgage arrears below 60% of median equivalised income

	Model 1b	Model 2b	Model 3b	Model 4b	Model 5b	Model 6b	Model 7b	Model 8b
$Overburden_{it}$	0.1745***	0.1578***	0.2930***	0.1543***	0.2778***	0.3927***	0.1418***	0.3798***
	(0.054)	(0.054)	(0.059)	(0.053)	(0.058)	(0.053)	(0.053)	(0.053)
$Inequality_{it}$	0.8485*	1.1424***	1.4037***	0.9371**	1.6531***	1.3532***	1.1912***	1.6815***
	(0.437)	(0.413)	(0.490)	(0.436)	(0.462)	(0.501)	(0.413)	(0.474)
$Credit_{it}$	-0.0012	0.0037	0.0005	-0.0005	0.0047	-0.0008	0.0039	0.0047
	(0.007)	(0.006)	(0.008)	(0.007)	(0.007)	(0.008)	(0.006)	(0.007)
$HICP_{it}$	0.1191**		0.1024	0.1058*		0.1341*		
	(0.060)		(0.068)	(0.060)		(0.069)		
$Employment_{it}$	-0.5606***	-0.5562***		-0.4892***			-0.4942***	
	(0.067)	(0.067)		(0.054)			(0.054)	
GDP_{it}	0.0387*	0.0333	-0.0703***		-0.0741***			
	(0.022)	(0.022)	(0.020)		(0.020)			
Time trend	0.0241	0.1967***	0.0582	0.0726	0.2067***	-0.0668	0.2223***	0.1216***
	(0.094)	(0.035)	(0.106)	(0.090)	(0.039)	(0.103)	(0.030)	(0.033)
Constant	25.5994***	33.7558***	-2.8903	25.2315***	4.3273	-12.1126**	32.6371***	-3.1814
	(6.094)	(4.522)	(5.731)	(6.118)	(3.139)	(5.231)	(4.475)	(2.492)
Number of obs.	265	265	265	265	265	265	265	265
Number of groups	19	19	19	19	19	19	19	19
R^2_{within}	0.4937	0.4854	0.3458	0.4871	0.3396	0.3114	0.4804	3006
F	33.30	37.73	21.14	37.98	24.79	21.80	44.56	26.01
$Prob > F$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; standard deviations are in brackets.

In the appendix A, we consider additional model specifications of the mortgage arrears model.

4.2 Consumer loans arrears model

The fixed effects panel regression consumer loans arrears model we estimate, takes the following form

$$Arrears^{C}_{it} = \beta_1 Finburden^{n}_{it} + \beta_2 Inequality_{it} + \beta_3 Credit_{it} + \beta_4 GDP_{it} + \beta_5 Employment_{it} + \beta_6 HICP_{it} + \alpha_i + u_{it} \quad (2)$$

where α_i, again, stands for entity-specific intercepts that capture heterogeneities across countries. The variable $Finburden^{n}_{it}$ represents the financial burden rate due to the housing cost and $n \in (heavy, without)$. The term $Inequality_{it}$ stands for the income inequality, $Credit_{it}$ the BLS survey credit standards, GDP_{it} the gross domestic product, $Employment_{it}$ the employment rate, and $HICP_{it}$ the inflation index. In the case of the $Credit_{it}$ variable, in certain estimated models we substitute it for two types

of macroprudential indexes that are based on MAPPED database. As for mortgage arrears, we estimate three variants of models for arrears of consumer loans. They differ in the usage of different type of the dependant variable arrears of consumer loans, as depicted in equation (2) as $Arrears_{it}^{C}$. In the first variant of the panel data model we estimate the effects of the independent variables on total arrears of consumer loans. In the second variant of the panel data model we estimate the effects by taking into account arrears of consumer loans of households that are below 60% of median equivalised income, while in the third variant of the model we consider arrears of consumer loans of households that are above 60% of median equivalised income as the dependent variable.

The Table 7 presents the results for for total arrears of consumer loans. Similar to the results of the mortgage arrears model, income inequality, financial burden costs and employment play the most important role in determining the arrears of consumer loans. Credit standard variable plays a less significant role, however we can conclude that to some extent the tightening of credit standards takes a positive sign as credit standards and arrears of consumer loans may share a common driving factor, as discussed in the case of mortgage arrears. If we substitute the credit standards variable with macroprudential indexes, we see the opposite effect taking place as the sign takes a negative value. Tightened macroprudential policy may in this case play a partial beneficial role in the decrease of arrears of consumer loans. Nevertheless, in the following regressions, we test these conclusions that were made on aggregate (or average) households by dividing type of households onto households that are below 60% of median equivalised income and households that are above 60% of median equivalised income.

Table 7: Panel data model with fixed effects results for total arrears of consumer loans as a dependent variable

	Model 1C	Model 2C	Model 3C	Model 4C	Model 5C	Model 6C
$Finburden_{it}^{heavy}$	0.0390**	0.0955***			0.0952***	0.0975***
	(0.019)	(0.014)			(0.013)	(0.013)
$Finburden_{it}^{without}$			-0.0083	-0.0827***		
			(0.025)	(0.024)		
$Inequality_{it}$	0.2851	0.7152***	0.2517	0.8624***	0.4769**	0.4878**
	(0.248)	(0.246)	(0.250)	(0.262)	(0.214)	(0.213)
$Credit_{it}$	0.0051	0.0086**	0.0063	0.0132***		
	(0.004)	(0.004)	(0.004)	(0.004)		
MPI_{it}					-0.1342***	
					(0.051)	
$MaPru_{it}$						-0.1245***
						(0.046)
$HICP_{it}$	0.1522***		0.1675***			
	(0.035)		(0.035)			
$Employment_{it}$	-0.1459***		-0.1919***			
	(0.044)		(0.041)			
GDP_{it}	0.0040		0.0021			
	(0.012)		(0.012)			
Time trend	-0.2364***	-0.0352**	-0.2518***	-0.0202	-0.0056	-0.0054
	(0.053)	(0.017)	(0.053)	(0.021)	(0.017)	(0.017)
Constant	-2.4651	-3.2685**	0.8757	0.2674	11.8605**	10.7795**
	(3.712)	(1.333)	(3.377)	(1.536)	(5.273)	(4.756)
Number of obs	266	266	266	266	295	295
Number of groups	19	19	19	19	19	19
R^2_{within}	0.3335	0.2551	0.0862	0.1504	0.2072	0.2082
F	17.16	20.80	16.28	10.75	17.77	17.88
$Prob > F$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; standard deviations are in brackets.

For consumer loans (or loans that are not mortgage loans by EU-SILC definition), the panel data model results show that heavy financial burden due to the housing costs have a statistically significant effect on arrears of consumer loans for both types of households, i.e. for households that are above 60% of median equivalised income and households that are below 60% of median equivalised income (Tables 8 and 9). If we consider a different financial burden variable, namely the rate of households without financial burden due to the housing costs, the effect on arrears for consumer loans changes the sign to negative (models 3aC, 3bC, 4aC and 4bC), meaning that the more households without any financial burden are there, the less pressure on arrears for consumer loans there is. Both types of households are affected by the employment variable. Based on the results, the effect of employment is around twice as large for households with lower income. As in the case of mortgage arrears, income inequality matters for the increase in arrears of consumer loans for households with lower income, while it is statistically insignificant for higher income households. On the contrary to mortgage arrears, it seems that credit standards play a bigger role in determining arrears for consumer loans, especially for households that are below 60%

of median equivalised income. Similarly to mortgage arrears it seems that tightening of the macroprudential policy also does not have a statistically significant effect on arrears of consumer loans for households with lower income. But, what is noteworthy to mention is that tightening of the macroprudential policy decreases the arrears of consumer loans for households with higher income. This means that the tightened macroprudential policy might only have played a partial beneficial role for arrears of consumer loans. Nevertheless tightening of the macroprudential policy truncates (but this time with statistical significance for households with higher income) the access to consumer loans.

Table 8: Panel data model with fixed effects results for arrears of consumer loans above 60% of median equivalised income

	Model 1aC	Model 2aC	Model 3aC	Model 4aC	Model 5aC	Model 6aC
$Finburden_{it}^{heavy}$	0.0448**	0.0945***			0.0927***	0.0952***
	(0.020)	(0.014)			(0.013)	(0.013)
$Finburden_{it}^{without}$			-0.0144	-0.0753***		
			(0.024)	(0.023)		
$Inequality_{it}$	0.1515	0.5076**	0.0996	0.6295**	0.3256	0.3367
	(0.254)	(0.246)	(0.256)	(0.260)	(0.210)	(0.210)
$Credit_{it}$	0.0041	0.0064	0.0055	0.0112***		
	(0.004)	(0.004)	(0.004)	(0.004)		
MPI_{it}					-0.1388***	
					(0.050)	
$MaPru_{it}$						-0.1310***
						(0.045)
$HICP_{it}$	0.1188***		0.1372***			
	(0.036)		(0.035)			
$Employment_{it}$	-0.1206***		-0.1674***			
	(0.045)		(0.042)			
GDP_{it}	0.0025		0.0005			
	(0.013)		(0.013)			
Time trend	-0.1908***	-0.0342**	-0.2090***	-0.0212	-0.0085	-0.0082
	(0.054)	(0.017)	(0.054)	(0.021)	(0.016)	(0.016)
Constant	-0.9858	-2.2192*	2.4299	1.0931	12.9995**	12.1113**
	(3.783)	(1.334)	(3.462)	(1.521)	(5.195)	(4.688)
Number of obs	266	266	266	266	295	295
Number of groups	19	19	19	19	19	19
R^2_{within}	0.2723	0.2200	0.2586	0.1239	0.1847	0.1867
F	12.83	17.13	11.96	8.59	15.41	15.61
$Prob > F$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; standard deviations are in brackets.

Table 9: Panel data model with fixed effects results for arrears of consumer loans below 60% of median equivalised income

	Model 1bC	Model 2bC	Model 3bC	Model 4bC	Model 5bC	Model 6bC
$Finburden_{it}^{heavy}$	0.0385**	0.0799***			0.0820***	0.0827***
	(0.017)	(0.015)			(0.014)	(0.014)
$Finburden_{it}^{without}$			-0.0439	-0.1014***		
			(0.033)	(0.036)		
$Inequality_{it}$	0.7387*	1.6715***	0.6855*	1.7728***	1.1191***	1.1327***
	(0.386)	(0.392)	(0.388)	(0.406)	(0.350)	(0.350)
$Credit_{it}$	0.0092	0.0198***	0.0100	0.0221***		
	(0.006)	(0.006)	(0.006)	(0.006)		
MPI_{it}					-0.0906	
					(0.083)	
$MaPru_{it}$						-0.0664
						(0.075)
$HICP_{it}$	0.2785***		0.2828***			
	(0.053)		(0.054)			
$Employment_{it}$	-0.2634***		-0.3043***			
	(0.061)		(0.058)			
GDP_{it}	0.0226		0.0195			
	(0.019)		(0.019)			
Time trend	-0.4074***	-0.0393	-0.3970***	-0.0247	0.016	0.0157
	(0.081)	(0.028)	(0.082)	(0.030)	(0.027)	(0.027)
Constant	-7.9399	-7.5478***	-2.8032	-3.0849	5.2963	2.7782
	(5.714)	(2.198)	(5.186)	(2.255)	(8.709)	(7.844)
Number of obs	266	266	266	266	295	295
Number of groups	19	19	19	19	19	19
R^2_{within}	0.3307	0.2002	0.3209	0.1353	0.1479	0.1466
F	16.94	15.20	16.20	9.51	11.80	11.69
$Prob > F$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; standard deviations are in brackets.

4.3 Key takeaways from the results

The key takeaway from the fixed effects regression results is that we cannot consider the households uniformly, but we have to take into account their differences, especially income-wise differences in order to better assess the effects of the main drivers on arrears. Households with lower income are much more sensitive to changes in most of the explanatory variables that mostly represent economic or social status (housing cost overburden rate, financial burden, income inequality and employment) compared to households with higher income. On the other hand, the results show that income inequality does not play significant role in determining the arrears of households that are above 60% of median equivalised income. With respect to the HICP variable, it seems it does not affect the mortgage arrears of households that are below 60% of median equivalised income, while for mortgage arrears of households that are above 60% of median equivalised income it has a strong effect.

Additionally, we obtain relatively similar results with respect to the differences

between households that are above and below 60% of median equivalised income regardless of the type of loans, i.e. mortgage loans and consumer loans. The obtained results are also inline with the findings of the relevant literature, described in literature review section.

From policy perspective it is important to take these results into account, especially the sensitiveness of households with lower income to economic and social changes or shocks. Social policies should therefore be designed in a way that provide sufficient social safety nets and prevent increases in inequalities, while economic policies should prevent negative economic externalities taking place.

5 Conclusions

The start of the global financial crisis in 2007 has brought an increased focus of different economic policies with the intention to tackle the negative effects of the economic downturn, while housing markets had a central role in the development and effects of the crisis. In this respect, one of the most intriguing research questions was studying the interplay between the housing market volatility and the households' welfare dynamics. Understanding the determinants between the latter could help to explain the phenomenon of mortgage arrears, how they form and what are the consequences for the banking sector and households. Furthermore, from the policy-maker's point of view, it is important to apply policies that would have significant effects for supporting financial and macroeconomic stability of an economy in play.

The results show that households in paying off their debt face detrimental factors, such as unemployment, high housing and financial costs, income inequality and to some extent stricter credit standards or macroprudential policy tightening. Against this backdrop it is important to distinguish between types of households based on

their level of income. It seems that for households with lower income their social and especially economic status matters more in the occurrence of arrears (mortgage and/or consumer loans). On the other hand, for households with above average income the economic status plays a lesser role in determining the arrears dynamics, while credit standards and macroprudential policy stance are significant as well.

References

1. Ampudia, M., van Vlokhoven, H., & Zochowski, D. (2016). Financial Fragility of Euro Area Households. *Journal of Financial Stability*, 207(C), 250-262.

2. Arellano, M., Blundell, R., & Bonhomme, S. (2017). Earnings and Consumption Dynamics: A Nonlinear Panel Data Framework. *Econometrica*, 85(3), 693-734.

3. Aristei, D., & Gallo, M. (2016). The Determinants of Households' Repayment Difficulties on Mortgage Loans: Evidence from Italian Microdata. *International Journal of Consumer Studies*, 40(4), 453-465.

4. Anghel, B., Basso, H., Bover, O., Casado, J.M., Hospido, L., Izquierdo, M., Kataryniuk, I.A., Lacuesta, A., Montero, J.M., & Vozmediano, E. (2018). Income, Consumption and Wealth Inequality in Spain. *SERIEs*, 9, 351-387.

5. Aron, J., & Muellbauer, J. (2010).*Modelling and Forecasting UK Mortgage Arrears and Possessions*. London: Department for Communities and Local Government.

6. Basso, H., Bover, O., Casado, J.M., & Hospido, L. (2017). *Income Risk Asymmetries, Consumption and Wealth: the Dynamics of Inequality in the Spanish Survey of Household Finances*. Banco de España Documentos Ocasionales, No. 1806.

7. Bhutta, N., Dokko, J., & Shan, H. (2010). *The Depth of Negative Equity and Mortgage Default Decisions*. Federal Reserve Board Finance and Economics Discussion Series, 2010-35.

8. Blanco, R., & Gimeno, R. (2012). *Determinants of Default Ratios in the Segment of Loans to Households in Spain*. Banco de Espana Documentos de Trabajo 1210.

9. Blundell, R. (2011). From Income to Consumption: Understanding the Transmission of Inequality. *Focus*, 28(1), 23-30.

10. Böheim, R., & Taylor, M.P. (2000). My Home was My Castle: Evictions and Repossessions in Britain. *Journal of Housing Economics*, 9, 287-319.

11. Borg, I. (2015). Housing Deprivation in Europe: On the Role of Rental Tenure Types. *Housing, Theory and Society*, 32(1), 73-93.

12. Borgersen, T.-A. (2016). Housing Appreciations and the (In)stable Relation Between Housing and Mortgage Markets. *International Journal of Housing Policy*, 16(1), 91-110.

13. Brown, S. (2015). Household Repayment Behaviour and Neighbourhood Effects. *Urban Studies*, 52(6), 1169-1188

14. Carliner, M., & Marya, E. (2016). *Rental Housing: An International Comparison*. JCHS Working Paper, September 2016.

15. Claessens, S., & Klapper, L.F. (2005). Bankruptcy Around the World: Explanations of Its Relative Use. *American Law and Economics Review*, 7(1), 253-283.

16. Connor, G., & Flavin, T. (2013). *Irish Mortgage Default Optionality*. mimeo. Ireland: Maynooth University.

17. Dawson, C., & Henley, A. (2012). Something Will Turn Up? Financial Over-Optimism and Mortgage Arrears. *Economics Letters*, 117(1), 49-52.

18. Demyanyk, Y., Koijen, R. S. J., & Van Hemert, O. (2010). *Determinants and Consequences of Mortgage Default.* Federal Reserve Bank of Cleveland Working Paper 10-19.

19. Diaz-Serrano, L. (2005). Income Volatility and Residential Mortgage Delinquency Across the EU. *Journal of Housing Economics*, 14(3), 153-177.

20. Doling, J., Horsewood, N., & Neuteboom, P. (2007). Why do European Home Owners Experience Loan Repayment Difficulties? Some Preliminary Results Combining Macro and Micro Approaches. *International Journal of Housing Policy*, 7(2), 193-209.

21. Duygan-Bump, B., & Grant, C. (2009). Household Debt Repayment Behaviour: What Role Do Institutions Play? *Economic Policy*, 24(57), 107-140.

22. Elmer, P.J., & Seelig, S.A. (1999). Insolvency, Trigger Events, and Consumer Risk Posture in the Theory of Single-Family Mortgage Default. *Journal of Housing Research*, 10(1), 1-25.

23. Elul, R., Souleles, N.S., Chomsisengphet, S., Glennon, D., & Hunt, R. (2010). What Triggers Mortgage Default? *American Economic Review*, 100(2), 490-494.

24. European Commission (2018). *Methodological Guidelines and Description of EU-SILC Target Variables.* European Commission, DocSILC065.

25. Figari, F., Hollman, K., Matsaganis, M., & Zolyomi, E. (2019a). *Recent Changes in Housing Policies and Their Distributional Impact Across Europe.* EM 12/19.

26. Figari, F., Verbist, G., & Zantomio, F. (2019b). *Homeownership Investment and Tax Neutrality: a Joint Assessment of Income and Property Taxes in Europe.* EM 17/19.

27. Figueira, C., Glen, J., & Nellis, J. (2005). A Dynamic Analysis of Mortgage Arrears in the UK Housing Market. *Urban Studies*, 42(10), 1755-1769.

28. Georgarakos, D., & Furth, S. (2015). Household Repayment Behavior: The Role of Social Capital, Institutional, Political and Religious Beliefs. *European Journal of Political Economy*, 37, 249-265.

29. Gerardi, K., Herkenhoff, K.F., Ohanian, L.E., & Willen, P.S. (2013). *Unemployment, Negative Equity and Strategic Default.* Federal Reserve Bank of Atlanta Working Paper, 2013-4.

30. Gerhardt, M. (2009). *Consumer Bankruptcy Regimes and Credit Default in the US and Europe: A Comparative Study.* Centre for European Policy Studies Working Document, No. 318.

31. Gerlach-Kristen, P., & Lyons, S. (2017). Determinants of Mortgage Arrears in Europe: Evidence from Household Microdata. *International Journal of Housing Policy*, 18(4), 545-567.

32. Ghent, A.C., & Kudlyak, M. (2011). Recourse and Residential Mortgage Default: Theory and Evidence from U.S. States. *Review of Financial Studies*, 24(9), 3139-3186.

33. Gomez-Salvador, R., Lojschova, A., & Westermann, T. (2011). *Household Sector Borrowing in the Euro Area: A Micro Data Perspective.* ECB Occasional Paper, No. 125

34. Guiso, L., Sapienza, P., & Zingales, L. (2013). The Determinants of Attitudes Toward Strategic Default on Mortgages. *Journal of Finance*, 68(4), 1473-1515.

35. Haffner, M.E.A., Ong, R., & Wood, G.A. (2015). Mortgage Equity Withdrawal and Institutional Settings: An Explanatory Analysis of Six Countries. *International Journal of Housing Policy*, 15(3), 235-259.

36. Hellebrandt, T., Kawar, S., & Waldron, M. (2009). The Economics and Estimation of Negative Equity. *Bank of England Quarterly Bulletin*, Q2, 110-121.

37. Hristov, N., Hülsewig, O., & Kolb, B. (2021). *Macroprudential Policy and the Sovereign-Bank Nexus in the Euro Area*. Deutsche Bundesbank Discussion Paper, No 32/2021.

38. Jappelli, T., Pagano, M., & Di Maggio, M. (2013). Households' Indebtedness and Financial Fragility. *Journal of Financial Management, Markets and Institutions*, 2013(1), 23-46.

39. Kaas, L., Kocharkov, G., & Preugschat, E. (2017). *Wealth Inequality and Homeownership in Europe*. CESifo Working Paper, No. 5498.

40. Kindermann, F., & Kohls, S. (2016). *Rental Markets and Wealth Inequality in the Euro-Area*. CESifo Conference on Macroeconomics and Survey Data.

41. Li, W., White, M.J., & Zhu, N. (2011). Did Bankruptcy Reform Contribute to the Mortgage Crisis? *American Economic Journal: Economic Policy*, 3(4), 123-147.

42. Livingstone, S.M., & Lunt, P.K. (1992). Predicting Personal Debt and Debt Repayment: Psychological, Social and Economic Determinants. *Journal of Economic Psychology*, 13(1), 111-134.

43. Lutz, E. (2020). The Housing Crisis as a Problem of Intergenerational Justice: The Case of Germany. *Intergenerational Justice Review*, 1/2020.

44. Lydon, R., & McCarthy, Y. (2013). What Lies Beneath? Understanding Recent Trends in Irish Mortgage Arrears. *Economic and Social Review*, 44(1), 117-150.

45. May, O., & Tudela, M. (2005). When is Mortgage Indebtedness a Financial Burden to British Households? A Dynamic Probit Approach. Bank of England Working Paper, No. 277.

46. McCarthy, Y. (2014). Dis-entangling the Mortgage Arrears Crisis: The Role of the Labour Market, Income Volatility and Negative Equity. *Journal of the Statistical and Social Inquiry Society of Ireland*, 43, 71-90.

47. Nkusu, M. (2011). *Nonperforming Loans and Macrofinancial Vulnerabilities in Advanced Economies*. IMF Working Papers 11/161, 1-27.

48. Norris, M., Coates, D., & Kane, F. (2007). Breaching the Limits of Owner Occupation? Supporting Low-Income Buyers in the Inflated Irish Housing Market. *International Journal of Housing Policy*, 7(3), 337-355.

49. Parkinson, S., Searle, B.A., Smith, S.J., Stoakes, A., & Wood, G. (2009). Mortgage Equity Withdrawal in Australia and Britain: Towards a Wealth-Fare State? *International Journal of Housing Policy*, 9(4), 365-389.

50. Ronald, R., Lennartz, C., & Kadi, J. (2017). What Ever Happened to Asset-Based Welfare? Shifting Approaches to Housing Wealth and Welfare Security. *Policy & Politics*, 45(2), 173-93.

51. Salvi del Pero, A., Adema, W., Ferraro, V., & Frey, V. (2016). *Policies to Promote Access to Good-Quality Affordable Housing in OECD Countries*. OECD Social, Employment and Migration Working Papers No. 176.

52. Scanlon, K., & Elsinga, M., (2013). Policy Changes Affecting Housing and Mortgage Markets: How Governments in the UK and the Netherlands Responded to the GFC. *Journal of Housing and the Built Environment*, 29(2), 335-360.

53. Scanlon, K., Lunde, J., & Whitehead, C. (2011). Responding to the Housing and Financial Crises: Mortgage Lending, Mortgage Products and Government Policies. *International Journal of Housing Policy*, 11(1), 23-49.

54. Turner, B., & Yang, Z. (2006). Security of Home Ownership – Using Equity or Benefiting from Low Debt? *International Journal of Housing Policy*, 6(3), 279-296.

55. Whitley, J., Windram, R., & Cox, P. (2004). *An Empirical Model of Household Arrears*. Bank of England Working Paper, No. 214.

56. Wolff, E.N. (2017). *Household Wealth Trends in the United States, 1962 to 2016: Has Middle Class Wealth Recovered?* NBER Working Paper No. 24085.

Appendix A: Alternative specifications of the mortgage arrears model

Table A1: Panel data model with fixed effects results for total mortgage arrears as a dependent variable

	Poverty 1	Poverty 2	MPI 1	MPI 2	MaPru 1	MaPru 2	Wage
$Overburden_{it}$	0.1307***	0.2540***	0.1384***	0.2330***	0.1387***	0.2330***	0.2233***
	(0.027)	(0.026)	(0.026)	(0.025)	(0.026)	(0.025)	(0.032)
$Inequality_{it}$			0.3220*	0.4036*	0.3154*	0.3992*	0.6629**
			(0.184)	(0.208)	(0.184)	(0.207)	(0.258)
$Poverty_{it}$	-0.0395	0.0440					
	(0.079)	(0.088)					
$Credit_{it}$	0.0052	0.0076**					0.0094**
	(0.003)	(0.004)					(0.004)
MPI_{it}			0.0597	0.0635			
			(0.041)	(0.046)			
$MaPru_{it}$					0.0527	0.0650	
					(0.037)	(0.042)	
$HICP_{it}$	0.0775**		0.0400**		0.0394**		
	(0.030)		(0.020)		(0.020)		
$Employment_{it}$	-0.2813***		-0.2013***		-0.2001***		
	(0.034)		(0.030)		(0.030)		
GDP_{it}	0.0141		0.0031		0.0028		
	(0.011)		(0.012)		(0.012)		
$Wage_{it}$							-0.0054
							(0.011)
Time trend	-0.0379	0.0255	0.0232	0.0434***	0.0244	0.0434***	0.0366
	(0.046)	(0.017)	(0.038)	(0.015)	(0.038)	(0.015)	(0.027)
Constant	12.8853***	0.6839	4.2251	-6.5711	4.9512	-6.713	-1.6724
	(3.052)	(0.847)	(4.787)	(4.848)	(4.421)	(4.367)	(1.676)
Number of obs	265	265	292	292	292	292	252
Number of groups	19	19	19	19	19	19	19
R^2_{within}	0.5093	0.3000	0.4695	0.3123	0.4693	0.3138	0.3070
F	35.43	25.93	33.63	30.55	33.61	30.75	20.20
$Prob > F$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; standard deviations are in brackets.

Table A2: Panel data model with fixed effects results for mortgage arrears above 60% of median equivalised income

	Poverty 1a	Poverty 2a	MPI 1a	MPI 2a	MaPru 1a	MaPru 2a	Wage a
$Overburden_{it}$	0.1090***	0.2074***	0.1217***	0.1973***	0.1219***	0.1973***	0.1954***
	(0.025)	(0.024)	(0.025)	(0.023)	(0.025)	(0.023)	(0.029)
$Inequality_{it}$			0.0288	0.0904	0.0213	0.0845	0.3643
			(0.174)	(0.189)	(0.174)	(0.189)	(0.233)
$Poverty_{it}$	-0.1254*	-0.0683					
	(0.073)	(0.078)					
$Credit_{it}$	0.0084***	0.0099***					0.0111***
	(0.003)	(0.003)					(0.004)
MPI_{it}			0.0504	0.0537			
			(0.039)	(0.042)			
$MaPru_{it}$					0.0396	0.0493	
					(0.035)	(0.038)	
$HICP_{it}$	0.0507*		0.0281		0.0277		
	(0.028)		(0.019)		(0.019)		
$Employment_{it}$	-0.2230***		-0.1505***		-0.1496***		
	(0.031)		(0.029)		(0.029)		
GDP_{it}	0.0109		-0.0009		-0.0012		
	(0.010)		(0.011)		(0.011)		
$Wage_{it}$							-0.0014
							(0.010)
Time trend	-0.0271	0.0081	0.0116	0.0195	0.0126	0.0196	0.0126
	(0.043)	(0.015)	(0.036)	(0.014)	(0.036)	(0.014)	(0.024)
Constant	11.3283***	0.8542	4.0703	-4.5178	5.1756	-4.0545	-1.3630
	(2.849)	(0.755)	(4.529)	(4.409)	(4.185)	(3.975)	(1.516)
Number of obs	265	265	292	292	292	292	252
Number of groups	19	19	19	19	19	19	19
R^2_{within}	0.4395	0.2711	0.3733	0.2494	0.3724	0.2496	0.2719
F	26.77	22.50	22.64	22.34	22.55	22.36	17.03
$Prob > F$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; standard deviations are in brackets.

Table A3: Panel data model with fixed effects results for mortgage arrears below 60% of median equivalised income

	Poverty 1b	Poverty 2b	MPI 1b	MPI 2b	MaPru 1b	MaPru 2b	Wage b
$Overburden_{it}$	0.1971***	0.4329***	0.2148***	0.3884***	0.2150***	0.3879***	0.3372***
	(0.053)	(0.052)	(0.052)	(0.050)	(0.052)	(0.050)	(0.062)
$Inequality_{it}$			1.0441***	1.2019***	1.0432***	1.2068***	1.1883**
			(0.367)	(0.416)	(0.366)	(0.415)	(0.499)
$Poverty_{it}$	0.1151	0.2779					
	(0.156)	(0.174)					
$Credit_{it}$	-0.0045	-0.0001					0.0033
	(0.007)	(0.007)					(0.008)
MPI_{it}			0.0761	0.0775			
			(0.082)	(0.093)			
$MaPru_{it}$					0.0865	0.1065	
					(0.073)	(0.083)	
$HICP_{it}$	0.1441**		0.0717*		0.0703*		
	(0.060)		(0.039)		(0.039)		
$Employment_{it}$	-0.5781***		-0.4611***		-0.4596***		
	(0.067)		(0.060)		(0.060)		
GDP_{it}	0.0420*		0.0385*		0.0384*		
	(0.022)		(0.023)		(0.023)		
$Wage_{it}$							-0.0304
							(0.021)
Time trend	-0.0177	0.1067***	0.0889	0.1451***	0.0908	0.1449***	0.1382***
	(0.092)	(0.034)	(0.076)	(0.031)	(0.076)	(0.030)	(0.052)
Constant	27.7035***	2.7930*	13.372	-9.0168	12.3358	-11.9646	2.3664
	(6.068)	(1.680)	(9.546)	(9.703)	(8.807)	(8.734)	(3.246)
Number of obs.	265	265	292	292	292	292	252
Number of groups	19	19	19	19	19	19	19
R^2_{within}	0.4869	0.2720	0.4666	0.3034	0.4676	0.3058	0.2626
F	32.40	22.60	33.24	29.30	33.38	29.63	16.23
$Prob > F$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; standard deviations are in brackets.