Household Borrowing and Monetary Policy Transmission: Post-Pandemic Insights from Nine European Credit Registers

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Abstract

We study heterogeneity in households' credit across nine European countries (Belgium, Spain, Hungary, Ireland, Italy, Latvia, Lithuania, Portugal, and Slovakia) during 2022-2024 using granular credit register data. We first document substantial between- and within-country variation in mortgage and consumer lending by borrower age, loan maturity, and interest rate fixation. We then quantify the pass-through of the ECB's recent tightening cycle to household borrowing costs, and assess its heterogeneous impact across households. Pass-through is nearly complete for mortgages (around 0.9) but considerably weaker for consumer credit (around 0.4). While mortgage pass-through is relatively homogeneous across countries, consumer credit shows pronounced cross-country differences that cannot be explained by borrower or loan characteristics. Younger households face stronger mortgage pass-through but weaker consumer credit pass-through relative to older borrowers, and longer maturities are associated with stronger pass-through in both credit markets.

JEL code: E52, G21, D14

Keywords: monetary policy transmission, household borrowing, credit registers, interest rate pass-through, cross-country heterogeneity

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1. Introduction

Monetary policy shapes the consumption and investment decisions of households. An important part of the transmission mechanism is intermediated through the financial system, with borrowing decisions being altered by contractionary and easing cycles, which directly affect the cost of credit (Bernanke and Gertler, 1995; Kashyap and Stein, 2000). In response to a monetary tightening, households can decide to borrow less (intensive margin) or not borrow at all (extensive margin) (Mian et al., 2013). However, some households may well be unresponsive to changes in the cost of credit, especially if they are among the very wealthy or very poor (Cloyne et al., 2020). Most of the evidence on the transmission of monetary policy through mortgages and consumer loans to households is based on evidence from aggregate data or single countries, notably the U.S. or the U.K.[1] Country-specific studies are naturally bounded by the institutional setting that shapes the credit and housing markets.

In this paper, we undertake the unique task of collecting and jointly analyzing granular loan-level data for households in nine European countries to establish novel facts on the transmission of monetary policy to households through bank loans across different markets. By pulling together such granular data on household and consumer loans across countries in a single study, we are able to go beyond borders that may constrain the understanding of the transmission mechanism and explore common features and notable differences. The evidence that we collect shows that mortgage and consumer loan markets are highly heterogeneous, even across neighboring euro area countries. We explore within- and across-country variation to establish how prices and quantities change in credit markets during a period that contains the steepest and fastest tightening cycle in the history of the European monetary union.

The data set includes household loans granted in eight countries in the euro area: Belgium, Ireland, Italy, Latvia, Lithuania, Portugal, Slovakia, and Spain; and one non euro-area country, Hungary. We cover a 36-month period from January 2022 to December 2024. This sample period spans the entire post-pandemic tightening episode in the euro area, as well as the first months of easing. After a prolonged period of historically low interest rates, the European Central Bank increased interest rates for the first time in July 2022, in response to steeply increasing inflation. Interest rates increased by 4.5 percentage points between that month and September 2023. After several months of plateauing monetary restriction, in June 2024, the ECB decreased rates. Our analysis focuses on the new loan contracts that originated within this period.

Unlike for firms, there is no harmonized euro area credit register for households. Instead, we rely on national household credit registers from nine countries and harmonize them to enable cross-country comparison. Because of strict legal and privacy restrictions, loan-level data cannot be shared across borders. We therefore work with harmonized aggregates that preserve privacy but still allow us to document cross-country heterogeneity and study monetary policy transmission in detail. This approach ensures robust comparability across countries while providing more granularity than existing euro area datasets such as the individual Balance Sheet Items (iBSI) or MFI interest rate statistics (iMIR). The construction of the dataset and the standardized aggregation procedure are described in detail in Sections 2 and 3.

The descriptive evidence highlights substantial heterogeneity in household credit markets across Europe in the post-pandemic period. Interest rate dispersion is far more pronounced in consumer credit, where cross-country differences can reach several percentage points, whereas mortgage rates are more tightly clustered. Loan amounts also vary markedly, with consumer

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[1]For instance, see Benetton et al. (2025), Pietrunti and Signoretti (2017), Beyer et al. (2024), Beraja et al. (2018), Berger et al. (2021), Bosshardt et al. (2024), Drechsler et al. (2022), Emiris and Koulischer (2023), Flodén et al. (2020), Indarte (2023), Liebersohn and Rothstein (2025).

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credit showing greater relative dispersion than mortgage loans, consistent with the more diverse purposes and shorter horizons of these products. In addition, the number of new loan contracts differs strongly across borrower groups and loan characteristics, underscoring the diversity of household borrowing patterns.

We document systematic differences in credit allocation by borrower age. Mortgages are overwhelmingly concentrated among households aged 25-44, in line with life-cycle patterns around home purchases, while consumer credit has a more even age distribution and plays a greater role among mid- to late-career households. Young borrowers under 25 generally have limited access to credit; though in Latvia, Lithuania, and Slovakia, they account for a larger share of consumer loans.

There is also pronounced variation in loan maturities and interest rate fixation structures. For mortgages, Belgium, Hungary, Italy, and Latvia show a greater share of contracts with maturities below 20 years, while others make extensive use of very long-term contracts, such as Portugal, where loans exceeding 30 years are common. Consumer credit is typically shorter in duration, but longer-term loans such as auto credit dominate in value terms. Fixation practices differ just as sharply: Spain and Italy predominantly issue fixed-rate mortgages, whereas Portugal, Latvia, and Lithuania rely on variable-rate loans with short reset periods. These institutional differences directly shape the transmission of monetary policy.

Building on these facts, we estimate how policy rate changes feed into household borrowing costs for newly originated loans. We find that pass-through is nearly complete in mortgage markets (0.90), but substantially weaker (0.36) and more fragmented in consumer credit. This is consistent with the findings surveyed in (Gregor et al., 2021) as well as with a recent study by (Beyer et al., 2024) on transmission in 30 European countries in the latest tightening cycle. We also explore heterogeneity in pass-through by interacting reference rates with borrower and contract characteristics. Transmission is stronger for younger borrowers in mortgages and for older borrowers in consumer loans. Short-maturity mortgages behave more like consumer loans, with muted sensitivity to policy changes, while long maturities and variable-rate contracts transmit policy more directly. Importantly, these results are robust across samples and show that country-level differences persist even after accounting for contract characteristics, with Ireland consistently exhibiting the lowest pass-through.

Importantly, we find that interest rate changes also affect the dispersion of borrowing costs: in mortgages, pricing remains uniform, but in consumer credit, rate increases widen the distribution of contract rates, suggesting strategic repricing by lenders. This shows that monetary policy affects not just average rates, but also the distribution of financing costs across households.

Overall, our results show that monetary policy does not affect all households uniformly, but interacts with demographic factors, contract design, and national market structures. By harmonizing household credit register data across nine European countries, our study extends earlier work that relied on single-country or aggregate data and provides a unique cross-country perspective on the heterogeneous transmission of monetary policy to households. This literature has established that household heterogeneity—across income, age, mortgage structure, and credit constraints—plays a crucial role in how monetary shocks affect borrowing costs and, ultimately, spending (Beraja et al., 2018; Berger et al., 2021; Bhutta et al., 2020; Charalambakis et al., 2024; Drechsler et al., 2022; Liaudinskas, 2023; Liebersohn and Rothstein, 2025).

The findings we present can be reconciled with several possible explanations, whose detailed investigation we leave for future work. In interpreting the results, we highlight what we view

as the most plausible mechanisms, while acknowledging that other interpretations are possible. A further limitation concerns the external validity of our evidence: we examine a very unique tightening cycle, which followed an equally unique long spell of very low interest rates. This context should be borne in mind when extrapolating the results to other settings.

Our paper adds to the literature on the effects of interest rate changes on mortgage flows and pricing, which mostly focuses on single-country settings. These include research on prepayment and path dependency in the U.S. mortgage market (Berger et al., 2021), on the distributional consequences of tightening U.S. policy on mortgage availability (Bosshardt et al., 2024), and on how interest rate pass-through varies by borrower and lender health (Indarte, 2023). In Europe, evidence from Belgium (Emiris and Koulischer, 2023), Italy (Pietrunti and Signoretti, 2017), Sweden (Flodén et al., 2020) and the UK (Benetton et al., 2025; Bracke et al., 2024) discusses the roles of contractual design and financial frictions.

However, most of this literature relies on country-specific data. Our study, in contrast, seeks to integrate insights from a diverse set of countries within a harmonized methodological framework, exploiting highly granular cross-country data on new loan originations across mortgage and consumer credit markets.[2] Our paper complements and extends previous work studying mortgage market dynamics across countries that use more aggregated data. For instance, while Badarinza et al. (2018) show that the choice of rate fixation types depends on rate expectations, using data for nine countries, we show that even within a monetary union with common rate expectations there are persistent and sizable differences across countries, which have important implications on the magnitude and distribution of the effects of monetary policy decisions. By using borrower-level data instead of country-level information (as in Badarinza et al. (2018)) we are able to shed light on the role of borrower and loan characteristics on borrowing decisions and the transmission of monetary policy. De Stefani and Mano (2025) focus more explicitly on the role of rate fixation in the transmission of monetary policy using quarterly country-level data on rate types for 35 countries over two decades. They find that monetary policy shapes choices on rate fixation for mortgages, which change the composition of the outstanding mortgage stock, thereby altering monetary policy transmission in the future. We extend this work by using granular loan-level data on mortgages (and consumer loans), showing that monetary policy decisions affect other borrowing choices, such as maturity and loan products, which also play a role in monetary policy transmission.[3]

2. Construction of the dataset

A harmonized credit register for individuals or households is not available at the European level. Leveraging a collaboration among researchers from different central banks in Europe, within the context of the ESCB Research Network ChaMP[4], we construct a harmonized data set compliant with confidentiality and privacy legislation covering nine countries. In this section, we delineate the data commonly accessible and capable of being standardized across the participating countries.

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[2]When it comes to corporate credit, an expanding literature exploits contract-level data across countries—much of it enabled by AnaCredit in the euro area (see e.g. Vilerts et al. (2025) and references therein).

[3]In Appendix B we present an overview of selected recent household credit register-based studies from our sample of countries. This highlights the range of questions that household credit registers can address, but it is by no means exhaustive.

[4]The Challenges for Monetary Policy Transmission in a Changing World (ChaMP) Research Network aims to improve our understanding of how monetary policy transmits to the European economy amid unprecedented shocks, structural changes and shifting inflation dynamics. More information on the network is available at https://www.ecb.europa.eu/pub/research-networks/html/champ.en.html.

2.1.   Sample composition

The sample consists of households in nine European countries, eight of which are in the euro-area. The countries in the sample are: Belgium (BE), Spain (ES), Hungary (HU), Ireland (IE), Italy (IT), Lithuania (LT), Latvia (LV), Portugal (PT) and Slovakia (SK). While in some countries the data spans even more than two decades, in others the collection of data is more recent - starting in 2019 or later. The data used in this study spans the period between January 2022 and December 2024 (June 2024 for Belgium and Lithuania). This sample period allows us to focus on the behavior of the household credit market in the post-pandemic period. Doing so, we avoid country-specific idiosyncrasies in pandemic-related credit market interventions as well as a potential impact of the phasing in of the credit registers. The sample period covers the steep monetary tightening episode with several interest rate hikes between July 27, 2022, and September 20, 2023. For the analysis in this paper, we are collapsing the data in six-month intervals. Our data collection focuses on the characteristics of all new contracts (flows) originated between January 2022 and December 2024.

2.2.   Dimensions of the data

Credit Types We include two different loan types: mortgages and consumer credit.[5] To get to comparable categories across countries, we make the following sampling choices. Concerning mortgages, we only include mortgages with collateral. The collateral or protection offered can be physical assets (typically the property) but also personal guarantees (typically senior relatives). We exclude mortgages whose purpose is not the purchase or construction of a physical property. Consumer credit includes both collateralized and uncollateralized loans.[6] Leasing contracts are excluded from the consumer credit sample, as there is no automatic ownership transfer or obligation to purchase the leased good.

Borrowers We only include loans to natural persons. We exclude loans that are given to individuals who are self-employed or sole proprietors. Loans can be given to a single individual, but also co-signing or co-debtorship can take place (e.g. by a couple who cosigns a mortgage for financing a house purchase). The only characteristics of the borrower that are available in all of the countries in the sample are information on the age of the borrower and the location of residence. We group borrowers in six age groups, corresponding to different phases in the life cycle. The six bins are: < 25 years, 25 to 34 years, 35 to 44 years, 45 to 54 years, 55 to 64 years, and ≥ 65 years; or missing if no information is provided.

Creditor Types Various types of financial institutions participate in the reporting to the credit registers. In addition to credit institutions, these can also be installment sellers, other financial institutions that give consumer loans, social lenders, insurance companies, and other entities that grant mortgage loans. To be able to make accurate comparisons between countries and between financial institutions, we classify them into two groups: Monetary financial institutions (MFI) and Other financial institutions (OFI).[7] The presence and importance of MFIs and OFIs differ not only between countries, but also within credit types in a given country.[8]

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[5]In the data collection effort, we also collect information on revolving credit, which includes overdrafts and credit card debt. This third category is not described in the stylized facts nor included in the pass-through analysis due to its heterogeneity and rate-stickiness. Across countries, this product category is characterized by a high number of observations but smaller loan amounts.

[6]In Slovakia, only collateralized consumer credit is available.

[7]We obtain the list of MFIs from https://www.ecb.europa.eu/stats/financial_corporations/list_of_financial_institutions/html/index.en.html.

[8]This study includes the information on OFIs in the descriptive analyses of the dataset, to provide the complete picture of the dataset. However, in the pass-through analyses, we focus only on the loans granted by MFI, which is

Loan contracts For each loan contract, we have information on five characteristics. We know the authorized or committed amount, expressed in euro, and the interest rate, expressed as the annual percentage rate on the contract (at origination). Furthermore, we also have information about maturity, interest rate fixation period, and whether the loan is secured or not. We use bins of **maturity** and these differ depending on the type of credit. For mortgages, we classify loans into four groups of maturity at origination: ≤ 10 year maturity, 10 to 20 year maturity, 20 to 30 year maturity, and > 30 year maturity. We also consider four bins for consumer credit: ≤ 1 year maturity, 1 to 3 year maturity, 3 to 10 year maturity, and > 10 year maturity. For each loan type, we also have a category for missing or implausible values. We do not have information on the specific type of **collateral** for all countries, so we only use a binary indicator to determine whether a loan is secured or not.

In all countries except Belgium, we also have information on the **initial rate fixation** period. We categorize this information into four groups. Loans with an interest rate fixation period of up to twelve months, loans with a fixation period between one and five years, loans with an interest rate fixation period between five and 10 years, and loans with a fixation period longer than 10 years. For fixed-rate loans, we use the maturity of the contract to assign the fixation period. As with the previous characteristics, there is also a fifth category for cases where information is missing.

2.3. Data Coverage and Limitations

While the dataset provides an unprecedented cross-country view of household credit markets, its coverage and construction are subject to several limitations that define the boundaries of the analysis. Our data collection and cleaning involve collective methodological choices and constraints that shape the interpretation of the results. The online appendix provides detailed country-specific descriptions; here we summarize the main aspects.

First, coverage and availability differ across countries: Belgium does not report contractual interest rates, though we can estimate them for mortgages (but not consumer loans), and the Italian register likewise lacks rates on consumer credit. In some cases, information from multiple registries must be combined—for example, in Italy, from *Centrale dei Rischi* and *Consorzio Tutela del Credito*. Second, institutional changes create breaks in coverage, such as Belgium's transition to a new register in May 2024, which prevented us from using data thereafter. Third, data availability is incomplete in some countries, e.g. Lithuania lacks observations for the second half of 2024, due to delayed dissemination. Finally, confidentiality requirements prevent us from working with or sharing contract-level data; instead, we aggregate into multi-dimensional bins, dropping bins with fewer than five contracts. These steps preserve privacy but inevitably reduce granularity.

In addition, the pass-through analysis is limited to loans granted by monetary financial institutions (MFIs). We impose this restriction for two reasons. First, other financial institutions (OFIs) are, in most countries, active only in the consumer credit market. To ensure comparability between mortgages and consumer credit, we restrict the analysis to the more homogeneous set of MFIs. Second, there is substantial cross-country variation in the presence and importance of OFIs, which would otherwise confound the interpretation of cross-country differences.

Finally, aggregate monetary and financial statistics are compiled according to harmonized rules within the euro area. These rules were used as guidance for concepts and definitions in our work whenever possible.

a more homogeneous and comparable set of financial institutions. We leave a detailed description of the differences between MFIs and OFIs and the cross-country heterogeneity for future analyses.

Taken together, these constraints imply that the harmonized dataset used in this paper provides a representative but not exhaustive picture of household credit markets. They also motivate the binning approach described in the next section, which ensures comparability across countries while respecting confidentiality requirements.

2.4. Additional data

In the context of this study, we complement the household credit register information with additional data on market interest rates. This includes Euribor rates and country-level interest rate swaps (IRS) at various maturities. Namely, we have Euribor rates at 1 month, 3 months, 6 months, and 1 year, and IRS at 5, 10, 15, 20, and 30 years, as well as their counterparts for Hungary. These rates help to understand how interest rates on household credit with different characteristics change when the relevant reference rate changes due to changes in monetary policy and broader economic conditions.

3. Statistical treatment of confidential data

3.1. Binning granular data

For each new loan granted to households, each credit register records both the committed loan amount and the interest rate at the beginning of the contract.[9] The unit of observation is the loan contract of borrower i with institution b in country c at time t. Because contract-level household credit data cannot be shared due to strict confidentiality, we aggregate the data into standardized bins that preserve comparability across countries while safeguarding privacy.

For each of the dimensions described in Subsection 2.2, we create indicator variables. Subsequently, we create bins from all possible combinations of these dimensions and label these $BIN_{Country,Period,LoanType,Age,Maturity,IRF,Collateral,MFI}$. Each bin is thus defined by country, half-year period, loan type (mortgage or consumer credit), borrower age group, loan maturity, interest rate fixation horizon, collateral status, and lender type (MFI versus non-MFI). This multidimensional classification allows us to compare contracts with similar characteristics across countries. The grouping of observations with similar characteristics in the same bin thus aims at preserving confidentiality while maximizing within-bin homogeneity.[10] At the same time, after aggregation, there is still a sufficient number of different combinations across countries and over time periods.

In principle, this approach could generate up to 768 bins per country-period, though the actual number is often smaller. One reason is that some combinations of characteristics are not observed in practice (e.g., loans with maturity over 30 years in the age group over 65). The more decisive factor is the absence of a specific category in a country (e.g., there is no information on loans provided by OFIs in Slovakia, effectively reducing the set to 384 combinations).

3.2. Bin-specific information

For each bin, we collect several statistics on both the nominal loan amount and the annualized interest rate. First, we compute the within-bin average nominal loan amount at the time of origination and the within-bin average interest rate (APR) on new loans. While potentially los-

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[9]For more details, see the online appendix with country-specific information and exceptions.

[10]Studies using corporate credit register data often include industry-location-size-time (ILST) fixed effects, following Degryse et al. (2019). While their goal is different, i.e. preserving single-bank borrowers in a high-dimensional fixed effects setup, the idea is similar. An ILST bin should contain firms with similar credit needs.

ing information due to aggregation, the bins still allow for new insights not observable through other datasets (like iBSI or iMIR, or surveys).

Second, we also compute the within-bin standard deviation in amounts and interest rates. This not only gives us an indication of the homogeneity within a bin, but also allows for studying dispersion in pricing in very similar contracts. To the best of our knowledge, such information is not available in other cross-country datasets.

Third, we also compute the within-bin median and within-bin interquartile range, which are robust estimators of centrality and dispersion. Furthermore, combining measures of centrality and dispersion will also allow us to compute coefficients of variation, which are unit-free and thus enhance cross-country and time comparisons.

Finally, for each bin, we also count the number of observations (i.e. the number of new loan contracts in that bin) and do that for two reasons. First, we use that information to delete bins with less than five observations, to avoid re-identification in scarcely populated bins. Second, we can also use this information as statistical or importance weights in any analysis. Statistical weights might be considered to account for the precision of the within BIN estimates. Importance weights might be considered if one is interested in a macro-analysis treating different bins or countries differently depending on their relative size and prevalence in the economy.

3.3. Summary statistics

To provide an overview of the dataset, Table 1 presents summary statistics on new loan contracts disaggregated by product type. The sample spans the period 2022H1-2024H2. The table contains two panels: Panel A reports statistics on *mortgages*, whereas Panel B on *consumer credit*. The unit of observation is a narrowly defined bin constructed over combinations of country, period, loan type, borrower age group, maturity bin, interest rate fixation category, collateral status, and lender type. For each product type, we provide statistics (means and percentiles) on the within-bin average and dispersion in loan amounts and interest rates for newly originated contracts, as well as the number of new contracts per bin. Monetary values are expressed in euros, while interest rates are in percentage terms.

The number of bins with at least five credit contracts differs substantially across product types. There are 3,000 bins for mortgages and 5,728 bins for consumer loans. Differences between products are due to the exclusion of uncollateralized mortgages or mutually exclusive combinations (e.g., short-term consumer loans with long interest rate fixation). Moreover, in Belgium and Italy, contract-level interest rate data are only available for mortgages, which explains the lower observation count of interest rates compared to amounts for non-mortgage credit.

For each product, the number of new contracts per pre-defined bin varies considerably. This mainly reflects differences in country's size. Variation within a country is mainly due to bins' characteristics. Some bins are less populated for economic reasons, e.g. long-term mortgages to people aged 65 or higher. Interestingly, comparing the number of observations per bin, we find that for the average bin, there are six times as many observations on consumer credit compared to mortgages. The observed variation in the number of contracts is also informative for empirical specification design, underscoring the importance of weighted regressions to account for bin-specific sample sizes and importance. For example, using the number of observations in a bin as weights in a regression framework would, in spirit, be similar to using the underlying contract-level data and unweighted regressions, where loans with more common characteristics will be a larger fraction of such a sample.

Across the product types, the table reveals significant heterogeneity in contract size and pricing. Average amounts for new mortgages are over 100,000 (Panel A), while consumer loans

average just below 15,000 (Panel B). The ratio of these average values is basically the inverse of the ratio of the number of new consumer credit to new mortgages, indicating that both markets are of similar size. Interest rate differences across products are also striking: mortgages average 4.22%, whereas consumer loans average 11.52%. These differences reflect both credit risk and contract design, with consumer credit typically involving uncollateralized, flexible credit, and shorter durations. For each bin type, there is also sizeable between-bin variation in both average amounts and average interest rates. This may reflect both cross-country differences as well as within-country variation due to contract features.

The dispersion in loan amounts is substantial for both products. Standard deviations highlight wide within-bin variation. Among consumer loans, the coefficient of variation for loan amounts is 0.89. The within-bin dispersion in mortgage credit amount points to slightly more homogeneity, relative to consumer loans. Importantly for our study, the within-bin dispersion and coefficient of variation are much smaller for interest rates. Interestingly, we observe the reverse pattern for within-bin price dispersion, compared to within-bin amount dispersion. Mortgage pricing seems to be more standardized (within a bin) than consumer loan rate setting.

Table 1: Summary statistics: Mortgages and Consumer Credit

Panel A: Mortgages

	count	mean	p5	p25	p50	p75	p95
Number of new contracts	3000	1158	7	25	117	629	5971
Average Amount on new contract	3000	108960	23577	58995	104008	147256	227522
St.Dev. Amount on new contract	3000	71514	13018	42346	61992	94499	159865
Coefficient of variation - amount	3000	0.70	0.37	0.52	0.65	0.80	1.17
Average interest rate on new contract	2972	4.22	1.62	3.05	4.01	4.93	7.87
St.Dev. interest rate on new contract	2971	0.95	0.31	0.58	0.84	1.17	1.98
Coefficient of variation - interest rate	2971	0.26	0.07	0.14	0.23	0.34	0.55

Panel B: Consumer Credit

	count	mean	p5	p25	p50	p75	p95
Number of new contracts	5728	7194	9	58	509	3385	38143
Average Amount on new contract	5728	13862	637	2758	9484	19721	40508
St.Dev. Amount on new contract	5728	9883	495	2588	6517	12041	32892
Coefficient of variation - amount	5728	0.89	0.35	0.55	0.76	1.04	1.81
Average interest rate on new contract	4763	11.52	2.89	6.62	8.73	14.47	27.58
St.Dev. interest rate on new contract	4752	4.16	0.58	1.73	2.85	4.60	13.45
Coefficient of variation - interest rate	4751	0.42	0.08	0.20	0.31	0.48	0.99

Notes: This table presents summary statistics on newly originated household loan contracts, disaggregated by product type. Panel A reports statistics for mortgages and Panel B for consumer credit. The unit of observation is a bin defined over the combination of period, country, lender, borrower age group, product type, collateral, maturity bin, and interest rate fixation category. For each product, we report the number of observations per bin, as well as statistics on the within-bin mean, standard deviation and coefficient of variation of amounts and interest rates. The columns correspond with different distributional statistics, such as the mean and selected percentiles. Loan amounts are expressed in euros; interest rates are reported in percentage points. More detailed breakdowns by country and product type are reported in Appendix C (Tables C.1 to C.3).

Additional descriptive evidence is provided in Appendix C. Table C.1 reports the number of bins with at least five contracts per country and product type, offering a measure of data representativeness and granularity. The total count of observations varies across different countries,

which may be attributed to certain characteristics that are either immeasurable within a specific country or lack the level of detail required by predefined bins. For instance, Belgium exhibits a generally low count due to the absence of data on interest rate fixation, a trait categorized into five distinct bins. This absence significantly limits the possible number of cells. The highest observation count is seen in Spain and Portugal, suggesting two factors: first, the data are highly detailed with comprehensive documentation of all characteristics; second, there is considerable diversity in the types of contracts available in household credit markets.

Tables C.2 to C.3 provide detailed within-bin statistics separately for mortgages and consumer credit, broken down by country. For each product type, the tables present percentiles, standard deviations, and coefficients of variation for both loan amounts and interest rates. This expanded breakdown supports cross-country comparisons of pricing dispersion and loan size heterogeneity and highlights the variation that may be masked in pooled summary statistics.

Complementary graphical evidence is provided in the Appendices D, E and F. Figures D.1 to D.9 plot country-level time series of total new credit volume and number of contracts, as well as value-weighted average loan amounts and interest rates by product type. Figures E.1 to E.9 further disaggregate these statistics by initial maturity category, and Figures F.1 to F.9 by borrower age group. These visualizations reinforce the cross-sectional heterogeneity identified in the summary statistics.

Implications. These summary statistics reveal a high degree of heterogeneity in household credit markets across Europe—both across and within countries, and across product types. The results indicate that consumer credit is substantially less standardized than mortgage lending. This underscores the need to go beyond very aggregate measures when analyzing the transmission of monetary policy and the dynamics of household borrowing.

4. Stylized facts: country and product variation

4.1. Composition of new credit

Before proceeding to a regression analysis analyzing heterogeneity in the pass-through of monetary policy, we first document a set of stylized facts on the composition of newly originated mortgage and consumer loan contracts—across borrower age, loan maturity, and interest-rate fixation. These stylized facts highlight key patterns in the composition of credit within and between countries that our subsequent analyses will seek to exploit.

We infer these stylized facts from Figure 1 and Figure G.1, which are constructed in a similar fashion. Figure 1 and Figure G.1 differ in that the former is based on the value of the contracts, whereas the latter is based on the number of contracts. Each row of charts corresponds to a loan type (mortgages on top, consumer loans on the bottom), while the three columns report, respectively, the distribution of contracts by borrower age (left), by loan maturity (middle), and by interest-rate fixation period (right). Within each bar, the colored segments show the percentage share of total contracts in nine euro-area countries—Belgium (BE), Spain (ES), Hungary (HU), Ireland (IE), Italy (IT), Lithuania (LT), Latvia (LV), Portugal (PT), and Slovakia (SK)—for the age groups, maturity bins, or interest-rate fixation horizons. This stylized-facts figure provides a concise visual summary of how borrower demographics and contract characteristics vary both across loan types and across countries over the period January 2022–December 2024. Patterns that emerge are compatible with a wide array of potential explanations, of which we discuss only some in the text, deferring more accurate analyses to future research.

Figure 1: Breakdown of new loan contracts (value) by age, maturity and interest rate fixation period
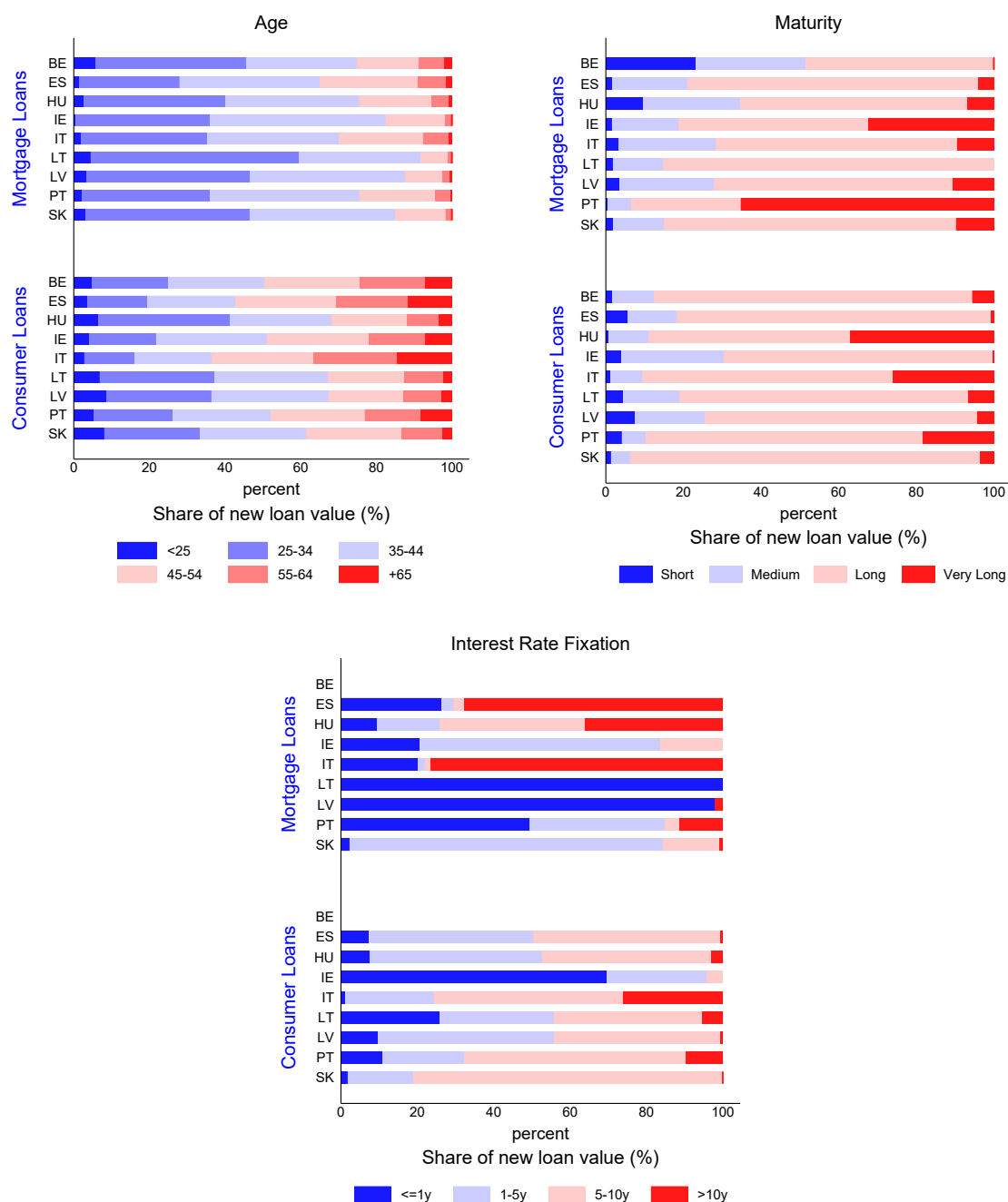
Notes: The figure shows the distribution of new loan contracts (by value) across borrower age (left), loan maturity (middle), and interest-rate fixation (right) for mortgages (top) and consumer loans (bottom) in nine European countries (2022–2024).

Breakdown of New Loan Contracts by Age of Borrower

We begin by examining how new loan origination varies by borrower age. This analysis complements a growing literature emphasizing demographic heterogeneity as a key driver of monetary policy transmission (see e.g. Leahy and Thapar, 2022). Age is arguably the most relevant borrower characteristic lost in aggregate data, and its distributional effects warrant detailed investigation.

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The left panel of Figure 1 (and Figure G.1) displays the age composition of new loan contracts by product type for nine European countries over the period January 2022 to December 2024. The upper figure shows the share of the value of mortgages granted to each age group; the lower figure reports the corresponding share in total loan value of consumer credit. Each bar is disaggregated into six borrower age brackets: under 25, 25–34, 35–44, 45–54, 55–64, and over 65 years.

Mortgages exhibit the most pronounced age-based skew. The bulk of new mortgage lending is concentrated among individuals aged 25 to 44 years, who account for 65% to 85% of new contracts across countries, both in value and number of loans. This is consistent with first-time home purchases and life-cycle patterns of household formation. The 45–54 group plays a more limited but visible role, particularly in countries like Spain, Italy, and Portugal, possibly due to postponed investments by young people, potentially related to later stabilization in the employment situation, or due to second-home buyers. The youngest borrowers (under 25) represent a negligible share in most countries, though surpassing 5% in Belgium, Lithuania, and Latvia (in number, not in value), while the over-65 group has almost no presence in this market segment—likely reflecting the repayment horizon and past housing choices.

Consumer Credit exhibits a more even age distribution than mortgages. The 25–34 and 35–44 groups dominate originations in most countries, especially in terms of total loan value. Borrowers under 25 play a relatively larger role in Lithuania, Latvia, and Slovakia, though their loan sizes are typically smaller, as evidenced by their lower share in value relative to volume (see complementary Figure G.1). The share of borrowers aged 45 to 65 years is more pronounced in consumer credit markets (compared to mortgages), suggesting that mid-career individuals continue to demand credit, possibly for consumption smoothing or household investments. Especially in Southern European countries (Spain and Italy), we see a greater share of consumer credit going to borrowers aged 45 and above, and the lowest participation rate for the youngest age group.

These patterns underscore the importance of borrower age in understanding credit access and pricing across product markets. They also highlight meaningful cross-country differences in credit market demographics, possibly linked to household structure, income dynamics, and institutional settings such as credit scoring systems, retirement-related borrowing constraints, or home ownership preferences and other social patterns.

Breakdown of New Loan Contracts by Maturity of Contract

We now turn to an analysis of how loan maturity structures vary by credit product and across countries, based on originations between January 2022 and December 2024. Maturities are classified separately for mortgage and consumer credit. For **mortgages**, we distinguish between short-term (≤10 years), medium-term (10–20 years), long-term (20–30 years), and very long-term (>30 years) maturities. For **consumer loans**, we use four bins: short-term (≤1 year), medium-term (1–3 years), long-term (3–10 years), and very long-term (>10 years). The middle charts of Figures 1 and G.1 illustrate substantial cross-country heterogeneity in the composition of loan contracts by maturity at origination.

The maturity structure of **mortgage loans** varies markedly across countries. In Hungary and Belgium, over half of the number of new mortgage lending is concentrated in maturities below 20 years, reflecting a preference for shorter repayment horizons. In contrast, countries such as Portugal, Lithuania, and Slovakia exhibit a strong reliance on long-dated mortgage contracts. In particular, Portugal stands out: over 60% of newly originated mortgage loans fall into the very long-term category (maturities above 30 years), and nearly 90% exceed 20 years. In all other countries, the 20–30 year bin is the most common. These differences likely reflect national institutional settings, such as mortgage market design, regulation on amortization periods,

and the availability of fixed-rate options. Given the role of maturity structure and interest rate revision in determining household exposure to interest rate risk, such variation has direct implications for the transmission of monetary policy (Hedlund et al., 2025).

In **consumer credit**, short (less than one year) and medium-term maturities (1-3 years) hold a notable presence, but are much less important in terms of total value. This is a reflection of the wide range of items that can be purchased with consumer credit. An important category of consumer loans is auto loans, which are large in value and often have a maturity exceeding three years. At the shorter end of the maturity spectrum, consumer durables bought on credit have less significant values and, most often, maturities up to three years. In value terms, long-term loans with a maturity between 3 and 10 years are the dominant group in all countries.

From the angle of monetary policy transmission, the bulk of the effect for mortgages is likely going to be driven by longer-term, higher-value loans. For consumer loans instead, the maturity-value mismatch (where short-term loans dominate by number but longer-term loans dominate by value) may imply a temporal duality in transmission if rate changes are different for short versus long maturity consumer loans. We analyze this in a later section (Section 5.3).

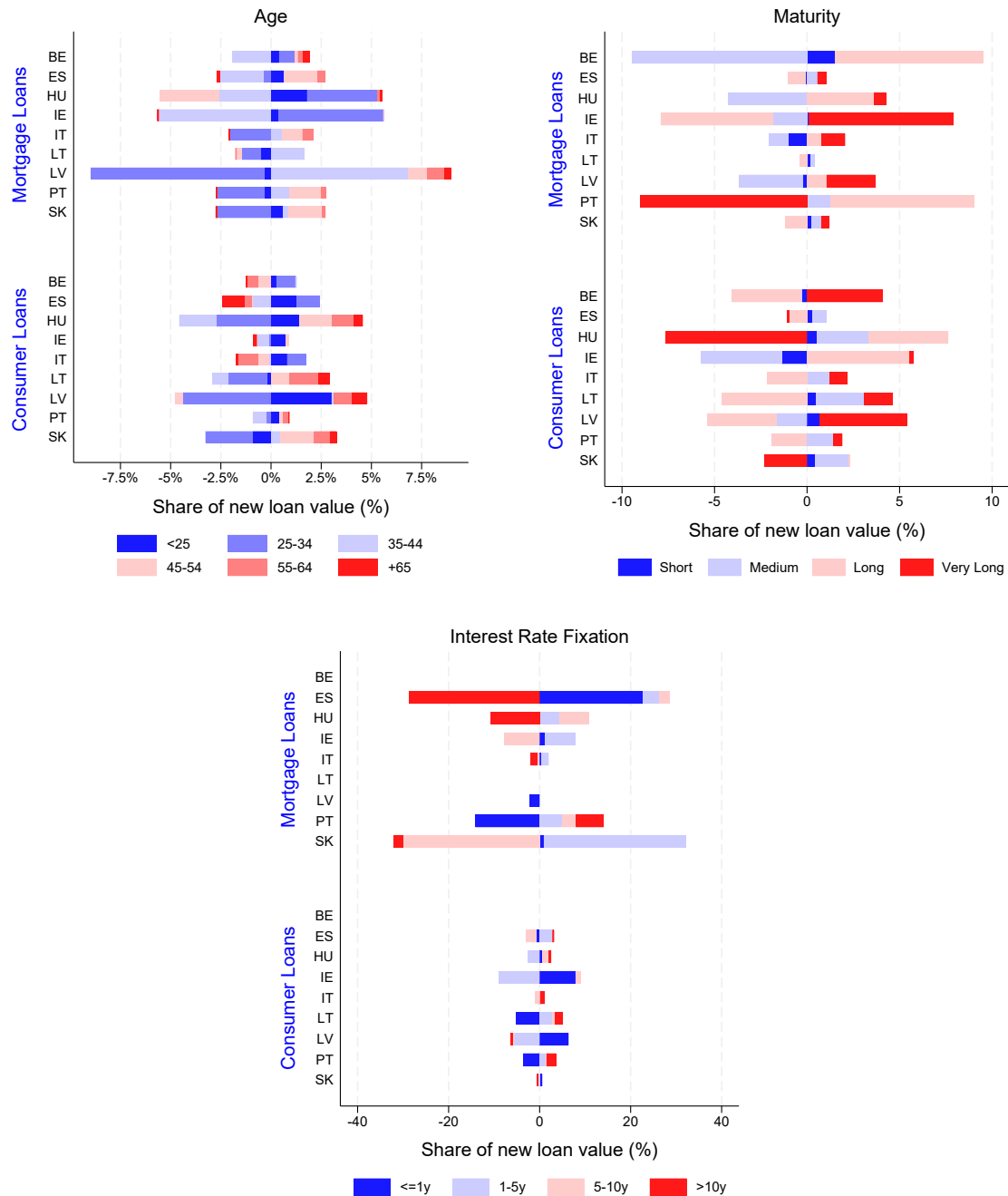**Breakdown of New Loan Contracts by Interest Rate Fixation period**

The final breakdown looks at differences in interest rate fixation periods between products and countries. Garriga et al. (2017), for example, highlights the role of fixation period in the transmission of monetary policy. The right panel of Figure 1 reports the distribution of new loan contracts in terms of total loan value, while the right panel of Figure G.1 represents their distribution by count. Considering mortgages, we again observe substantial cross-country heterogeneity. In Spain and Italy, mortgage interest rates are predominantly fixed over the duration of the contract. If not a fixed-rate contract, the contracts exhibit very high interest rate reset frequencies. There are hardly any intermediate cases. In Portugal, nearly half of the contracts have short fixation periods (less than a year), and in Latvia and Lithuania (nearly) only such contracts are used. Slovakia is different from the above two cases, in that mortgage contracts have rates that can be reset but not at very short notice. The disparity in mortgage loan fixation periods, in particular, may have implications for household financial stability, as shorter fixation periods expose borrowers to higher interest rate risk in tightening monetary conditions (while providing relief in easing periods). At the same time, this allows for faster monetary policy transmission.

Finally, turning to consumer loans, it is important here to assess the distribution across interest rate fixation bins together with the maturity distribution. The following interesting observations emerge. First, Ireland stands out by having nearly 70% of its consumer loans having reset periods within 12 months. Second, also in Latvia and Lithuania, many loan contracts are adjustable rate as interest rates can be reset within 12 months. Third, in Italy, Portugal, and Slovakia, many consumer loans have long interest rate fixation or are never reset.

4.2. Composition changes over a tightening cycle

We now turn to a graphical analysis that documents significant shifts in the composition of consumer and mortgage credit markets throughout the post-pandemic tightening cycle. Figures 2 (and G.2) compare for every country and category, the variation in relative weight (in terms of value and number of operations) in percentage points between 2022H1 and 2023H2. They thus capture differences between the "pre" and the "post" tightening cycle. However, it is important to note that significant shifts in composition may have already occurred just prior to 2022H1 due to anticipation effects. Although some patterns are broadly consistent across countries, others reveal notable idiosyncrasies at the country and market segment levels.

Figure 2: Share changes over a tightening episode (value): Breakdown by age, maturity and IRF

Notes: This figure presents the change in the composition of the value of new loan contracts with respect to borrower age (left), loan maturity (middle), and interest rate fixation (right) across two different credit products (Mortgage Loans (top) and Consumer Loans (bottom)) for selected European countries. Each bar represents the percentage change in the share of new loan contracts by age/maturity/IRF group between two time periods (2022H1 and 2023H2). Positive values indicate an increase in the share of new loan contracts for a given group, while negative values indicate a decline.

The key findings of Figures 2 (and G.2) are as follows. The composition of borrowing by age group varies across countries. At the peak of the tightening phase, younger borrowers (below age 34) account for a larger share of new mortgage issuance in Belgium, Spain, Hungary, and Ireland. However, the opposite trend is observed in Italy, Latvia, Lithuania, Portugal, and Slovakia, where borrowers younger than 34 experience a relative decline in their share of new

consumer credit flows. For the latter four countries, the trend is the same in the consumer credit market. In fact, in all countries but Belgium, Spain, and Italy, the share of consumer credit to late-career borrowers increases.

In general, there is an effect of maturity lengthening in the mortgage market. The exception is Portugal, where very long-term mortgages (exceeding 30 years) are more prevalent; there is a reallocation of these ultra-long maturities to the 20–30 year segment (Figure 2). In the consumer credit segment, there is, in all countries except Ireland, a small increase in the share of short maturity loans in Figure 2. In general, across countries, longer maturity consumer loans tend to lose share in terms of number of contracts (Figure G.2) though the picture is less consistent when looking in value terms, where there is also heterogeneous reshuffling between the two longest maturity bins.

The dynamics of loan composition based on interest rate fixation periods also provide important insights. In many countries, the allocation across different fixation periods appears relatively stable in consumer credit markets. In Portugal, Latvia and Lithuania, there is a small shift (in value) from variable rate consumer credit to slightly longer fixation period contracts. However, in the mortgage segment, there are clear shifts away from very long-term fixed-rate mortgages in Spain and Slovakia, and to a lesser extent also in Hungary and Ireland. By contrast, in Portugal, there is a reversal of this trend, with a decline in the popularity of variable-rate mortgages featuring interest rate adjustments within a year.

In general, these findings illustrate substantial compositional changes in credit markets during a tightening episode. Although certain patterns emerge consistently across countries, significant heterogeneity persists at the market segment level. Given that these changes reflect changes in the composition of newly issued loans, they have the potential to shape the medium to long-term evolution of bank credit portfolios.

5. Heterogeneity in the transmission of monetary policy

5.1. The average pass-through

To assess how monetary policy affects the pricing of household credit, we estimate pass-through regressions. The pass-through rate regression model examines how changes in the reference interest rate impact the pricing of newly originated household loans. The analysis is applied separately to mortgages and consumer credit. We estimate the following regression:

$$InterestRate_{bin,t} = \beta_1 \times ReferenceRate_{bin,t} + \nu_{c \times mat} + \nu_{age} + \nu_{irf} + \varepsilon_{bin,t} \qquad (1)$$

In our setup, this means that the dependent variable corresponds to the average interest for all new loans (in a 6-month window) of a narrowly defined bin. The coefficient (β_1) represents the baseline pass-through effect of the reference rate, showing how changes in the benchmark rate translate into changes in loan pricing. We measure the reference rate at the midpoint of each 6-month interval.[11] Importantly, our econometric approach measures the pass-through from reference rates to household loan rates. We thus focus on the contractual stage of transmission—how benchmark rates translate into borrowing costs for households. We do not estimate the first stage of transmission from monetary policy rates to reference rates, which may itself vary across maturities and countries.

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[11]The reference rate is assigned to each bin depending on the interest rate fixation that defines that bin and can be both product- and country-specific. For fixation periods up to one year, we use the relevant EURIBOR tenor. For fixation periods longer than one year, we use interest rate swap (IRS) rates corresponding to the fixation horizon. In the case of Hungary, we use BUBOR (Budapest Interbank Offered Rate) for short-term fixation periods and BIRS (Budapest Interest Rate Swap) rates for longer horizons.

Table 2 presents regression estimates, disaggregated into mortgages (columns 1–3) and consumer credit (columns 4–6). Columns 1 and 4 report unweighted regressions; columns 2–3 and 5–6 apply weights based on the number and value of loans, respectively. All specifications include country-by-maturity ($\nu_{c\times mat}$), age (ν_{age}) and IRF (ν_{irf}) fixed effects, and standard errors are clustered at the country-age level. Finally, the sample in the pass-through analysis is limited to loans granted by MFIs. We do that for two reasons. First, OFIs are in most countries only active in the consumer credit market. As we want to compare the pass-through across mortgages and consumer credit, we prefer to have the comparison on a similar set of financial institutions. Second, between countries, there is also significant variation in the presence and importance of various types of OFIs.

Table 2: The pass-through of reference rates to contract rates

	MORTGAGES			CONSUMER CREDIT		
	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent variable: Average interest rate on new contract					
Reference Rate	0.903***	0.904***	0.908***	0.358***	0.356***	0.522***
	(0.028)	(0.029)	(0.025)	(0.038)	(0.059)	(0.056)
Observations	2863	2863	2863	2641	2641	2641
Adjusted R-squared	0.77	0.86	0.86	0.81	0.87	0.82
FE	CxM	CxM	CxM	CxM	CxM	CxM
SE-cluster	Cntry-Age	Cntry-Age	Cntry-Age	Cntry-Age	Cntry-Age	Cntry-Age
WLS	-	number	value	-	number	value

Notes: This table presents regression estimates of the pass-through from reference interest rates to the average interest rate on new household loans, distinguishing between **mortgages** (Columns 1–3) and **consumer credit** (Columns 4–6). The specifications are similar across columns except for the weighting scheme applied. Columns 1 and 4 are unweighted. Columns 2 and 5 use weights based on the number of new contracts in each bin. Columns 3 and 6 are weighted by the total value of new loans within each bin. The dependent variable is the average interest rate on new loan contracts, aggregated at the bin level. Regressions include country-by-maturity fixed effects (CxM), as well as Age group and Interest Rate Fixation period fixed effects. Robust standard errors are clustered at the country-age level. Statistical significance is denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Pass-through to mortgage rates is nearly complete across all weighting schemes, with coefficients around 0.90. In contrast, pass-through to consumer credit is significantly weaker: unweighted estimates are around 0.36, rising to approximately 0.52 when weighted by loan value. This suggests stronger pass-through for large-value consumer loans—such as auto loans—whereas rates on small-value products appear less sensitive to reference rate changes.[12] These estimates are broadly in line with the average magnitudes reported in the meta-analysis of pass-through studies by Gregor et al. (2021) and Beyer et al. (2024).

The pattern of adjusted R^2 values provides further insight into the heterogeneity of pass-through. In the unweighted regressions (columns 1 and 4), the fit is similar for both mortgages and consumer credit, with adjusted R^2 values around 0.77–0.81. When applying weights, the explanatory power of the regressions improves across the board, but with notable variation by product and weighting scheme. For mortgages, both number-weighted and value-weighted specifications yield adjusted R^2 values of 0.86, indicating a uniformly strong fit across loan volumes and sizes. For consumer credit, the number-weighted specification shows a similarly high adjusted R^2 of 0.87, suggesting that pricing is relatively systematic in high-frequency, small-loan bins. However, the improvement is more modest when weighting by loan value, with the adjusted R^2 rising only to 0.82. This points to slightly greater pricing dispersion among large-value consumer loans, which may reflect more idiosyncratic contract

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[12]For comparison, Vilerts et al. (2025) find a pass-through coefficient for corporate credit of 0.66. They examine a similar period and also focus on new loans, but use the granular data available in AnaCredit for NFCs.

terms, borrower-specific pricing, or slower rate adjustment.

Several mechanisms may contribute to differences between products and across specifications. Lenders may adjust non-price contract terms—such as maturity, loan size, commissions and fees, or collateral requirements—rather than headline interest rates, particularly to preserve affordability in high-rate environments (Bharath et al., 2011; Qian and Strahan, 2007). Moreover, pass-through may be asymmetric: lenders might absorb part of rising funding costs during policy tightening to limit default risks or preserve borrower demand (Puglisi, 2023). These behaviors reflect a mix of risk mitigation, product-specific pricing constraints, and institutional frictions or banking sector structure and conduct.

Taken together, these mechanisms underscore the importance of composition effects arising from heterogeneity in monetary policy pass-through. In the next section, we exploit additional features of the dataset to uncover some of these mechanisms and sources of heterogeneity.

To examine heterogeneity by borrower and contract characteristics, we augment Equation (1) with interaction terms:

$$
\begin{aligned}
InterestRate_{bin,t} = \beta_1 \times & ReferenceRate_{bin,t}+ \\
+ & \sum_d \beta_d \times ReferenceRate_{bin,t} \times D(Characteristic = d) \\
+ & \sum_d \gamma_d \times D(Characteristic = d) + \nu_{c \times mat} + \nu_{age} + \nu_{irf} + \varepsilon_{bin,t}
\end{aligned}
\tag{2}
$$

where for each category d, β_d measures the *heterogeneous pass-through*, i.e. how the sensitivity of loan rates to the reference rate differs when the bin exhibits the characteristic d (e.g. a specific country, age group, maturity bin, or fixation period). γ_d captures a *level shift* in the average interest rate associated with the characteristic d, independent of reference rate movements. By comparing the estimates of β_d across categories, we identify how the pass-through varies with borrower demographics, contract design, and national market structures.

5.2.   Heterogeneity in the mortgage pass-through

Column 1 of Table 3 repeats the average pass-through using weighted least squares (column 2 of Table 2). Column 2 introduces interactions between the reference rate and country dummies. The omitted, benchmark category is Spain. We find that a 100bps rise in the reference rate raises new mortgage rates in Spain by 80bps. Almost every other country exhibits a higher coefficient—implying more complete pass-through of policy changes. The only country in our sample whose pass-through is significantly lower is Ireland.[13] This cross-country variation persists when we add borrower age (col. 3) or loan maturity (col. 4) interactions, indicating that these dimensions alone do not explain the national differences.

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[13]This could be explained by excess liquidity, competition, and bank health. Ireland has had weaker pass-through to mortgage rates and overnight household deposits during the recent tightening than other European countries (Byrne and Foster, 2023).

Table 3: Heterogeneity in the pass-through: Mortgages

	(1)	(2)	(3)	(4)	(5)	(6)
			Dependent variable: Average interest rate on new contract			
Reference Rate	0.904***	0.796***	0.799***	0.816***	0.865***	0.895***
	(0.029)	(0.009)	(0.013)	(0.012)	(0.039)	(0.050)
BE × Reference Rate		0.225***	0.213***	0.277***	0.155***	0.185***
		(0.018)	(0.028)	(0.040)	(0.042)	(0.051)
ES × Reference Rate		-	-	-	-	-
HU × Reference Rate		0.242***	0.234***	0.316***	-0.044	0.033
		(0.041)	(0.033)	(0.033)	(0.045)	(0.069)
IE × Reference Rate		-0.422***	-0.431***	-0.416***	-0.585***	-0.592***
		(0.014)	(0.012)	(0.017)	(0.025)	(0.030)
IT × Reference Rate		0.223***	0.213***	0.232***	0.173***	0.176***
		(0.056)	(0.055)	(0.059)	(0.037)	(0.037)
LT × Reference Rate		0.116***	0.093***	0.112***	0.047	0.012
		(0.010)	(0.015)	(0.011)	(0.039)	(0.048)
LV × Reference Rate		0.085***	0.066***	0.096***	0.014	-0.005
		(0.011)	(0.014)	(0.015)	(0.039)	(0.044)
PT × Reference Rate		0.137***	0.127***	0.140***	0.034	0.022
		(0.019)	(0.021)	(0.029)	(0.037)	(0.045)
SK × Reference Rate		0.397***	0.382***	0.394***	0.109*	0.097*
		(0.053)	(0.056)	(0.055)	(0.055)	(0.056)
Age: < 25 × Reference Rate			0.073***			0.065***
			(0.018)			(0.020)
Age: 25-34 × Reference Rate			0.032***			0.027***
			(0.009)			(0.009)
Age: 35-44 × Reference Rate			-			-
Age: 45-54 × Reference Rate			-0.006			-0.002
			(0.009)			(0.008)
Age: 55-64 × Reference Rate			-0.051**			-0.018
			(0.021)			(0.029)
Age: >=65 × Reference Rate			-0.187***			-0.152***
			(0.045)			(0.048)
Short × Reference Rate				-0.316***		-0.324**
				(0.110)		(0.128)
Medium × Reference Rate				-0.008		0.005
				(0.017)		(0.012)
Long × Reference Rate				-		-
Very Long × Reference Rate				-0.028		-0.034
				(0.029)		(0.022)
IRF: <= 1 year × Reference Rate					-	-
IRF: 1-5 yrs × Reference Rate					0.453***	0.435***
					(0.075)	(0.079)
IRF: 5-10 years × Reference Rate					-0.119	-0.133
					(0.077)	(0.081)
IRF: >10 years × Reference Rate					-0.159*	-0.191**
					(0.081)	(0.091)
Observations	2863	2863	2863	2863	2863	2863
Adjusted R-squared	0.86	0.87	0.87	0.87	0.90	0.91

Notes: This table presents heterogeneity in the pass-through for new **mortgage loans**. The main independent variable is the reference interest rate, interacted with four sets of characteristics: country dummies, borrower age-group indicators, loan maturity groups, and interest rate fixation (IRF) categories. Columns 2 through 5 add each block of interactions separately, while column 6 includes all interaction terms jointly. The omitted benchmark category of each characteristic is indicated by the empty row (-). All regressions are estimated using weighted least squares, where weights reflect the number of newly originated contracts in each country-age bin. Regressions include country-by-maturity fixed effects, as well as the components of the interactions (Age groups, Interest Rate Fixation periods). Robust standard errors are clustered at the country-age group level. Statistical significance is denoted as follows: *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

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Borrower age effects are monotonically decreasing with age. As the cohort 35-44 is the omitted reference group, this implies that coefficients are positive for the two younger groups (<25 and 25–34) and negative for the two older groups (55–64 and $\geq$65), with only the 45–54 bracket insignificant. Younger borrowers face lower income, less stable job positions, higher debt-to-income ratios, and weaker negotiation power—so rate changes bite harder—whereas older borrowers' greater wealth and credit histories dampen repricing. From a distributional perspective, this implies that tightening cycles impose relatively larger burdens on first-time buyers. These patterns align with life-cycle models of borrowing, in which younger households are more constrained by down-payment and income considerations in mortgage markets, while mid- to late-career borrowers rely more on consumer credit. Credit-constrained households are therefore more exposed to interest rate changes, consistent with theories of balance-sheet channels of monetary policy (Cloyne et al., 2020; Mian and Sufi, 2010).

Loan maturity interactions reveal a threshold effect. The 10–20 year and >30 year bins are not statistically different from the 20–30 year benchmark. Short-maturity mortgages (under 10 years), on the other hand, feature significantly weaker pass-through. Short-term loans—often financing smaller or second homes with sizable down-payments—carry less duration risk, giving lenders less incentive to reprice aggressively.[14] These mortgages with very short total maturities appear to be treated almost like consumer loans. Table 2 showed that consumer credit exhibits a muted pass-through ($\approx$0.36 unweighted), and we observe a similar dampening for these short-maturity mortgages.

Interest-rate fixation is an important driver of heterogeneity in the pass-through (judged from the increase in adjusted R^2): loans fixed for 1–5 years show the strongest and most immediate pass-through, as they reset frequently. By contrast, mortgages with 5–10 year and >10 year fixations are far less responsive, reflecting banks' asset–liability matching incentives and the forward-looking nature of long-fixation pricing, which smooths borrower payments but blunts short-term policy impulses.

Importantly, when we include interest-rate fixation (IRF) interactions (cols. 5–6), four patterns emerge. First, all else equal, Spain's pass-through rises to 0.87-0.90, revealing a stronger link after accounting for fixation structure. Second, several countries (Portugal, Hungary, Latvia, and Lithuania) no longer differ statistically from Spain—implying their earlier apparent "over-pass-through" was driven by a higher share of short-fixation loans. Third, the pass-through is still higher in Italy, Belgium, and Slovakia and indicates a one-for-one relationship between contractual rates and reference rates. Finally, Ireland remains a persistent outlier, with a muted pass-through even after controlling for age, maturity, and fixation, suggesting deeper institutional or market-structure barriers.

5.3. Heterogeneity in the Consumer Credit Pass-Through

We now move to analyze the pass-through to consumer credit. Column 1 of Table 4 repeats the average pass-through using weighted least squares (column 5 of Table 2). Column 2 interacts the reference rate with country dummies. In Spain (the omitted category), the baseline pass-through is 0.36: a 100 bps increase in the reference rate raises the average rate on new consumer loans in Spain by only 49 bps (slightly more than half the mortgage pass-through). Cross-country coefficients vary markedly: Hungary, Ireland, and Lithuania lie at the lower end with only a modest pass-through, while Latvia and Slovakia show near-complete pass-through.[15] Interestingly, Portugal's pass-through closely matches Spain's, suggesting similar transmission

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[14]Vilerts et al. (2025) also find that, for corporate loans, those with shorter residual maturity are more exposed to monetary reference rate changes

[15]Despite the general similarity of the banking sectors in Latvia and Lithuania, the high pass-through in Latvia is to a large extent driven by one specific bank focusing on consumer credits.

efficiencies in those markets.[16]

Table 4: Heterogeneity in the pass-through: Consumer Credit

	(1)	(2)	(3)	(4)	(5)	(6)
			Dependent variable: Average interest rate on new contract			
Reference Rate	0.356***	0.485***	0.450***	0.608***	0.438***	0.634***
	(0.059)	(0.083)	(0.076)	(0.103)	(0.086)	(0.132)
ES × Reference Rate		-	-	-	-	-
HU × Reference Rate		-0.242**	-0.241***	-0.285***	-0.262***	-0.281***
		(0.090)	(0.084)	(0.083)	(0.090)	(0.076)
IE × Reference Rate		-0.429***	-0.428***	-0.456***	-0.384***	-0.500***
		(0.084)	(0.077)	(0.084)	(0.086)	(0.094)
LT × Reference Rate		-0.339***	-0.329***	-0.405***	-0.333***	-0.390***
		(0.107)	(0.103)	(0.108)	(0.113)	(0.110)
LV × Reference Rate		0.566***	0.574***	0.531***	0.551***	0.539***
		(0.185)	(0.186)	(0.191)	(0.181)	(0.195)
PT × Reference Rate		0.051	0.054	-0.025	0.039	-0.028
		(0.081)	(0.073)	(0.079)	(0.080)	(0.067)
SK × Reference Rate		0.513***	0.522***	0.465***	0.484***	0.473***
		(0.095)	(0.090)	(0.101)	(0.104)	(0.098)
Age: < 25 × Reference Rate			0.040			0.040
			(0.061)			(0.064)
Age: 25-34 × Reference Rate			0.035*			0.028
			(0.018)			(0.018)
Age: 35-44 × Reference Rate			-			-
Age: 45-54 × Reference Rate			0.005			0.012
			(0.020)			(0.020)
Age: 55-64 × Reference Rate			0.050*			0.060**
			(0.026)			(0.027)
Age: >=65 × Reference Rate			0.153***			0.174***
			(0.033)			(0.034)
Short × Reference Rate				-0.208**		-0.271**
				(0.086)		(0.126)
Medium × Reference Rate				-0.137*		-0.146*
				(0.079)		(0.084)
Long × Reference Rate				-		-
Very Long × Reference Rate				0.371**		0.469**
				(0.170)		(0.194)
IRF: <= 1 year × Reference Rate					-	-
IRF: 1-5 yrs × Reference Rate					0.104	-0.074
					(0.080)	(0.118)
IRF: 5-10 years × Reference Rate					0.118	-0.062
					(0.085)	(0.115)
IRF: >10 years × Reference Rate					-0.196**	-0.511***
					(0.077)	(0.100)
Observations	2641	2641	2641	2641	2641	2641
Adjusted R-squared	0.87	0.87	0.87	0.88	0.87	0.88

Notes: This table presents heterogeneity in the pass-through for new **consumer credit**. The main independent variable is the reference interest rate, interacted with four sets of characteristics: country dummies, borrower age-group indicators, loan maturity groups, and interest rate fixation (IRF) categories. Columns 2 through 5 add each block of interactions separately, while column 6 includes all interaction terms jointly. The omitted benchmark category of each characteristic is indicated by the empty row (-). All regressions are estimated using weighted least squares, where weights reflect the number of newly originated contracts in each country-age bin. Regressions include country-by-maturity fixed effects, as well as the components of the interactions (Age groups, Interest Rate Fixation periods). Robust standard errors are clustered at the country-age group level. Statistical significance is denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

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[16]Recall that Belgium and Italy are excluded because comparable consumer-rate data are unavailable.

Column 3 adds borrower age-group interactions, revealing a modest upward slope in pass-through with age: only the oldest cohorts (55–64 and ≥65) exhibit statistically significant coefficients above the baseline, suggesting that late-life loans may carry higher risk premia or involve more frequent renegotiation, thereby increasing rate sensitivity.

Column 4 introduces maturity-bin interactions. Short (≤1 year) and medium (1-3 years) maturity loans display substantially weaker pass-through—akin to the muted response seen for short-term mortgages. The very-long maturity bin (above 10 years) is statistically indistinguishable from the 3–10 year reference. Importantly, adjusting for maturity elevates Spain's estimated pass-through from 0.49 to about 0.61 but does not alter the ordering of country effects, implying that contract length alone cannot account for national differences. Unlike in the mortgage regressions, the role of the interest rate fixation period is less pronounced and its inclusion does not affect the country interactions. There seems to be some effect across the longer fixation periods, though the coefficients are unstable across specifications.

Finally, our mortgage results showed that short-maturity mortgages behave like consumer loans in their muted pass-through, while long-maturity mortgages align closely with the reference rate. Similarly, within consumer credit, *long-maturity loans* (most likely financing vehicles) exhibit pass-through patterns more akin to mortgages, whereas *short-maturity products* remain as reference-rate insensitive as other small-ticket credit. Recognizing the *purpose* of each loan—whether for housing, vehicle purchase, or consumer durables—could offer further clarity and would therefore be a valuable extension.[17]

5.4. Rate dispersion and monetary policy

Up to this point, our analysis has focused on the *average* sensitivity of newly originated loan rates to changes in the reference rate. In Table 2, our results demonstrated that mortgage rates adjust almost one-for-one with policy moves, while consumer-credit rates exhibit significantly weaker pass-through. However, focusing solely on central-tendency measures masks an important aspect of lender behavior: how policy shocks affect the *cross-sectional dispersion* of rates offered to otherwise similar borrowers or similar contracts.

To capture this dimension, Table 5 reports weighted-least-squares estimates that allow assessing how a 100 bp increase in the reference rate influences both the central tendency and within-bin dispersion of *newly originated* household loan rates. Panel A isolates mortgages and Panel B consumer credit. Column (1) replicates the baseline pass-through coefficients for the within-bin average rate. Columns (2) to (6) then extend the analysis to the median rate, interquartile range (IQR), standard deviation (StD), robust coefficient of variation (IQR/median), and conventional coefficient of variation (StD/mean). Each measure is computed for all contracts within a bin. By comparing these dispersion metrics across loan types, we can determine whether, and to what extent, monetary conditions amplify or compress rate heterogeneity in the origination of household credit.

Panel A (Mortgages): The estimated pass-through to new mortgage rates is nearly complete, also when using the median rate in a bin. Moreover, measures of within-bin dispersion remain essentially unchanged. The interquartile range and standard deviation within a bin increase only marginally and are economically negligible. The combined effect of the first and second moments is that both coefficients of variation decline slightly (by approximately 6 percent)

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[17]For instance, Ivashina et al. (2022) show that loan purpose on corporate loans has important implications for the bank lending channel.

Table 5: Impact of reference rates on loan rate dispersion

Panel A: Mortgage Loans

	(1)	(2)	(3)	(4)	(5)	(6)
	Avg	p50	IQR	StD	CoV-R	CoV
Reference Rate	0.904***	0.908***	0.049*	0.042*	-0.064***	-0.058***
	(0.029)	(0.029)	(0.029)	(0.021)	(0.011)	(0.009)
Observations	2863	2863	2863	2862	2863	2862
Adjusted R-squared	0.86	0.85	0.38	0.56	0.36	0.60
FE	CxM	CxM	CxM	CxM	CxM	CxM
SE-cluster	Cntry-Age	Cntry-Age	Cntry-Age	Cntry-Age	Cntry-Age	Cntry-Age
WLS	number	number	number	number	number	number

Panel B: Consumer Credit

	(1)	(2)	(3)	(4)	(5)	(6)
	Avg	p50	IQR	StD	CoV-R	CoV
Reference Rate	0.356***	0.296***	0.325***	0.098**	-0.006	-0.009***
	(0.059)	(0.063)	(0.094)	(0.041)	(0.005)	(0.001)
Observations	2641	2641	2641	2637	2600	2637
Adjusted R-squared	0.87	0.78	0.70	0.86	0.63	0.83
FE	CxM	CxM	CxM	CxM	CxM	CxM
SE-cluster	Cntry-Age	Cntry-Age	Cntry-Age	Cntry-Age	Cntry-Age	Cntry-Age
WLS	number	number	number	number	number	number

Notes: This table presents regression results for two household loan categories: **mortgage loans** (upper panel) and **consumer credit** (lower panel). Each panel reports results from six regressions that differ only in the choice of the dependent variable. The dependent variables used in Columns 1–6 are as follows: (1) average interest rate, (2) median interest rate (p50), (3) interquartile range (IQR) of the interest rate, (4) standard deviation of the interest rate (StD), (5) robust coefficient of variation (CoV-R), and (6) coefficient of variation (CoV). All regressions are estimated using weighted least squares (WLS), with weights reflecting the number of loan contracts in each bin. Fixed effects are included by country and maturity group (CxM) as well as dummies (fixed effects) for Age groups and Interest Rate Fixation periods. Standard errors are clustered at the country-age level. Statistical significance is denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

when the reference rate tightens. These findings indicate that, even as reference rates fluctuate, mortgage pricing adjusts almost uniformly across borrowers and loan contracts.

Panel B (Consumer Credit): In contrast, new consumer-credit rates exhibit substantially weaker pass-through. Importantly, the effect on the within-bin median is around 0.30 basis points and thus smaller than the within-bin mean —reflecting already some discretionary price setting within a bin. This is confirmed in columns 3 and 4. Crucially, the interquartile range coefficient of 0.325 (statistically significant at the 1 percent level) reveals a pronounced absolute widening of the rate distribution. A 100 basis points increase in the reference rate widens the gap between the 75th and 25th percentiles within a bin by 33 basis points. The within-bin standard deviation also increases (by 0.098 basis points, significant at 5 percent) when the reference rate increases. However, in relative terms, the increase in dispersion (IQR) and increase in median offset each other, resulting in an insignificant impact on the robust coefficient of variation. The conventional coefficient of variation declines by 0.009 (1 percent significance), implying that although absolute dispersion rises, relative heterogeneity decreases because the mean rate increases more rapidly than the standard deviation. However, the economic magnitude of this effect is small.

These results may suggest that monetary conditions have fundamentally different cross-sectional effects on mortgage versus consumer-credit markets. Mortgage lenders, operating under standardized product menus and intense competition, adjust rates almost uniformly, thereby preserving the homogeneity of pricing (Scharfstein and Sunderam, 2016). By contrast, consumer-credit providers may engage in a more strategic repricing (Yannelis and Zhang, 2023), raising

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central-tendency measures only partially while sharply expanding the absolute spread of offered rates—particularly penalizing higher-rate borrowers (in a bin)—and thus intensifying segmentation.

This widening of dispersion is consistent with theories of risk pricing and asymmetric information: consumer credit markets are less transparent, with higher monitoring costs and stronger scope for price discrimination, which can amplify heterogeneity in response to monetary policy (Stiglitz and Weiss, 1981; Indarte, 2023). The pronounced widening of absolute rate dispersion in new consumer-credit contracts following a policy-rate increase not only reflects supply-side factors but is a combination of borrower-level, contract-level, and lender-level heterogeneity. On the borrower side, differences in financial literacy and search sophistication influence how effectively individuals compare and negotiate loan offers. More sophisticated borrowers, who tend to have higher incomes and greater financial experience, are better able to secure favorable terms, whereas less informed or credit-constrained households face higher markups (Lusardi and Mitchell, 2014; Bhutta et al., 2020). Demographic factors such as age further shape risk assessments: older borrowers often benefit from longer credit histories and established relationships with lenders, while younger or lower-income applicants are charged risk premia that amplify rate dispersion as reference rates climb (Argyle et al., 2023).

Lender- and market-structure factors may also play a central role in driving cross-sectional dispersion. Heterogeneity in bank size, capitalization, and funding profiles gives rise to differential cost pass-through: well-capitalized institutions with access to stable funding can adjust rates uniformly, while smaller or less liquid banks rely on higher markups and selective repricing to maintain margins. Moreover, market concentration and the presence of non-bank or online lenders intensify competitive pressures, particularly in the consumer-credit segment, where a fragmented supply base permits greater price dispersion when benchmark rates change (Kiefer et al., 2025).

Although our collapsed data would permit testing some of these channels, they are better assessed using the underlying micro-data. We see our results as suggestive evidence that could motivate a rich agenda for future work examining how borrower sophistication, contract structure, and lender health jointly determine the uneven pass-through of monetary policy through new-loan origination. Complementing average-rate indicators with *distributional metrics*—such as IQR and CoV—to capture the widening of credit-cost dispersion, particularly in consumer markets, can thus be valuable to central banks and macro-prudential authorities.

6. Robustness and variation

6.1. Subsample stability

To ensure that our findings on heterogeneous mortgage pass-through are not driven by specific sample choices, we conduct a series of robustness checks in Table 6, re-estimating the core specifications under alternative sample restrictions.

The mortgage pass-through estimates in Table 6 (Columns 1–3) demonstrate substantial robustness to three alternative samples: omitting 2024 (col 1), excluding Belgium and Italy—due to missing consumer-credit data (col 2)—and removing Ireland, which has a much lower baseline pass-through than all other countries (col 3).

Baseline pass-through estimates remain stable at 0.87–0.95 across all specifications, confirming near-complete pass-through regardless of sample restrictions. Country heterogeneity remains robust. Ireland's large negative interaction persists across samples, reinforcing its classification as being structurally different. Positive deviations for other countries also remain consistent, indicating these effects are not driven by transient shocks or sample composition. The only

Table 6: Heterogeneity in the pass-through: Robustness

	MORTGAGES			CONSUMER CREDIT		
	(1)	(2)	(3)	(4)	(5)	(6)
VARIATION	no 2024	no BE/IT	no IE	no 2024	no IE	no IE + Collateral
Dependent variable: Average interest rate on new contract						
Reference Rate	0.874***	0.950***	0.904***	0.686***	0.966***	1.009***
BE × Reference Rate	0.183**		0.181***			
ES × Reference Rate	-	-	-	-	-	-
HU × Reference Rate	0.023	0.063	0.065	-0.295***	-0.260***	-0.255***
IE × Reference Rate	-0.620***	-0.628***		-0.515***		
IT × Reference Rate	0.211***		0.176***			
LT × Reference Rate	0.008	-0.036	0.005	-0.430***	-0.453***	-0.437***
LV × Reference Rate	0.030	-0.049	-0.011	1.016***	0.554***	0.549***
PT × Reference Rate	0.055	-0.037	0.015	-0.094	-0.066	-0.047
SK × Reference Rate	0.024	0.085	0.141**	0.382***	0.451***	0.438***
Age: < 25 × Ref. Rate	0.074***	0.063***	0.064***	0.026	-0.009	-0.014
Age: 25–34 × Ref. Rate	0.032***	0.026***	0.027***	0.028	0.028	0.026
Age: 35–44 × Ref. Rate	-	-	-	-	-	-
Age: 45–54 × Ref. Rate	-0.002	0.002	0.000	0.008	0.009	0.010
Age: 55–64 × Ref. Rate	-0.024	-0.017	-0.017	0.038	0.060*	0.061*
Age: >=× Ref. Rate	-0.165***	-0.176***	-0.146***	0.138***	0.187***	0.184***
Short × Ref. Rate	-0.273**	-0.431***	-0.343**	-0.459***	-0.632***	-0.676***
Medium × Ref. Rate	0.012	-0.003	0.003	-0.144	-0.271**	-0.293**
Long × Ref. Rate	-	-	-	-	-	-
Very Long × Ref. Rate	-0.027	-0.028	-0.037	0.352*	0.344	0.570**
IRF: <= yr × Ref. Rate	-	-	-	-	-	-
IRF: 1–5yrs × Ref. Rate	0.472***	0.402***	0.416***	-0.085	-0.378***	-0.401***
IRF: 5–10yrs × Ref. Rate	-0.127	-0.168*	-0.201**	-0.047	-0.356***	-0.383***
IRF: >10yrs × Ref. Rate	-0.207	-0.284***	-0.209**	-0.427***	-0.671***	-0.763***
Collateralized × Ref. Rate						-0.265***
Observations	1949	2071	2623	1775	2380	2380
Adj. R-squared	0.91	0.91	0.92	0.89	0.87	0.87

Notes: This table presents heterogeneity in the pass-through on new household loans, distinguishing between **mortgages** (Columns 1–3) and **consumer credit** (Columns 4–6). The top row indicates how the specification differs from the benchmark. The main independent variable is the reference interest rate, interacted with four sets of characteristics. Variables, weighting, clustering and fixed effects are as in 3 and 4. Robust standard errors clustered at the country-age level are reported in the Online Appendix H.1. Statistical significance is denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

noteworthy variation appears for Slovakia when 2024 is excluded: its country interaction tightens marginally.[18] Age and Maturity Effects also remain robust across specifications. The more complete pass-through for the youngest borrowers (< 25 yrs and 25-34 years) remains, while the lower pass-through for older borrowers or short-maturity loans (< 10 yrs) is unchanged. Finally, loans fixed for 1–5 years consistently display stronger pass-through ($\approx$ 0.40–0.47), while long-fixation contracts (5–10 yrs, > 10 yrs) remain negative. These invariant patterns linked with Interest Rate Fixation highlight banks' liability-management incentives as a key structural mechanism.

Overall, the core findings of a near-complete mortgage pass-through and its systematic heterogeneity by country, age, maturity, and fixation are highly robust to these alternative sample

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[18]This persistent deviation is suggestive of structural factors such as limited bank competition, legacy mortgage products, or regulatory differences, which are emphasized in theoretical and empirical work on market structure and monetary transmission (Kashyap and Stein, 2000; Byrne and Foster, 2023).

definitions.

Columns 4–6 present four variations of the consumer credit pass-through specification: a sample excluding all observations from 2024 (col. 4), a sample further omitting Ireland (col. 5), and finally the Ireland-omitted sample augmented with an interaction between the reference rate and a secured-loan dummy (col. 6).

We start with the most striking observation. When Ireland is excluded, every interest-rate fixation category (1–5 years, 5–10 years, and >10 years) exhibits a significantly negative interaction relative to the ≤1 year benchmark (or variable rate contracts). This uniform downward shift suggests that longer-fixation consumer loans adjust less to reference rate changes than fully adjustable rate contracts—likely reflecting banks' asset–liability matching priorities and the contractual frictions that delay repricing in these segments.

The change in these coefficients also affects the baseline pass-through coefficient; which correspondingly rises from 0.63 in the full sample (or 0.69 when 2024 is excluded) to approximately 1.01 once Ireland is omitted (cols. 5–6). Country-level heterogeneity remains stable across specifications, indicating that the relative difference with respect to the pass-through in Spain is robust (although Latvia's coefficient rises significantly to 1.016 when 2024 is excluded). These cross-country patterns reinforce that structural market and institutional factors underpin national differences in consumer-credit pass-through.

Age effects continue to be confined to the oldest borrowers (55–64 and ≥65), whose pass-through interactions remain in the 0.14–0.19 range across specifications. Meanwhile, short-term loans (under 12 months) consistently exhibit lower pass-through, with the coefficient growing more negative—from –0.27 to –0.68—as the sample is trimmed, underscoring the reliability of the short-maturity discount.

Finally, in the last column, we additionally add an interaction term between the reference rate and a secured-loan dummy. This interaction yields a significant negative coefficient (–0.265), indicating that collateralized consumer contracts experience systematically lower pass-through even after controlling for all other heterogeneity. Importantly, adding this additional dimension does not alter any of the other insights.

6.2. Dimensions of variation: Country versus time

The graphs presented in Figure 3 illustrate the explanatory power of different fixed effects structures in explaining variations in key loan characteristics: the average interest rate (upper panel) and the logarithm of the average loan amount (lower panel). Specifically, we are interested in uncovering whether country features and/or time variation have explanatory power across products and product characteristics. This information allows us to assess the degree of heterogeneity in the drivers of loan dynamics in different markets.

The two panels follow a similar structure, and we explain their design and information content based on the upper panel. Using the average interest rate as a dependent variable (of which summary statistics can be found in Table 1), we run 42 regressions which are combinations of 2 samples, 3 sets of fixed effects, and 7 weights used in the regression. The two samples correspond to the two credit product categories (distinguishing between consumer loans and mortgages). The three sets of fixed effects include (i) time fixed effects, (ii) country fixed effects, (iii) time-varying country fixed effects. Broadly speaking, time fixed effects control for macroeconomic conditions and common shocks affecting all countries similarly at a given point in time. Country fixed effects could account for the country-specific structural differences in the banking markets (like competition). Finally, country-time fixed effects capture time-varying factors that differ across countries or common shocks with heterogeneous impacts, such as

monetary policy transmission, financial regulations, or market conditions.

Figure 3: Sources of variation in Loan Characteristics

Explanatory power comparison
Average Interest Rate

Explanatory power comparison
ln(Average Amount)
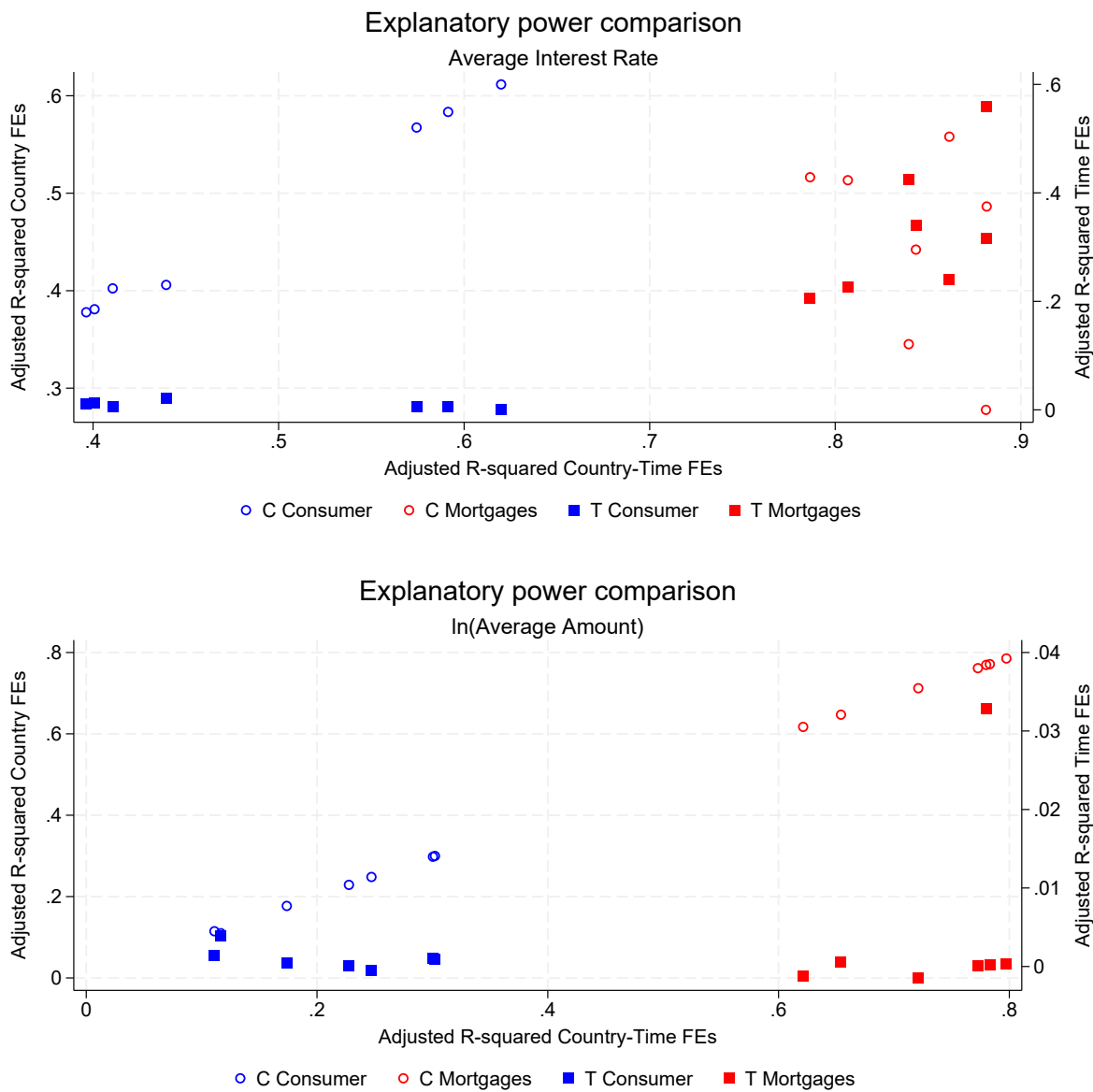
Notes: This figure illustrates the explanatory power of different fixed effects structures in explaining variations in the average interest rate (upper panel) and average committed amount (lower panel) across credit product categories. The x-axis represents the adjusted R-squared values from regressions with country-time fixed effects, while the y-axes show the adjusted R-squared values from regressions with country fixed effects (left) and time fixed effects (right). The scatter plots compare the explanatory power of country and time fixed effects against country-time fixed effects. Different colors and marker shapes indicate loan product types and fixed effects structures. Seven weighting schemes are applied to account for differences in economic significance across credit segments.

The seven different weighting schemes allow us to view the analysis from different perspectives. The first approach is unweighted, thus giving equal weight to any combination of characteristics. However, not every combination of characteristics is equally present or economically important. Therefore, we consider two weighting schemes that give more weight to combinations that are more likely or more sizable in the overall credit market (segment). The four other weighting schemes are modifications such that the count- or value-weights either sum to one in each country-year, or sum to one in each country-year-product. The former treats each country

as equally important in determining the fit, the latter treats each product market in each country as equally important (but allows for variation in importance within a country-time-product triple).

For each dependent variable, the adjusted R-squared of each of these 42 regressions is extracted and plotted to illustrate how much of the variation can be explained by each specification of fixed effects. The x-axis represents the adjusted R-square values of the specifications with country-time fixed effects. The left y-axis corresponds to the adjusted R-squared values of regressions with country-fixed effects, while the right y-axis corresponds to the adjusted R-squared values of time-fixed effects regressions. We overlay two scatter plots. The first is a scatter plot that compares adjusted R-squared values of country fixed effects with country-time fixed effects (circles). The second is a scatter plot that compares adjusted R-squared values of time fixed effects with country-time fixed effects (squared). Different colors and shades are used for the product categories. Each specific label appears seven times on the scatter plot (one for each weighting approach).

In fact, the figures confirm the relative importance of different fixed effects in explaining variations in loan pricing and contract size between countries and over time. Higher adjusted R-squared values indicate a greater ability of the corresponding fixed-effects specification to account for observed heterogeneity in loan characteristics. In turn, these provide guidance for which dimensions to analyze and on which credit markets to focus.

For example, interest rates can be very well explained by time-fixed effects, but only for mortgage loans. This suggests that in the period of analysis, the pass-through to mortgage rates was fairly homogeneous across countries, being explained for the largest part by a common time trend (the variation in reference rates). For consumer credit, the variation in interest rates is primarily country-specific, without significant differential effects over time. When looking at the average loan amount, we observe that it is primarily driven by cross-country differences rather than time variation (the values on the right-hand side Y-axis are very small). Consequently, if one wants to focus on the impact of monetary policy, the best starting point would be to focus on rate setting in the mortgage market; as this is where time fixed effects have substantial explanatory power.

In sum, these graphs provide a systematic way to assess the explanatory power of fixed effects in credit market data. They help in identifying the appropriate level of analysis and thus help researchers in providing focus on the relevant drivers. They should not be limited to these sets of fixed effects. Alternatively, one could, for instance, replace the country or time fixed effects with age group (or loan maturity bin) fixed effects, to see whether heterogeneity in credit market outcomes is structurally related to differences in borrower age and whether these age-group effects are fixed, time-varying, or country-specific.

7. Policy Implications

The heterogeneous transmission of monetary policy across European household credit markets documented in this study provides valuable guidance for both national and European policymakers. Our results indicate that while mortgage markets are relatively well integrated, consumer credit markets remain fragmented, and these differences matter for the design of monetary, macro-prudential, and consumer-protection policies.

For mortgages, during the latest tightening episode, the contractual pass-through from reference rates to mortgage markets was nearly complete and, once borrower and contract characteristics are controlled for, cross-country differences mostly vanish. This highlights that, at this stage of the transmission mechanism, mortgage pricing adjusts almost one-for-one to benchmark rates in a broadly uniform manner. At the same time, the disproportionate sensitivity of

younger borrowers underscores the distributional consequences of policy, as first-time buyers face higher costs during tightening cycles. This highlights the potential complementarity with fiscal measures in support of more exposed borrowers.

Contract design also shapes the trade-off between transmission speed and financial stability. In countries dominated by short fixation periods, interest rate changes feed through quickly, but households are more exposed to interest rate risk, whereas in systems with long fixation horizons, transmission is slower but borrowers are more insulated. These findings point to the importance of calibrating borrower-based measures and stress test assumptions to reflect the rapid pass-through observed in mortgage markets, while ensuring that national frameworks account for the risks embedded in local market structures.

In contrast to mortgage markets, consumer credit markets remain highly fragmented. Even after controlling for loan and borrower characteristics, pass-through differs markedly across countries, reflecting persistent institutional heterogeneity in regulation, enforcement, and competitive conditions. Moreover, monetary tightening often leads to a widening of rate dispersion and may disproportionately affect less sophisticated or financially constrained borrowers. This suggests that fragmented consumer credit markets may exacerbate both geographic and socio-economic inequality in the transmission of policy. Regulatory harmonization, enhanced transparency, policies that strengthen financial literacy, and monitoring of pricing practices would help to reduce these divergences and ensure that consumer credit does not remain a source of weakness in the monetary transmission chain.

Finally, the persistence of outliers such as Ireland, where mortgage pass-through is consistently weaker, illustrates that country-specific institutional and competitive factors can override broader integration trends. Identifying the underlying causes of such deviations is essential both for national supervisors and for assessing the risks of transmission fragmentation at the euro area level.

8. Conclusion

This paper has adopted a unique, cross-country, loan-level perspective on European mortgage and consumer-credit markets to document the heterogeneity in household borrowing conditions and to analyze the transmission of monetary policy during the recent tightening cycle. Leveraging granular data from nine credit registers, we have shown that substantial differences persist across products, borrower groups, and national contexts, and that these differences shape how policy shocks are passed through to household borrowing costs. This heterogeneity in household credit conditions both across and within countries was previously hard to detect using aggregate data.

Our findings underscore the value of harmonized credit-register data and uncover a high degree of heterogeneity: the explanations and drivers of which we discuss only briefly and non-exhaustively here, leaving open several promising avenues for further research. Future work could disentangle more systematically the role of institutional frameworks, labor market dynamics, competitive conditions, and borrower behavior in driving cross-country differences. Furthermore, understanding how rate dispersion arises within similar product categories would also help illuminate the mechanisms behind unequal pass-through. In addition, joint analyses across credit products - including revolving credit and overdrafts - could shed light on substitution patterns that shape household responses to monetary policy.

Additional work linking borrower-level outcomes to household and bank balance sheets, and distinguishing between supply- and demand-side drivers, would help clarify the channels through which monetary policy affects households and financial stability. While our study focused on new loan originations, another important margin of adjustment is the refinancing

or renegotiation of existing contracts. Our binning framework could in principle be extended to this dimension, allowing a cross-country analysis of refinancing activity and its sensitivity to monetary policy. This would help assess how existing borrowers, not just new ones, transmit and absorb policy shocks.

Finally, this paper has focused solely on a tightening episode, which calls for further evidence on easing phases and on potential asymmetries. Such research would not only complement the findings reported here but also provide a stronger basis for evaluating the broader economic and distributional consequences of monetary policy in Europe.

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Appendix

A. Country-specific information

A.1. BE - Belgium

The National Bank of Belgium has been collecting granular data on credit to individual persons since 2006. In May 2024, a new data model and platform (BECRIS-ICR) was introduced, replacing the previous credit register (CCR/KCP). As the coverage of the two systems differs, there is a break in the time series as of May 2024. The credit register collects loan-level information on new loans, overdue debt, and payment arrears. Information on the Individual Credit Register is available at https://www.nbb.be/en/central-credit-registers/individual-credit-register-icr.

Importantly, **Interest rates** are not recorded. For mortgages, they can be estimated (at origination) from data on the principal, the first monthly payment, the frequency of payments, and the number of payments. Assuming annuity amortization of mortgages, if F is the amount of the loan at the time of issuance (face value) and C be the monthly payment that the borrower must make until maturity (T periods later). The interest rate r on the loan can be computed from the following formula:

$$F = \frac{C}{r}\left(1 - \frac{1}{(1+r)^t}\right) \tag{3}$$

A.2. ES - Spain

The Spanish Credit Registry (Central de Información de Riesgos del Banco de España or CIRBE) provides monthly information on all loans, credits, bank endorsements and general risks that financial institutions have with their customers. This detailed information is reported at the contract level and includes both the contract and borrower characteristics at the time of origination and throughout the life of the contract. Specifically, contract characteristics include the loan amount at origination, maturity, interest rate modality (adjustable versus fixed), interest rate, collateral requirements, purpose of the loan or the bank granting the loan. For more information, see https://www.bde.es/wbe/en/publicaciones/informes-memorias-anuales/memoria-cir/

A.3. HU - Hungary

The Hungarian credit registry has continuously evolved: it started as a list of delinquent borrowers in 1995, and was extended to include descriptive information on all outstanding loan contracts granted by financial institutions to households in 2012. The data used in this paper come from a new administrative data source (HITREG) that financial institutions (FI) have to provide to The Central Bank of Hungary established by MNB Directive 35/2018. (XI. 13.). FIs have to submit information on all outstanding loans in their portfolio including information on the loans' attributes both at origination and at the time of reporting. Attributes include loan amount, origination date, duration, loan type, interest rate, formula for calculating the interest rate (base rate + premium), macroprudential measures (LTV and DSTI ratios), information on collateral values, and information on the borrowers (date of birth, gender) and guarantors of the loan contract. Of course, not all of these variables are applicable for all loans, and some of these variables could be missing for contracts that were originated before the establishment of the current reporting framework. For more information, see Technical assistance: https://aszp.mnb.hu/mnb-data-reporting/technical-assistance.

The Hungarian database was constructed based on the June 30 and December 31 screenshots of the HITREG for the analyzed period of 2021-2024, which means that the new loans with less than 6 months maturity are not included in the final database (less than 0.3% for 2022 first half year) and neither new loans which were terminated before the end of the half year (less than 1.7% for 2022 first half year). For the analyzed period

of 2021-2024, most new loans are denominated in HUF; less than 0.1% are denominated in EUR or CHF. We converted non-EUR loans to EUR amount on the half year end exchange rate. Loans with zero outstanding capital credit were dropped from the sample.

A.4.   IE - Ireland

Information on Ireland's Central Credit Register (CCR) is available at: `https://www.centralcreditreg` `ister.ie/about-us/what-is-included-on-the-central-credit-register/`. Some data points were excluded from the analysis due to confidentiality rules governing the use of CCR data.

A.5.   IT – Italy

The main source used for data on Italian mortgages is the Bank of Italy's TAXIA (Quarterly analytical sample survey of lending rates), which collects information on interest rates from a sample of banks on household clients. The sample of banks sends information on mortgage loans both at origination (among others: interest rate, TAEG, and outstanding amount) and on outstanding loans (numeri computistici, interest paid, charges). This dataset covers the period from 2004 onwards, on a quarterly basis. For the needs of this paper, from the section covering only new loans, we took: the so-called *TAEG* (annual percentage rate of charge, i.e. the interest rate with all charges) at origination, the loan amount issued at origination, and the interest rate fixation period (IRF).

From the section covering outstanding loans, we took interest paid quarterly, the product of days and capital outstanding (numeri computistici, which highlights from quarter to quarter how much the debtor has to repay in capital line) as a proxy to validate the consistency of estimated interest rates and maturities.[19]

Importantly, TAXIA only covers exposures above 75.000 per borrower–bank relationship, which limits its coverage to larger credit exposures. We use the more comprehensive Italian Central Credit Register (Centrale dei Rischi, or CR) with a threshold of 30.000, managed by the Banca d'Italia, only as a complementary source for mortgage loans, as it does not contain information on interest rates or interest rate fixation periods. The CR includes data from all financial institutions, covering, for the scope of this paper: monthly outstanding value (used to estimate the monthly capital repayment) and information on the presence of collateral (including type).

Maturity at origination is provided only in classes in both sources, and thus needs to be estimated. We assume annuity amortization and use the following formula, where the installment C is interpreted as the annual payment (including both capital and interest). This value is projected from the quarterly change in outstanding amounts:

$$A \ = \ \frac{\ln\bigl(-P\,R/(C\,T - P\,R)\bigr)}{P\,\ln\bigl(1 + \frac{T}{P}\bigr)}$$

where

A = number of years to repay the loan,

C = principal (loan amount at origination from TAXIA),

T = annual interest rate (TAEG, from TAXIA),

P = number of payment periods per year (12, as we took the delta in capital from CR from a month to another),

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[19]By dividing the numeri computistici by a number hovering 90, we get a proxy for the outstanding capital quarterly.

R = periodic payment amount (sum of $12\times$ capital monthly repayment from CR and $4\times$ interest paid quarterly from TAXIA).

We used different estimates, over different periods, and cross-validated using the maturity (and IRF for fixed rate) class information provided in TAXIA and CR, which serves as a benchmark for plausibility. When values are implausible, we input the minimum value to satisfy the class of belonging (e.g. above 5 but below 10, we input 5.1). We drop all observations which do not satisfy any condition based on the default information given by the two sources.

For more information, see:
https://www.bancaditalia.it/statistiche/raccolta-dati/centrale-rischi/index.html

For consumer credit and revolving credit, we rely on data from the Consorzio Tutela del Credito (CTC), a privately managed credit registry. CTC collects data from a sample of banks and other financial companies that participate, with a focus on exposures below 30.000. The dataset is available from December 2021 onwards on a quarterly frequency and includes information on collateral and maturity. The latter is thus reported directly and does not require any estimation. Although interest rates are not available, the outstanding amount typically includes the bulk of interest paid over the life of the loan, thus we cannot get the actual capital taken as loan by the debtor. IRFs are not available. However, since we know from other sources that consumer credit in Italy is almost always fixed rate, we assume the IRF equals the maturity.

Loan classification is based on self-explanatory variables available in each dataset. In TAXIA, mortgage loans are explicitly labeled as such and identified as loans for house purchase. In the CTC dataset, consumer credit is identified as loans with a declared purpose, or those labeled as personal loans or income-backed loans. Revolving credit includes credit cards and overdraft-like instruments, distinguished by their structure and repayment flexibility. No additional assumptions are required for classification, as the datasets provide direct identifiers for loan purpose and structure. As a final remark, the TAXIA-CR database managed by Bank of Italy and the CTC cannot be connected in any case as they must be considered two distinct databases with no key in common.

A.6. LT - Lithuania

The Lithuanian Household Credit Register (Namų Ūkių Finansinės Stebėsenos Informacinė Sistema or NŪFSIS) is managed by the Bank of Lithuania (BoL) and provides quarterly data on credit obligations of resident natural persons (debtors) and their collateralization, information on the household composition of the debtor, income received and taxes paid, and additional details on real estate used as collateral. Data are collected at the most granular level, so that person-household-loan-creditor-collateral combinations are observed.

As there are several variables related to the purpose of the loan and the type of instrument in the register, the following assumptions are made to distinguish between credit lines, consumer credit, and housing loans:

- **Credit lines:** we consider a loan to be a credit line if its instrument type is any of the following: 'overdrafts', 'credit card debt', 'revolving credit other than overdrafts and credit card debt' or 'credit lines other than revolving credit'.

- **Consumer credit**: we categorize a loan as consumer credit if the purpose of the loan to the household is 'credit for consumption', 'credit for house purchase' or 'other credit' and its purpose is none of the following: 'investment in first residential property for owner-occupation', 'investment in residential property for rental', 'other investment in residential property', 'purchase of first residential property for owner-occupation', 'purchase of residential property for rental', 'other purchase of residential property' and the credit is issued according to the consumer credit Directive 2008/48/EC.

- **Housing loan**: we consider a loan to be a housing loan if the purpose of the loan to the household is 'Lending for house purchase'; the loan is related to real estate in accordance with the Responsible Lending Regulations (RLR), including cases where the application status of the RLR has not been reported. Also, if the purpose of the loan to the household is either 'Other lending' or not reported; the purpose of the loan is either 'construction investment in first residential real estate for own use', 'construction investment in residential real estate for renting', 'other construction investment in residential real estate', 'purchase of first residential real estate purchase for own use', 'purchase of residential real estate for renting', 'other purchase of residential real estate'; the loan is related to real estate in accordance with Responsible Lending Regulations (RLR) including cases where the application status of RLR was not reported.

Loans that do not fall into any of these groups are categorized as 'other loans' and are therefore excluded from the analysis.

A.7. LV - Latvia

The Latvian Credit Register is a national information system established and managed by Latvijas Banka, in which information is collected regarding credit obligations of individuals and legal persons, the guarantees received and provided, and late payments. The Credit Register data is provided by credit institutions, subsidiaries of credit institutions (leasing companies), other commercial companies, insurers, credit unions, JSC, Development Finance Institution Altum and the Treasury. Information on the Credit Register is available at https://www.bank.lv/en/operational-areas/credit-register. See Latvijas Banka (2024) for an example of the use of this Credit Register in policy analysis for Latvia, in particular focusing on housing lending across Latvia's regions (pp. 29-36) and refinancing costs of housing loans (Box 1, pp.11-12). [20].

A.8. PT - Portugal

Information on the household credit register is available at https://www.bportugal.pt/en/perguntas-frequentes/crc. The Portuguese household credit register includes sole proprietorships. We exclude these borrowers from our analysis, as their loans can be used for both personal and professional use, having different risk profiles.

A.9. SK - Slovakia

The data on loans to households are compiled by the National Bank of Slovakia (NBS) primarily for supervisory purposes and are confidential. The NBS has the mandate to impose the reporting obligation on any entity that provides loans to the retail sector. A loan is understood as a loan provided based on a loan agreement between the client and the bank or a branch of a foreign bank, including a refinancing loan and a renegotiated loan. Only loans provided to individuals (Sector S.143, 144) are reported, excluding loans granted to individuals who are entrepreneurs. All loans that are in the bank's portfolio as of the reporting date are reported, i.e., loans for which the loan agreement has been signed by all contracting parties as of the reporting date, regardless of the actual loan disbursement. Approved loans for which the loan agreement has not been signed by all contracting parties are not reported. The data are reported on an individual basis, that is, the bank does not report retail loans provided by its subsidiary companies (e.g., installment sales and leasing companies).

Definitions of loan types Mortgage loans represent (housing) loans that are secured by residential real estate, flats, or non-residential spaces. These loans are intended to acquire ownership rights to real estate intended for housing. Collateral does not necessarily have to be the subject of purchase (it might be existing land, other

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[20]Latvijas Banka (2024) "Financing of the Economy, 2024", ISSN 2592-9887, https://datnes.latvijasbanka.lv/fpp/FPP_2024_EN.pdf

real estate intended for housing, construction of real estate intended for housing, etc.). Consumer loans are non-collateralized loans with amounts between 100 EUR and 75,000 EUR. These loans are not intended for the acquisition of ownership rights in real estate intended for housing. Revolving loans include consumer loans in the form of credit cards and overdrafts. New loans refer to "pure new loans". Refinancing and renegotiated loans are excluded, as they are granted under very different circumstances compared to "pure new loans".

Data adjustments and assumptions Loan maturities are calculated as a difference (in months) between the date of repayment (the date of full repayment) and the drawn date (the date of the loan withdrawal) minus one month (to take into account the possibility of withdrawing the loan one month before the start of the repayment schedule). Information about the interest rate on the date of granting of revolving loans is not available. Therefore, it is replaced by the interest rate at the reporting date (at the end of June or December, respectively). Loans that were already repaid before the reporting, but for some reason were not excluded from the reports, were excluded from the stock analysis.

B. Literature using the underlying micro-data

The literature on the transmission of monetary policy to household credit markets is extensive, though it typically relies on aggregate or country-specific data.[21] Our study, by contrast, seeks to integrate insights from a diverse set of countries within a harmonized methodological framework, complementing the work of Badarinza et al. (2018) and De Stefani and Mano (2025), who analyze credit-market dynamics using aggregated cross-country microdata.[22] What follows is a selective overview of recent household credit register-based studies from our sample of countries. It highlights the range of questions that household credit registers can address—but it is by no means exhaustive.

Granular data from national credit registries provide valuable insights into the distribution of household debt and lender-borrower interactions. Using data from the **Belgian** household credit registry, Emiris et al. (2025) show that local bank competition and borrower characteristics (credit worthiness, impatience, and switching costs) significantly influence refinancing outcomes. Emiris and Koulischer (2023) use the same dataset to examine the impact of interest rate changes on debt distribution and find that older households with preexisting housing wealth increased their borrowing as interest rates declined.

The **Spanish** Credit Registry has been extensively used for research, particularly concerning non-financial corporations (NFCs).[23] In the household sector, Mayordomo et al. (2024) identify the presence of over-appraisals of mortgage collateral values aimed at reducing bank capital requirements. Bover et al. (2022) compare the Spanish Survey of Household Finances with the Spanish Credit Registry, finding no significant differences in the levels of debt calculated from both datasets. Furthermore, this data set is frequently used in policy reports, for instance, to discuss the transmission of monetary policy to interest payments on bank debt for households and firms.

Using data from the **Hungarian** credit registry, Verner and Gyöngyösi (2020) show the detrimental effects of the revaluation of foreign currency-denominated mortgages (following the depreciation of the local currency in the wake of the 2008-9 financial crisis) on economic activity. They use geographic variation in the prevalence of foreign currency-denominated mortgages to show that the revaluation has led to a worse local recession, driven by a decline in local demand, and negative spillover effects on nearby borrowers without foreign currency debt. Briglevics et al. (2024) use data from the Hungarian credit registry to show that the introduction of positive information into the credit registry (as opposed to the earlier practice of reporting only delinquencies) has led to an overall increase in credit access measured by both the probability of loan application acceptance and the credit amount. While credit access increased, default rates decreased after the introduction of more information in the credit registry.

Dirma and Karmelavičius (2023) extensively use household-level credit data in **Lithuania** to assess the adequacy of Borrower-Based Measures (BBMs). They build a novel lifetime expected credit loss framework that is founded on actual loan-level default and household income data. They show that the BBM package effectively contains mortgage credit risk and that housing loans are more resilient to stress than in the pre-regulatory era in Lithuania.

Using **Portuguese** Credit Register data, Farinha and Lacerda (2010) explores household indebtedness profiles, revealing significant differences in delinquency across credit products. Farinha and Costa (2011) further as-

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[21]For instance, see Benetton et al. (2025), Beraja et al. (2018), Berger et al. (2021), Bosshardt et al. (2024), Drechsler et al. (2022), Emiris and Koulischer (2023), Flodén et al. (2020), Indarte (2023), Liebersohn and Rothstein (2025).

[22]When it comes to corporate credit, an expanding literature exploits contract-level data across countries—much of it enabled by AnaCredit in the euro area (see e.g. Vilerts et al., 2025, and references therein).

[23]For instance, Jiménez et al. (2012) and Jiménez et al. (2014) investigate the unique role of bank lending to firms in the transmission of monetary policy to the real economy. Furthermore, various aspects of NFC access to credit have been examined, such as the effects of housing booms (Martín et al., 2021) or the impact of unconventional monetary policies of the European Central Bank (Arce et al., 2020).

sess the role of foreign banks in housing loans and their impact on deleveraging during financial instability. Oliveira and Queiro (2022) analyze macroprudential policies on mortgage contracts using an overlapping generations model, showing that while LTV caps reduce mortgage debt and defaults, they also lower household welfare, particularly for low-income and low-wealth households. Bonfim and Zhao (2024) document a climate risk premium on mortgages exposed to wildfire risk and find that tighter monetary policy reduces this premium. Their results suggest that climate risk is managed primarily through pricing rather than quantities, with reduced risk sensitivity in more profitable environments.

Granular household credit register data of **Slovakia**, originally compiled for supervisory purposes, is increasingly utilized in macroprudential analyses and enhances macro stress testing. Micro-level data on individual retail loans improves estimates of nonperforming loans, particularly during periods of economic stress, such as the COVID-19 pandemic (Klacso, 2024). Moreover, detailed retail credit data facilitate a more precise cost-benefit analysis of borrower-based measures (Cesnak et al., 2021) as well as analyzing how the presence and role of financial advisors shape the impact of macroprudential policies on loan characteristics (Cesnak et al., 2025).

C. Summary Statistics by Product and Country

This appendix provides descriptive evidence on the structure of the granular loan-level data used in the analysis. The tables document key characteristics of newly originated household loans across nine European countries, distinguishing between two different loan product types: *mortgages* and *consumer credit*. All statistics are derived from narrowly defined bins constructed over combinations of country, time, lender, borrower characteristics (including age), and loan features such as collateral and maturity.

Table C.1   The first table in this appendix presents the distribution of the number of new loan contracts per bin, reported separately by loan type. Each panel of the table corresponds to a distinct loan product category. For each country and product type, the table reports the total number of observations (i.e., bins with at least five contracts), along with the mean and selected percentiles of the within-bin number of new loan contracts. This serves as a measure of the representativeness and density of the underlying microdata across different country-product combinations.

Tables C.2 and C.3   The subsequent tables offer a more detailed breakdown of within-bin summary statistics for each of the two loan product types, separately. Each table focuses on a single product: mortgages (C.2) or consumer credit (C.3). These tables present statistics across six dimensions:

- Panel A reports the average loan amount per bin;

- Panel B shows the standard deviation of loan amounts;

- Panel C provides the coefficient of variation for loan amounts, offering a scale-free
  measure of dispersion;

- Panel D presents the average interest rate within each bin;

- Panel E gives the standard deviation of interest rates;

- Panel F reports the coefficient of variation for interest rates.

All monetary values are expressed in euros, while interest rates are shown in percentage terms. For each panel, the number of bins, as well as measures of central tendency and dispersion (mean and percentiles), are reported at the country level. The breakdown by product type and by panel enables comparisons in loan size and pricing heterogeneity across products and countries.

Table C.1: Number of observations: by product and country

Panel A: Number of Observations - Mortgages

	count	mean	p5	p10	p25	p50	p75	p90	p95
BE	126	4432	9	22	208	1416	6078	11835	19387
ES	508	2360	9	12	55	379	1193	6837	12288
HU	392	431	6	11	30	177	638	1245	1541
IE	249	430	10	16	44	137	498	1181	1947
IT	726	1084	6	8	16	80	360	1793	5386
LT	94	534	12	14	36	89	474	1926	3824
LV	174	149	5	6	11	46	114	470	792
PT	423	799	9	11	30	89	471	2002	4498
SK	308	779	6	9	15	58	458	1688	2871

Panel B: Number of Observations - Consumer Credit

	count	mean	p5	p10	p25	p50	p75	p90	p95
BE	235	7265	65	163	1092	3736	10351	20383	24136
ES	906	18158	9	15	78	786	15665	72918	95554
HU	844	2177	8	12	32	368	1190	7441	13739
IE	398	5764	19	32	144	1179	8608	19094	29123
IT	643	21164	20	33	120	4930	25340	64450	101314
LT	606	1717	11	14	29	146	2354	5207	7155
LV	626	1138	6	10	34	506	1615	2998	3659
PT	1209	2076	8	12	39	239	1025	6207	11505
SK	261	4018	7	11	268	1811	4943	9166	23967

D.   Aggregate Household Credit Developments

This appendix presents graphical evidence on the evolution of household credit across nine European countries during the period 2022–2024. The figures offer a visual summary of key features of new loan origination, disaggregated by product type and country.

Figures D.1–D.9   These figures display developments in new mortgage and consumer loan contracts for each country separately. For each country, four panels are shown:

- The top-left panel reports the time series of the weighted average amount and
  interest rate for newly originated mortgage loans.

- The top-right panel presents the same two variables for new consumer credit.

- The bottom-left panel shows the total volume (in million euros) and the number
  of new mortgage contracts over time.

- The bottom-right panel provides the corresponding totals for consumer credit.

Each panel covers semiannual periods from the first half of 2022 through the first half of 2024 (with data for the second half of 2024 included where available). This layout facilitates both cross-country and within-country comparisons of household borrowing trends over time.

All figures are based on aggregated data computed from highly disaggregated bins defined by time, country, loan type, creditor, borrower age, initial maturity, and interest rate fixation period. The plotted statistics correspond to either weighted averages or totals, as noted in the figure labels and axis annotations.

The sequence of figures is: Belgium (D.1), Spain (D.2), Hungary (D.3), Ireland (D.4), Italy (D.5), Lithuania (D.6), Latvia (D.7), Portugal (D.8), and Slovakia (D.9).

Table C.2: Mortgages: summary statistics by country

	count	mean	p5	p10	p25	p50	p75	p90	p95
Panel A: Average amount									
BE	126	172429	117087	118302	133845	169069	194047	252048	262869
ES	508	114114	46313	54595	76244	115689	151880	167623	179748
HU	392	34769	8628	10351	14304	32533	47228	62026	70693
IE	249	186817	80303	98080	137896	185998	236787	283527	300847
IT	726	156183	109180	116180	128434	145514	169116	210469	251524
LT	94	73369	30149	31932	47577	74693	100177	116318	118986
LV	174	75483	31163	35110	44778	69738	99366	127048	141133
PT	423	74913	33388	40045	58005	77283	91988	103543	108806
SK	308	71200	30409	34275	43986	67695	94854	113339	121812
Panel B: SD Amount									
BE	126	132409	83153	93462	109801	127258	159803	176381	191351
ES	508	79938	36693	43803	59026	81397	98603	113027	121141
HU	392	22931	5988	7067	10012	22004	31252	41953	49639
IE	249	120525	50881	59949	82337	116698	150622	183376	200583
IT	726	93772	40127	47408	63311	84714	113281	150039	182191
LT	94	49580	15183	25810	33957	48429	61189	76040	82343
LV	174	42369	13839	15875	27668	41614	56400	68307	75779
PT	423	53853	28929	36842	46727	53795	61068	69032	73728
SK	308	49869	18745	22788	36733	48470	62241	74958	84213
Panel C: Coefficient of variation - Amount									
BE	126	0.78	0.52	0.56	0.65	0.76	0.93	1.05	1.10
ES	508	0.80	0.37	0.42	0.54	0.67	0.89	1.53	1.82
HU	392	0.69	0.35	0.43	0.53	0.67	0.80	0.98	1.13
IE	249	0.68	0.40	0.44	0.52	0.63	0.77	0.95	1.12
IT	726	0.59	0.33	0.37	0.45	0.58	0.69	0.82	0.93
LT	94	0.70	0.48	0.50	0.55	0.68	0.78	0.92	1.09
LV	174	0.58	0.31	0.37	0.45	0.57	0.69	0.82	0.89
PT	423	0.76	0.51	0.53	0.61	0.72	0.87	1.05	1.25
SK	308	0.73	0.41	0.46	0.57	0.71	0.85	1.02	1.13
Panel D: Average interest rate									
BE	99	3.43	1.67	1.83	2.89	3.46	3.90	4.69	5.56
ES	508	3.11	1.41	1.63	2.50	3.15	3.79	4.35	4.75
HU	392	7.65	4.66	5.11	6.10	7.13	8.37	10.87	13.49
IE	249	3.64	2.42	2.50	2.89	3.81	4.22	4.44	4.53
IT	726	3.93	1.74	2.06	3.02	4.20	4.84	5.43	5.66
LT	94	4.78	2.38	2.67	3.73	5.41	5.88	6.23	6.53
LV	173	4.74	2.02	2.52	3.97	5.11	5.70	5.94	6.19
PT	423	3.47	1.13	2.13	3.08	3.73	4.12	4.41	4.59
SK	308	3.64	1.29	1.44	2.95	4.07	4.59	4.91	5.10
Panel E: SD interest rate									
BE	99	1.43	0.51	0.55	0.62	1.09	1.78	2.37	3.10
ES	508	0.97	0.40	0.51	0.74	0.96	1.21	1.38	1.54
HU	392	1.46	0.42	0.51	0.74	1.31	2.05	2.57	3.04
IE	249	0.61	0.29	0.33	0.43	0.53	0.71	1.00	1.23
IT	726	0.94	0.52	0.61	0.74	0.91	1.11	1.33	1.46
LT	94	1.08	0.57	0.66	0.80	0.98	1.28	1.53	1.81
LV	172	0.58	0.23	0.30	0.44	0.56	0.70	0.90	0.95
PT	423	0.84	0.26	0.29	0.46	0.73	1.07	1.68	1.85
SK	308	0.68	0.27	0.31	0.44	0.60	0.81	1.21	1.44
Panel F: Coefficient of variation - Interest rate									
BE	99	0.41	0.15	0.16	0.22	0.35	0.53	0.73	0.87
ES	508	0.34	0.12	0.17	0.24	0.31	0.42	0.55	0.62
HU	392	0.21	0.06	0.07	0.09	0.17	0.28	0.41	0.49
IE	249	0.17	0.09	0.10	0.12	0.15	0.20	0.26	0.31
IT	726	0.26	0.13	0.14	0.19	0.24	0.34	0.40	0.44
LT	94	0.25	0.10	0.12	0.15	0.23	0.35	0.41	0.48
LV	172	0.14	0.04	0.06	0.08	0.12	0.17	0.25	0.27
PT	423	0.27	0.07	0.08	0.13	0.22	0.38	0.53	0.63
SK	308	0.23	0.06	0.07	0.11	0.18	0.29	0.42	0.61

Table C.3: Consumer Credit: summary statistics by country

	count	mean	p5	p10	p25	p50	p75	p90	p95
Panel A: Average amount									
BE	235	23709	1484	2047	4715	19554	26277	62820	76832
ES	906	19883	742	1407	7113	16534	24142	36143	55428
HU	844	8290	404	626	1013	3827	10904	25963	27492
IE	398	21264	2307	4449	10681	21236	25859	29205	42278
IT	643	17015	724	1020	3626	11416	26032	40313	50128
LT	606	9035	602	755	1377	7241	15485	21073	22109
LV	626	4849	489	564	970	3802	6837	10083	14220
PT	1209	15358	1991	2545	6933	12449	16065	29061	45423
SK	261	8975	754	816	1234	5436	17380	21282	22380
Panel B: SD Amount									
BE	235	14908	2329	3740	6013	14336	22299	29089	32746
ES	906	15796	917	2201	6604	10563	19506	38400	49513
HU	844	3818	216	315	616	2465	5495	10295	11764
IE	398	14488	3144	3844	6413	12173	14609	20074	55612
IT	643	10229	602	1276	3359	9458	15800	21029	22449
LT	606	5185	867	1038	1576	4796	8069	9862	10673
LV	626	2883	402	464	1015	2788	4509	5757	6322
PT	1209	13809	1647	2387	5729	8216	14817	34035	48847
SK	261	6081	862	998	1408	5959	9858	11475	13122
Panel C: Coefficient of variation - Amount									
BE	235	1.12	0.29	0.37	0.55	0.83	1.35	2.36	2.81
ES	906	1.07	0.35	0.39	0.56	0.83	1.29	1.90	2.69
HU	844	0.66	0.10	0.24	0.44	0.65	0.84	1.09	1.27
IE	398	0.75	0.41	0.46	0.53	0.62	0.81	1.09	1.38
IT	643	0.86	0.39	0.44	0.57	0.71	0.92	1.29	1.45
LT	606	0.84	0.39	0.43	0.50	0.73	1.03	1.34	1.85
LV	626	0.82	0.33	0.43	0.62	0.82	1.01	1.22	1.35
PT	1209	0.99	0.42	0.47	0.60	0.84	1.04	1.43	1.91
SK	261	0.96	0.47	0.49	0.63	0.92	1.25	1.46	1.56
Panel D: Average interest rate									
BE					Not recorded				
ES	884	7.32	2.53	3.60	5.51	7.80	8.93	10.06	10.95
HU	843	17.22	8.02	8.78	12.16	15.94	22.29	25.60	28.97
IE	398	7.52	4.97	5.55	6.51	7.78	8.52	8.97	9.30
IT					Not recorded				
LT	543	13.51	3.24	4.38	6.68	10.21	17.61	25.83	37.72
LV	625	20.11	1.44	4.89	13.40	20.40	26.66	34.80	40.77
PT	1209	6.77	1.56	3.30	5.33	7.33	8.48	9.42	9.98
SK	261	10.66	3.26	3.92	6.41	10.45	14.49	17.03	19.40
Panel E: SD interest rate									
BE					Not recorded				
ES	883	2.85	0.52	0.94	1.60	2.83	3.90	4.96	5.77
HU	839	4.15	0.57	0.86	1.68	3.59	6.03	8.61	10.09
IE	398	2.60	1.43	1.69	1.98	2.41	3.01	3.78	4.43
IT					Not recorded				
LT	537	6.25	0.60	0.75	1.43	3.21	8.94	18.08	22.93
LV	625	8.05	0.26	0.43	3.02	7.48	11.94	16.45	17.63
PT	1209	2.39	0.94	1.32	1.68	2.12	3.08	4.04	4.40
SK	261	5.53	0.36	0.58	0.97	3.95	8.67	13.32	15.75
Panel F: Coefficient of variation - Interest rate									
BE					Not recorded				
ES	883	0.46	0.07	0.15	0.25	0.38	0.48	0.87	1.35
HU	839	0.23	0.06	0.08	0.13	0.21	0.30	0.40	0.48
IE	398	0.37	0.18	0.20	0.24	0.31	0.47	0.57	0.66
IT					Not recorded				
LT	537	0.39	0.10	0.12	0.19	0.39	0.53	0.68	0.78
LV	625	0.40	0.05	0.10	0.23	0.35	0.55	0.71	0.90
PT	1208	0.55	0.14	0.17	0.21	0.30	0.51	1.03	2.00
SK	261	0.45	0.07	0.10	0.19	0.38	0.65	0.88	0.96

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Figure D.1: Household credit in Belgium during 2022-2024

Figure D.2: Household credit in Spain during 2022-2024
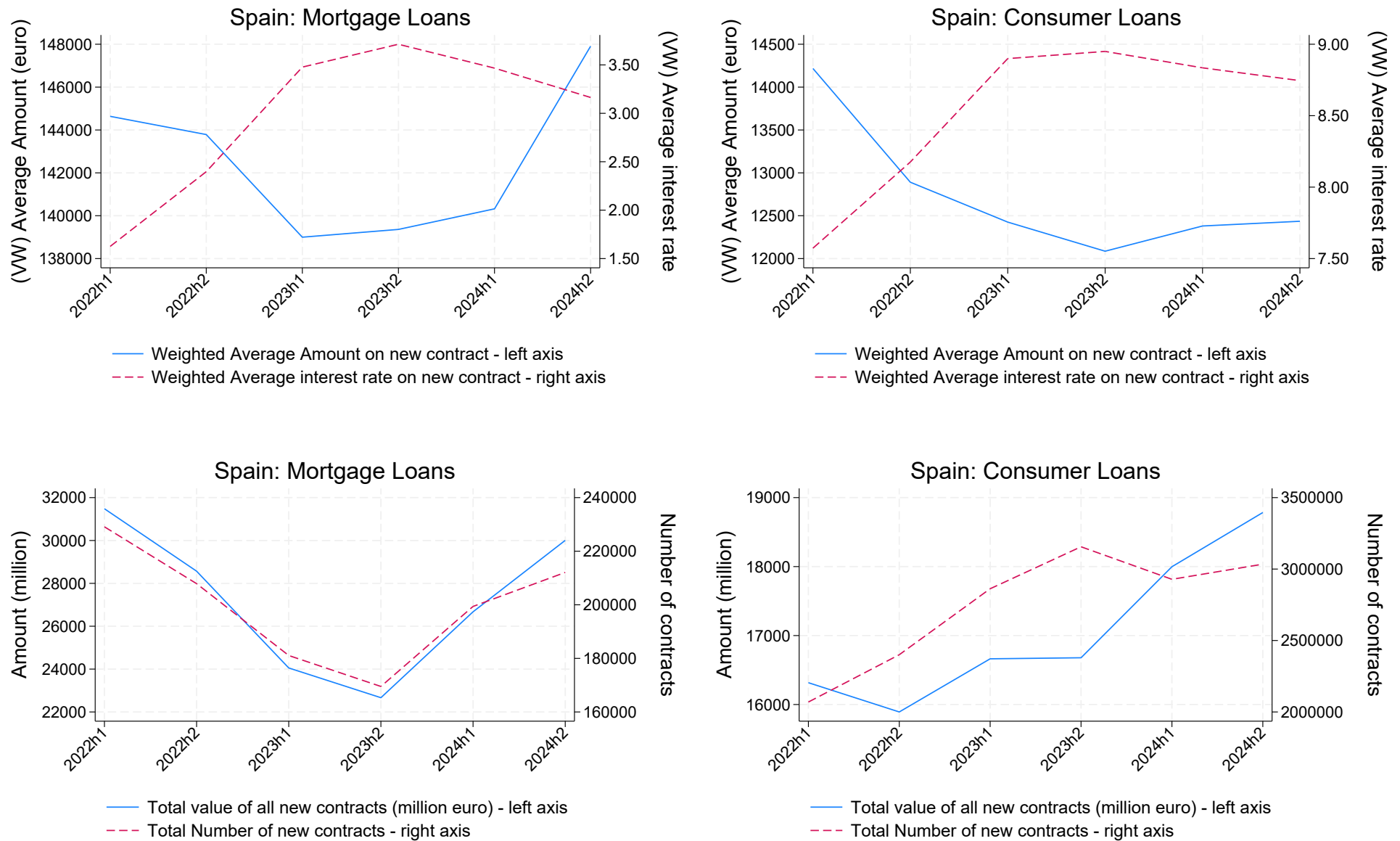
Figure D.3: Household credit in Hungary during 2022-2024
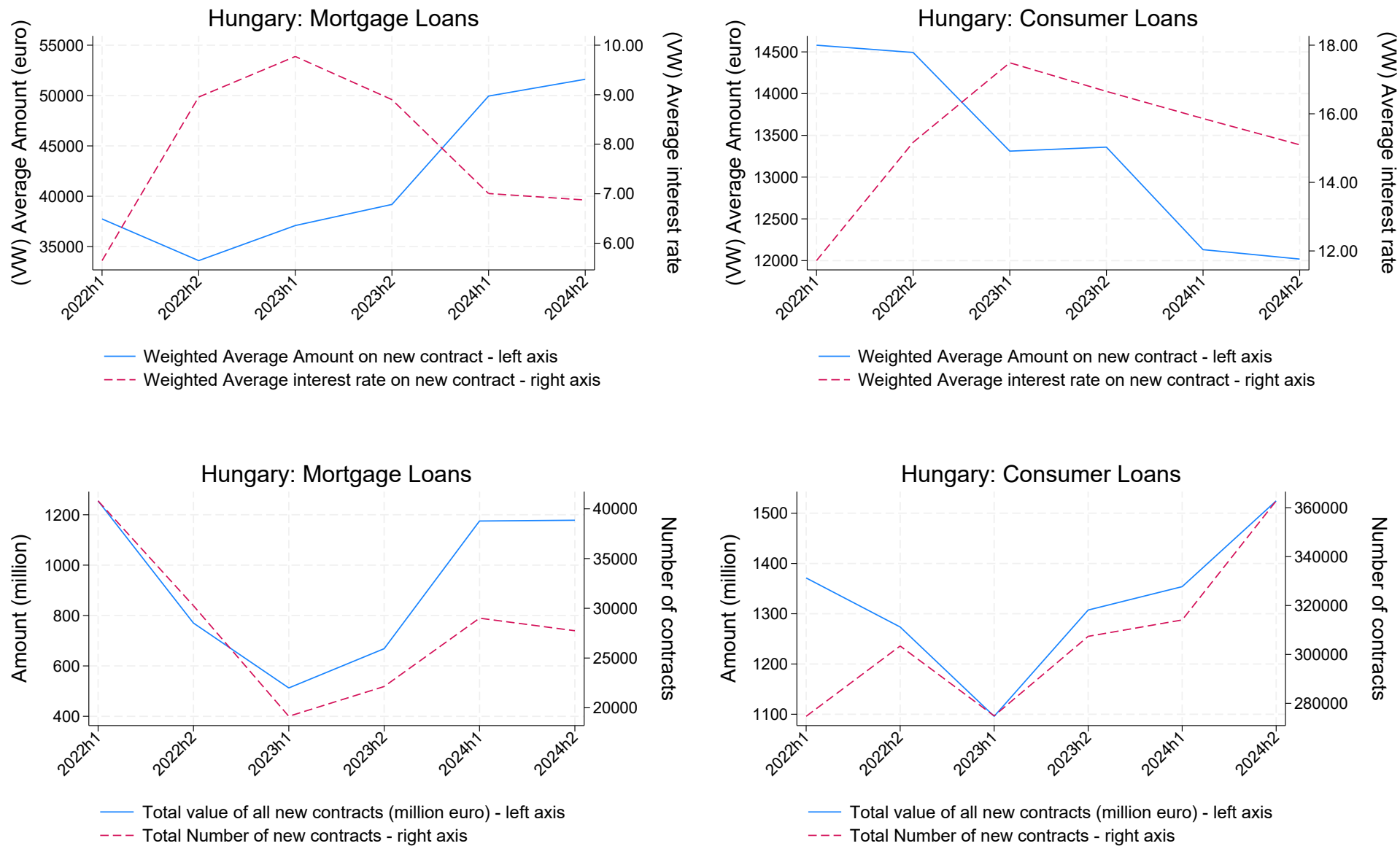
Figure D.4: Household credit in Ireland during 2022-2024

Ireland: Mortgage Loans

Ireland: Consumer Loans

Ireland: Mortgage Loans

Ireland: Consumer Loans

Figure D.5: Household credit in Italy during 2022-2024
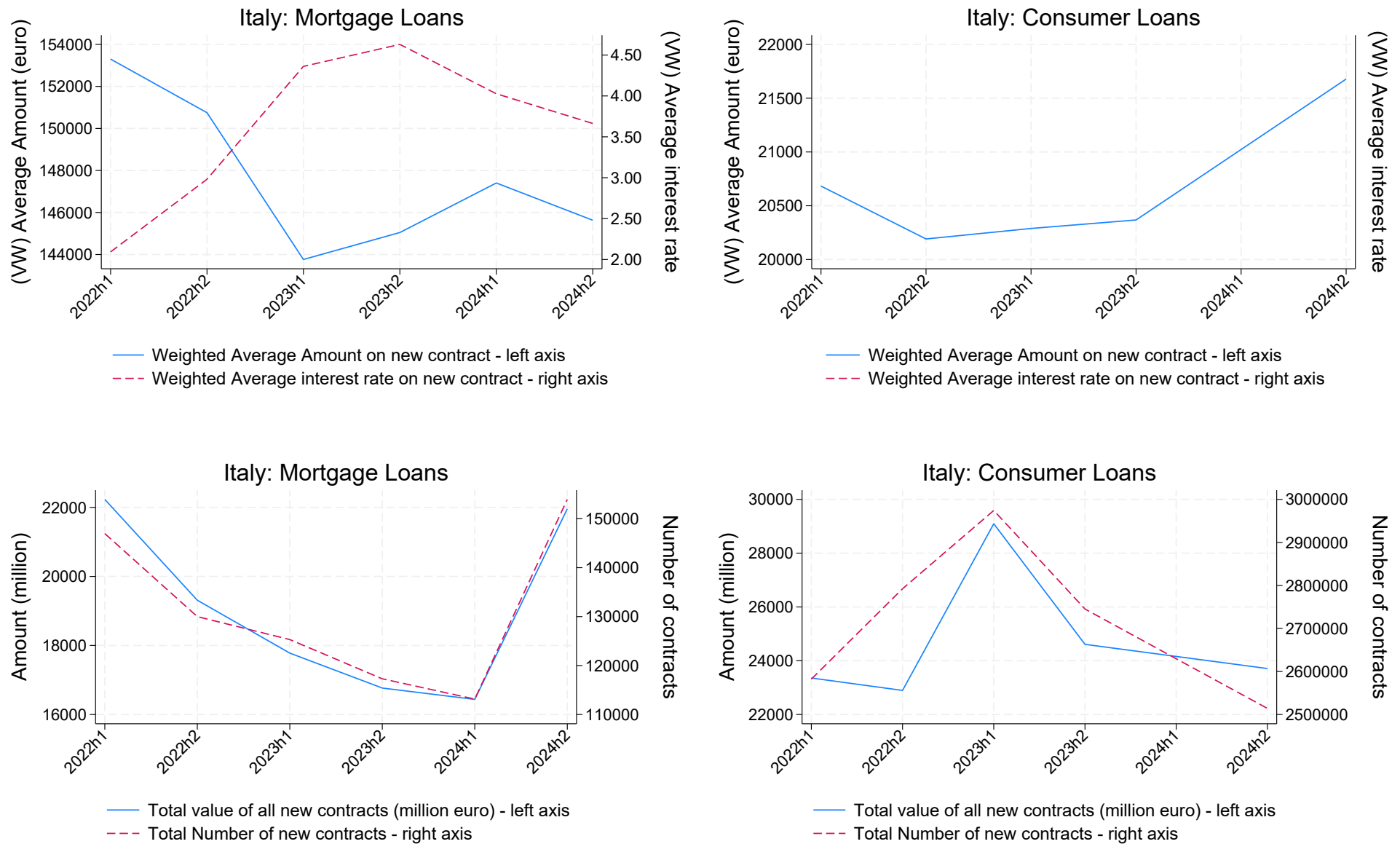
Figure D.6: Household credit in Lithuania during 2022-2024

Figure D.7: Household credit in Latvia during 2022-2024

Figure D.8: Household credit in Portugal during 2022-2024

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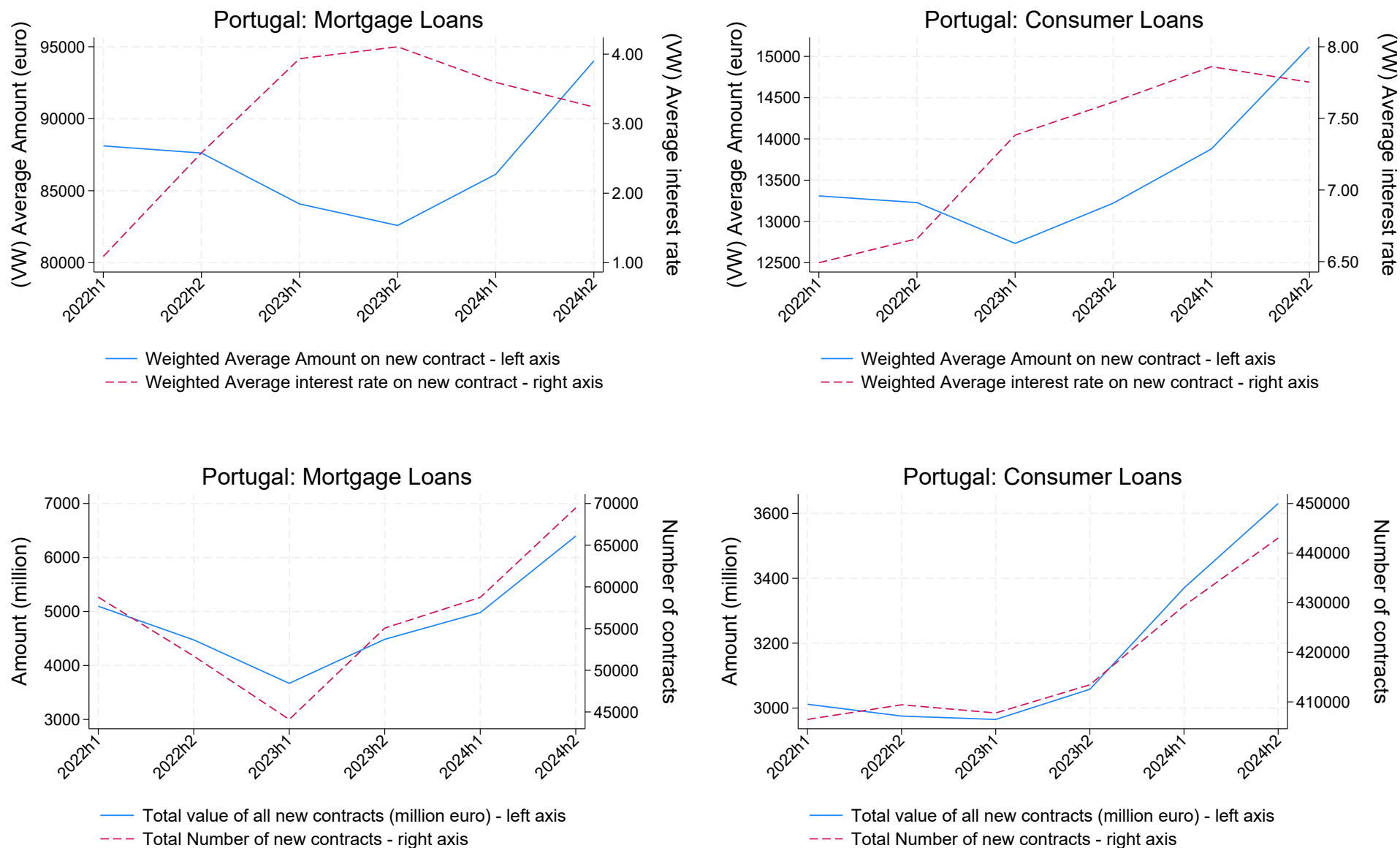
E. Household credit: Split by initial maturity

Figures E.1–E.9 This set of figures displays the evolution of household loan characteristics, disaggregated by the initial maturity of the loan. Each figure corresponds to a specific country and covers the semiannual periods from 2022:H1 through 2024:H2.

For each country, the figure is structured into four panels:

- The top-left panel shows the average interest rate on newly originated **mortgage loans**, split by maturity group.

- The top-right panel presents the same statistic for new **consumer loans**.

- The bottom-left panel reports the average amount of new **mortgage loans**, again disaggregated by maturity group.

- The bottom-right panel shows the average amount of new **consumer loans** by maturity.

The maturity groups are defined as follows:

- For mortgage loans: *Short* ($\leq$10 years), *Medium* (10–20 years), *Long* (20–30 years), and *Very Long* (>30 years);

- For consumer loans: *Short* ($\leq$12 months), *Medium* (1–3 years), *Long* (3–10 years), and *Very Long* (>10 years).

The figures provide a dynamic view of how the pricing (interest rates) and scale (loan amounts) of new household borrowing vary over time and across maturity segments. This breakdown allows for the inspection of potential shifts in the distribution of new lending, as well as the differential response of short- and long-term credit to changes in economic or financial conditions.

Countries included in this series are: Belgium (E.1), Spain (E.2), Hungary (E.3), Ireland (E.4), Italy (E.5), Lithuania (E.6), Latvia (E.7), Portugal (E.8), and Slovakia (E.9).
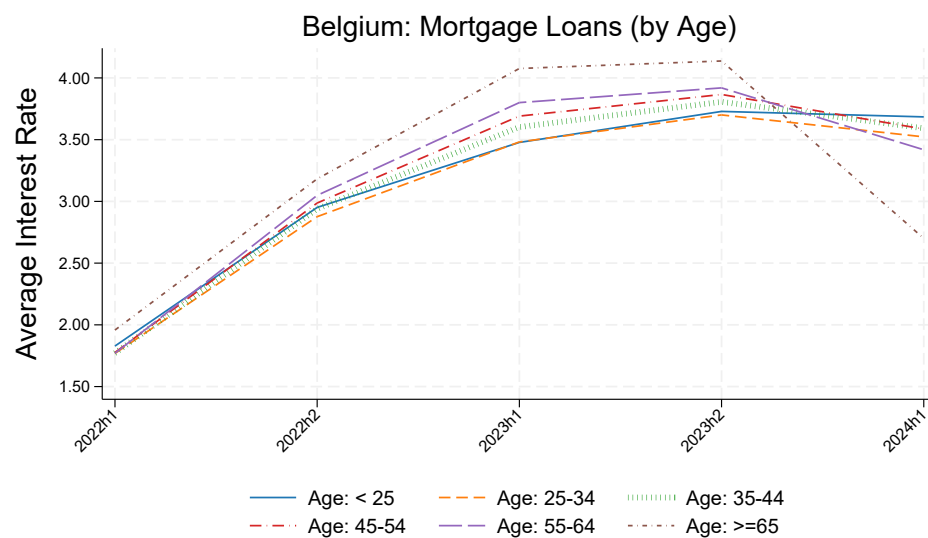
Figure E.1: Maturity breakdown: Belgium

Belgium: Mortgage Loans (by Maturity)

Belgium: Consumer Loans (by Maturity)

Short (<=10 years) — Medium (10-20 yrs) — Long (20-30 yrs) — Very Long (>30yrs)

Short (<= 12 months) — Medium (1-3 yrs) — Long (3-10 yrs) — Very Long (>10yrs)

Belgium: Mortgage Loans (by Maturity)

Belgium: Consumer Loans (by Maturity)

Short (<=10 years) — Medium (10-20 yrs) — Long (20-30 yrs) — Very Long (>30yrs)

Short (<= 12 months) — Medium (1-3 yrs) — Long (3-10 yrs) — Very Long (>10yrs)

Figure E.2: Maturity breakdown: Spain
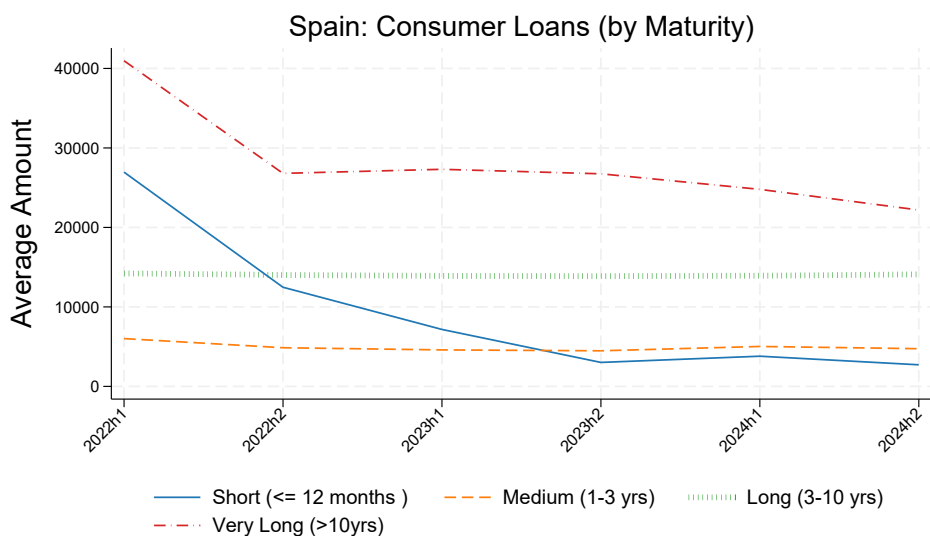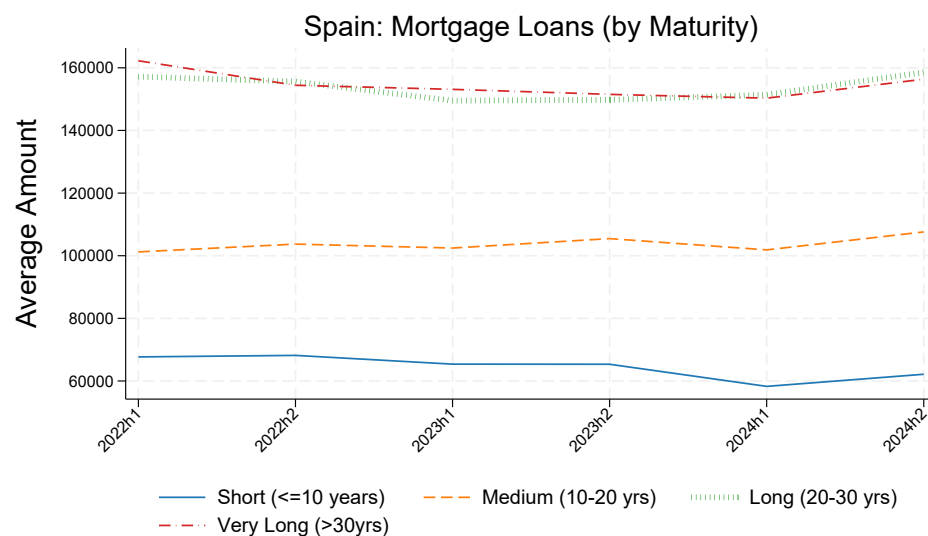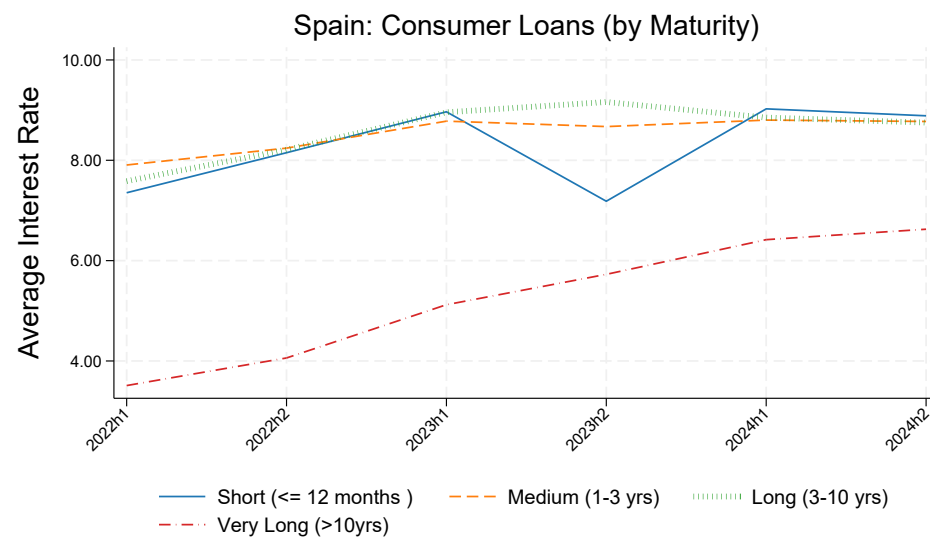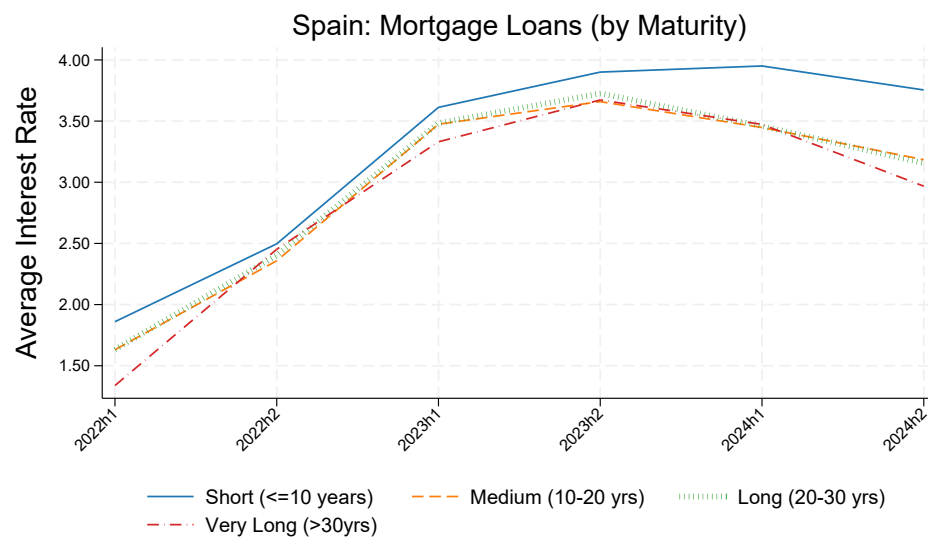
Figure E.3: Maturity breakdown: Hungary

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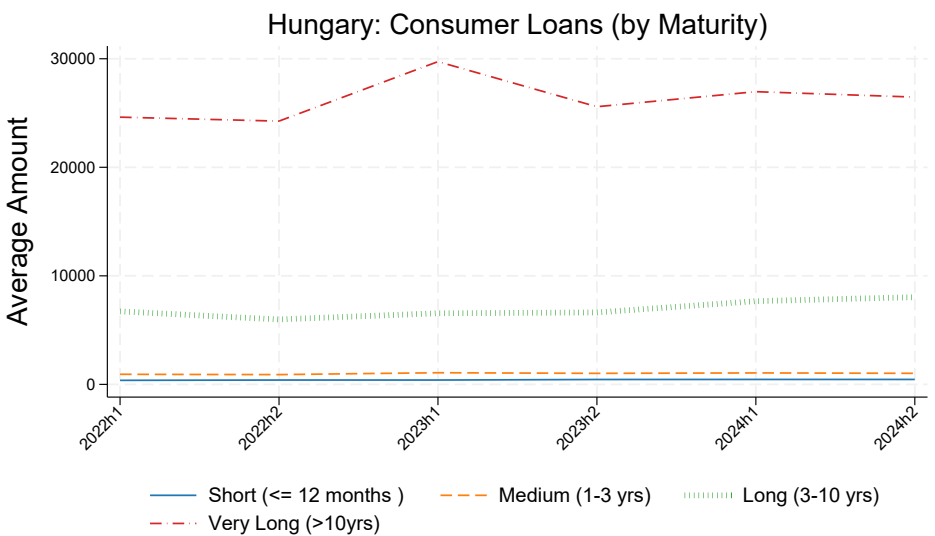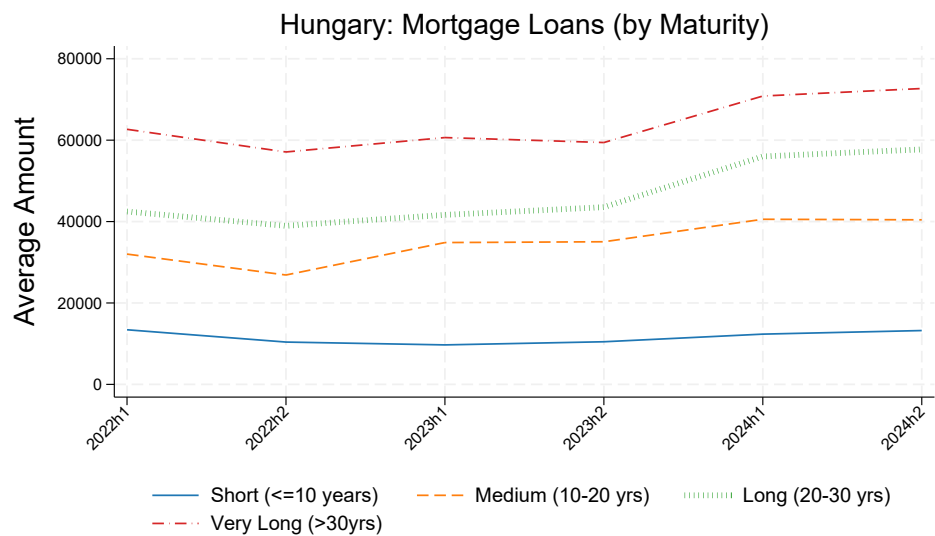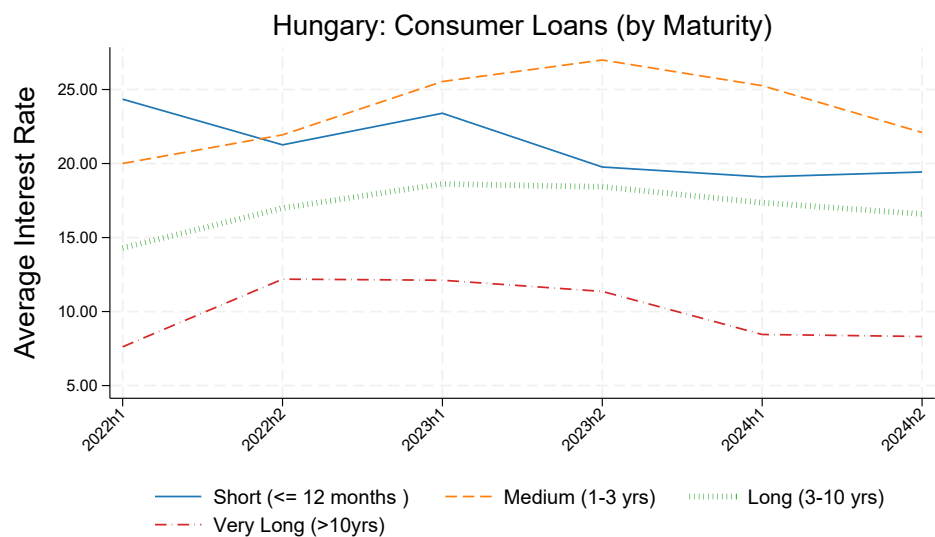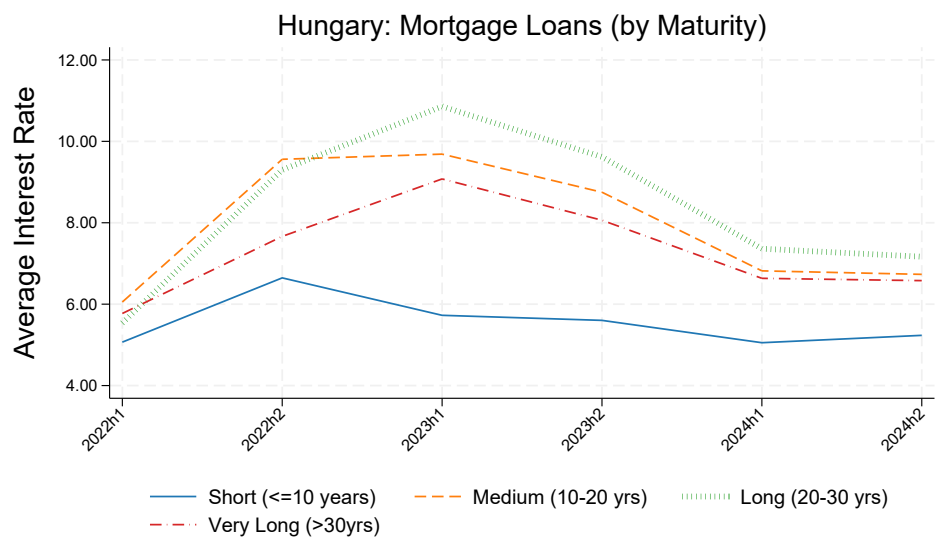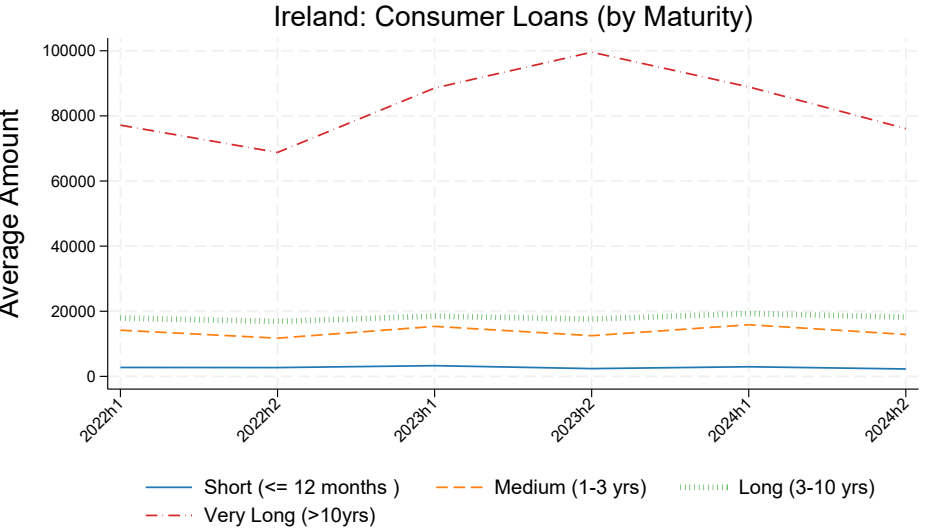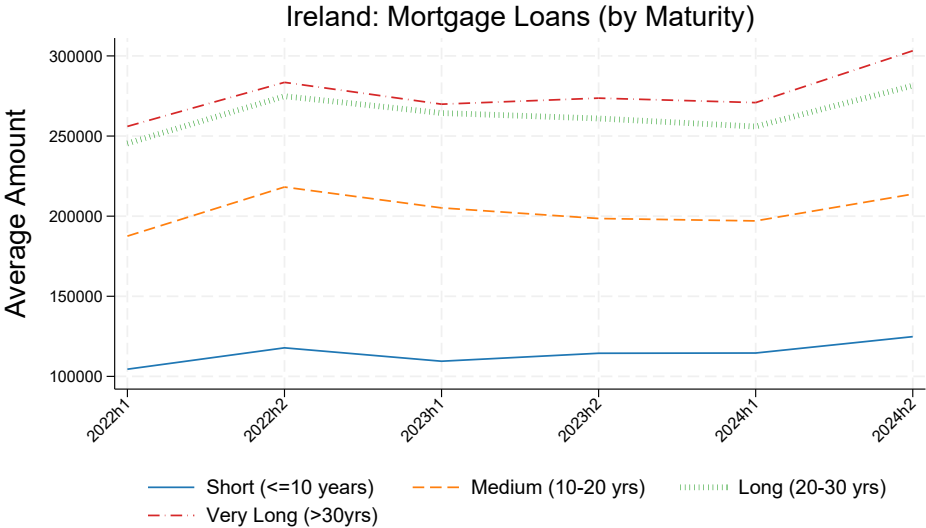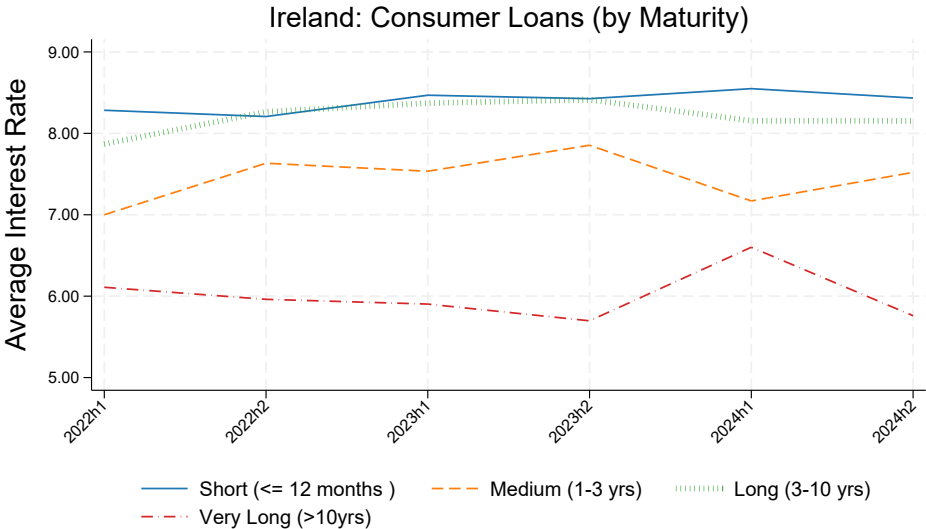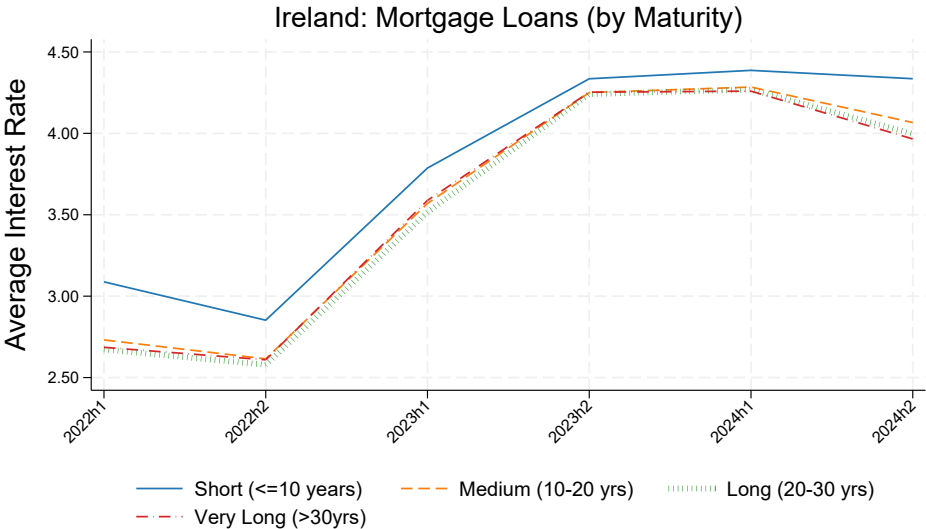
Figure E.5: Maturity breakdown: Italy
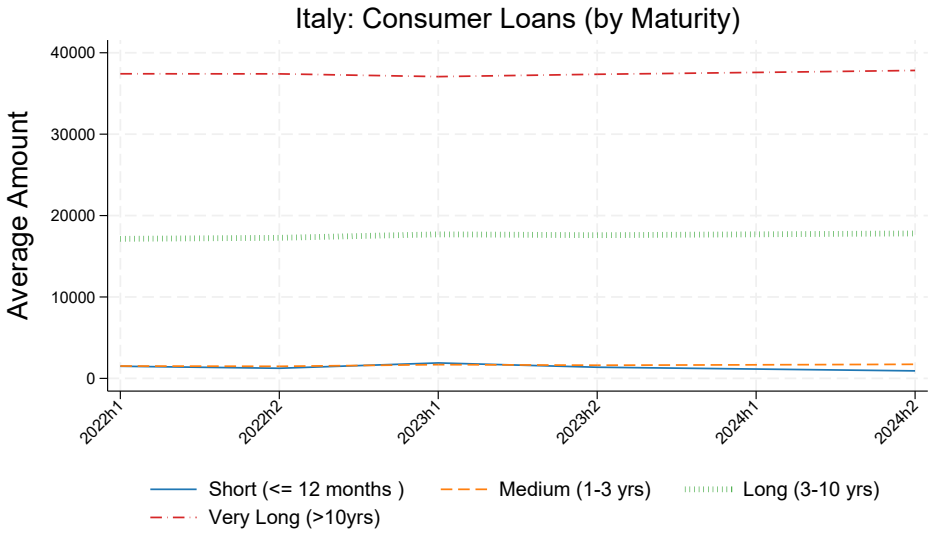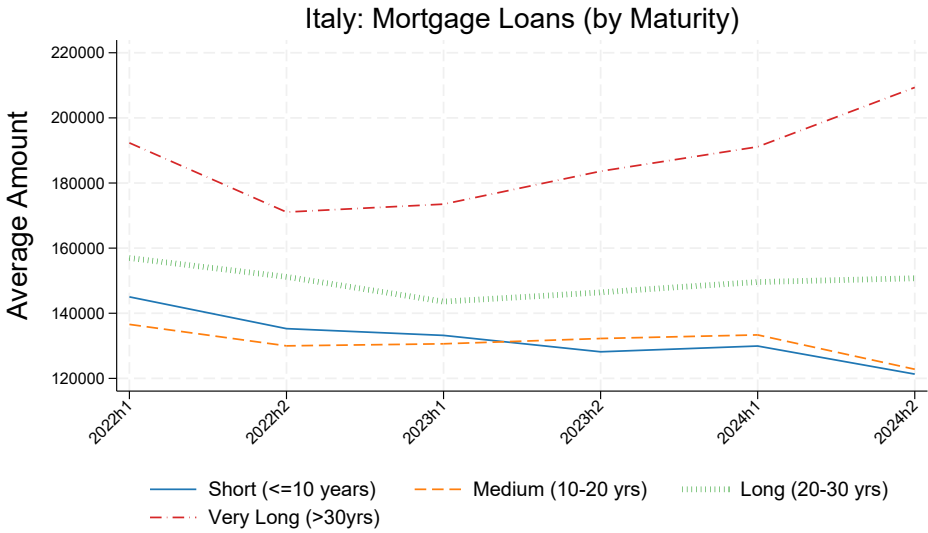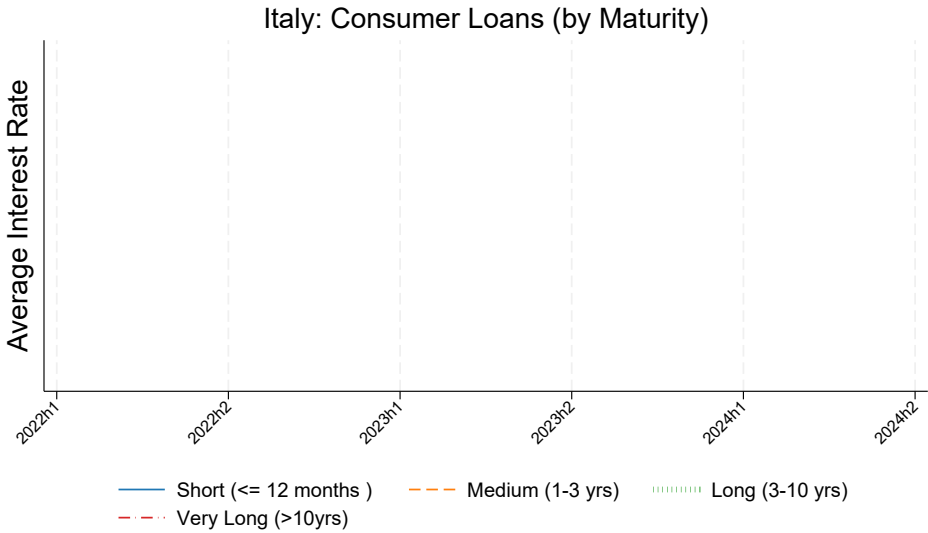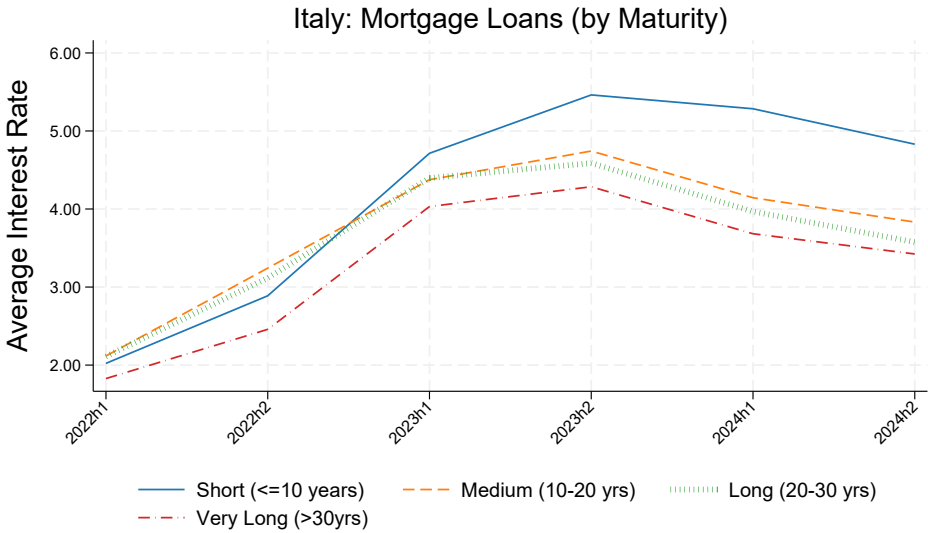
Figure E.6: Maturity breakdown: Lithuania
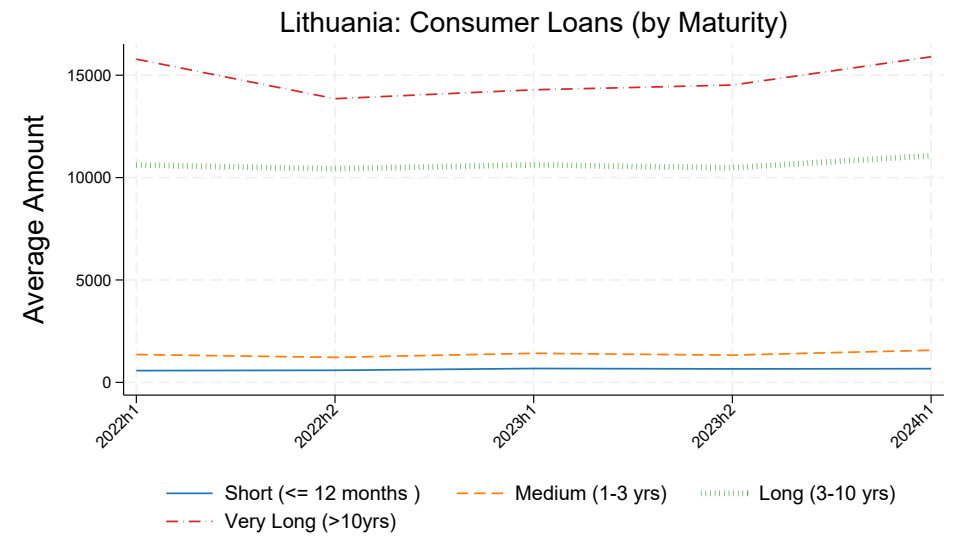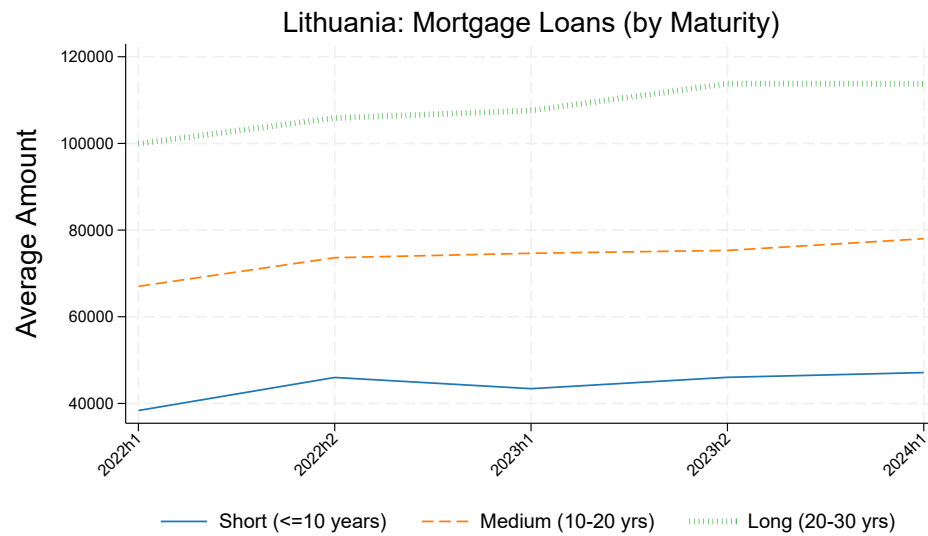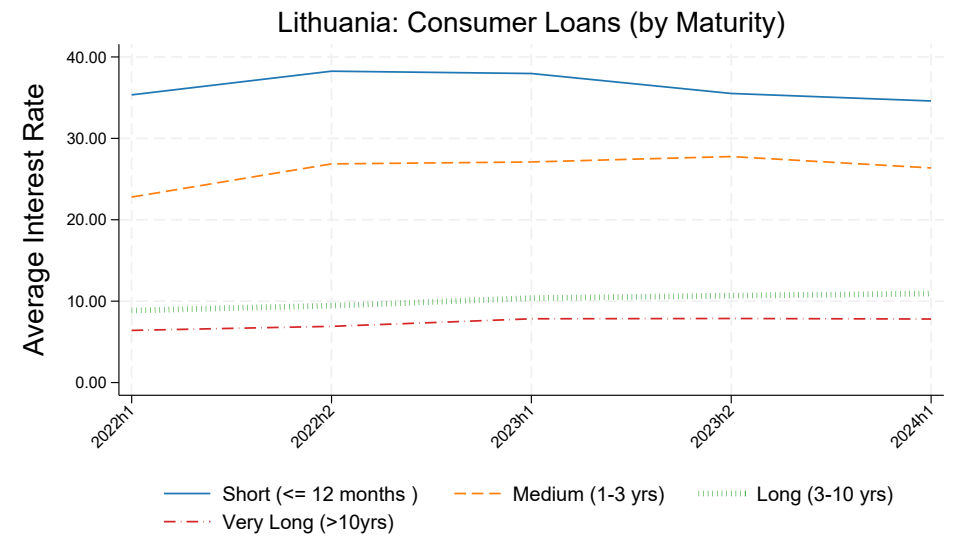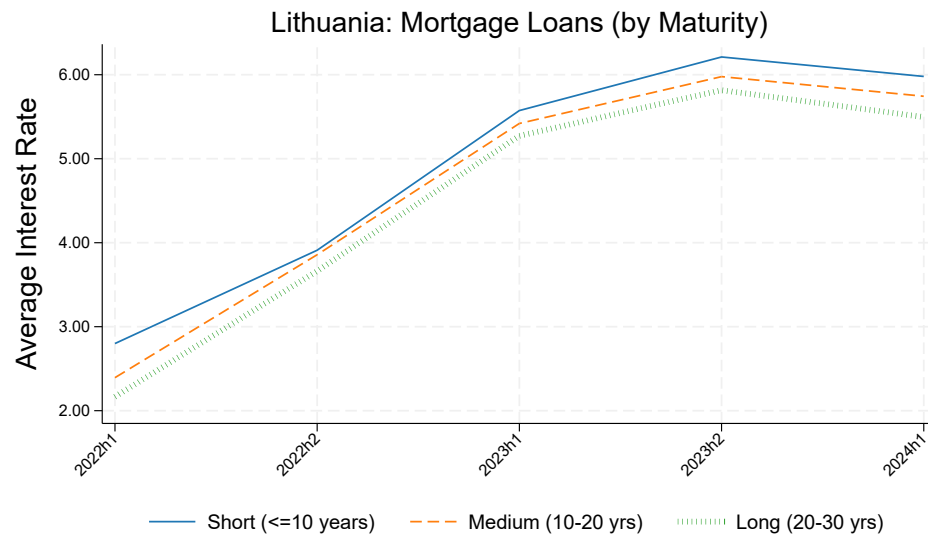
Figure E.7: Maturity breakdown: Latvia
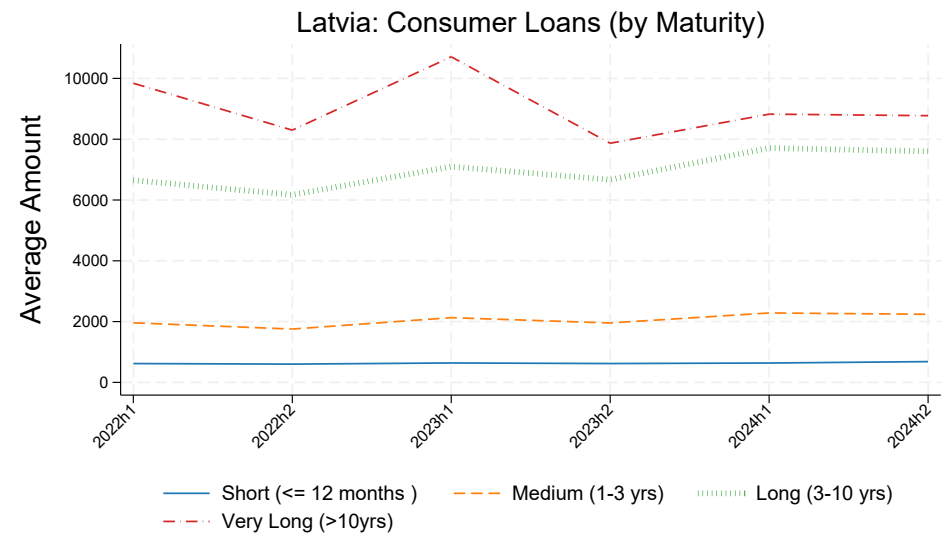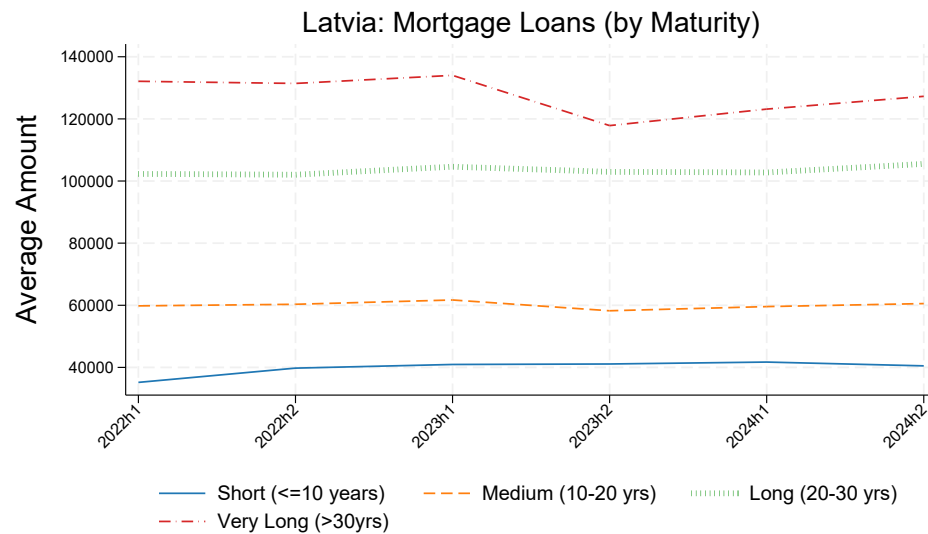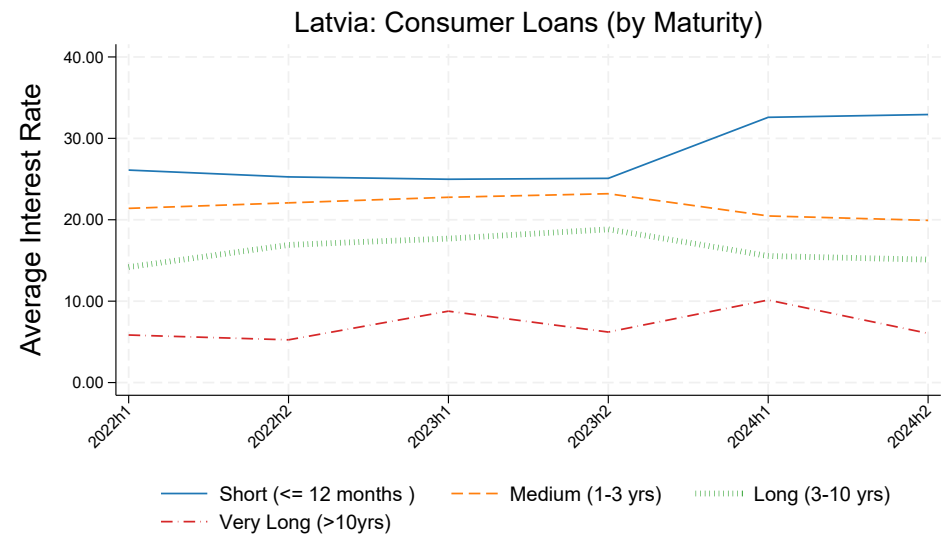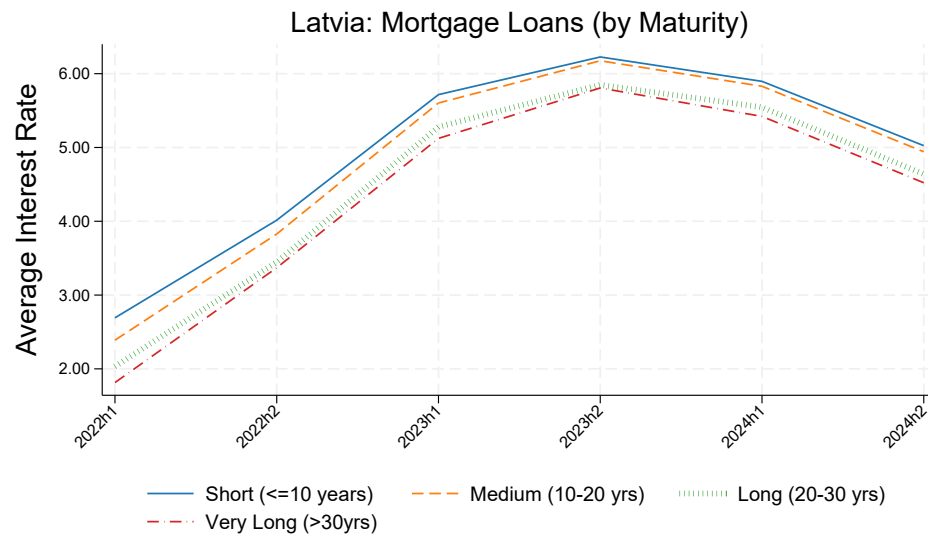
Figure E.8: Maturity breakdown: Portugal
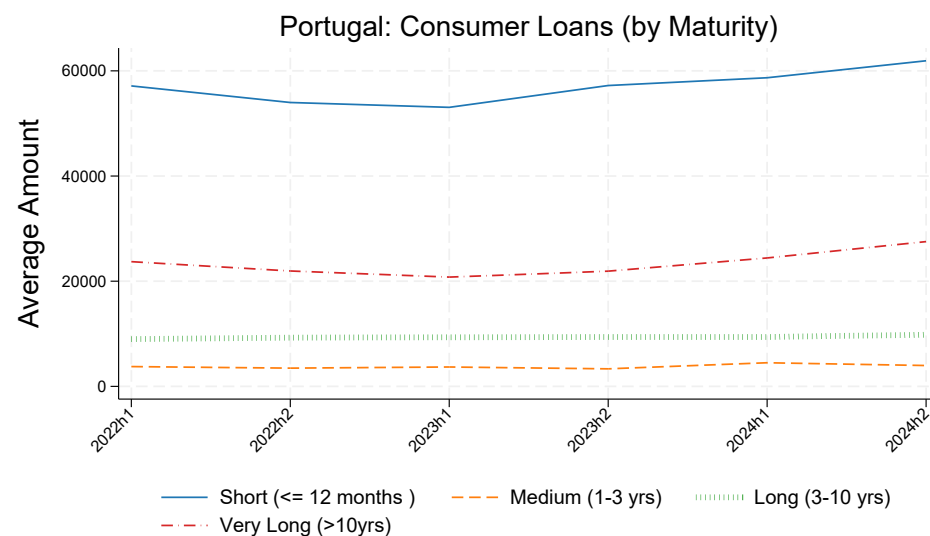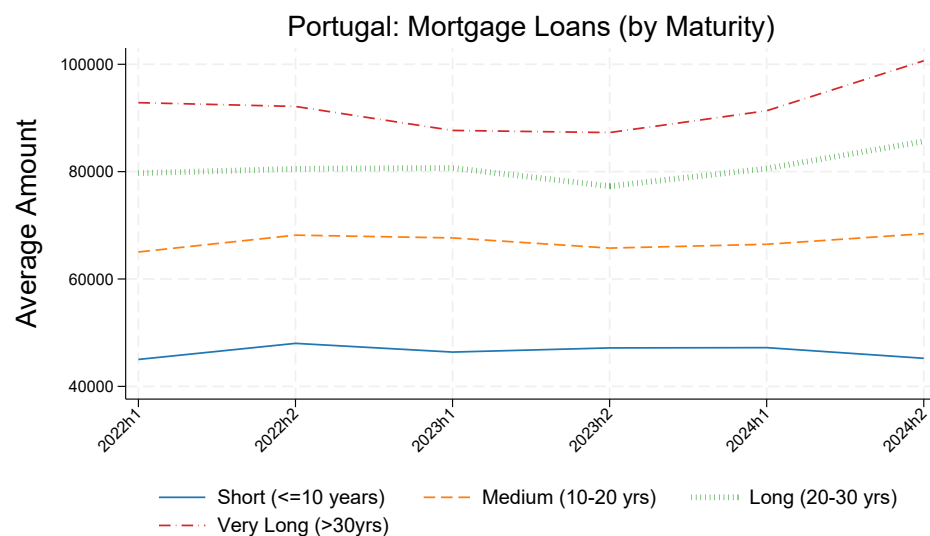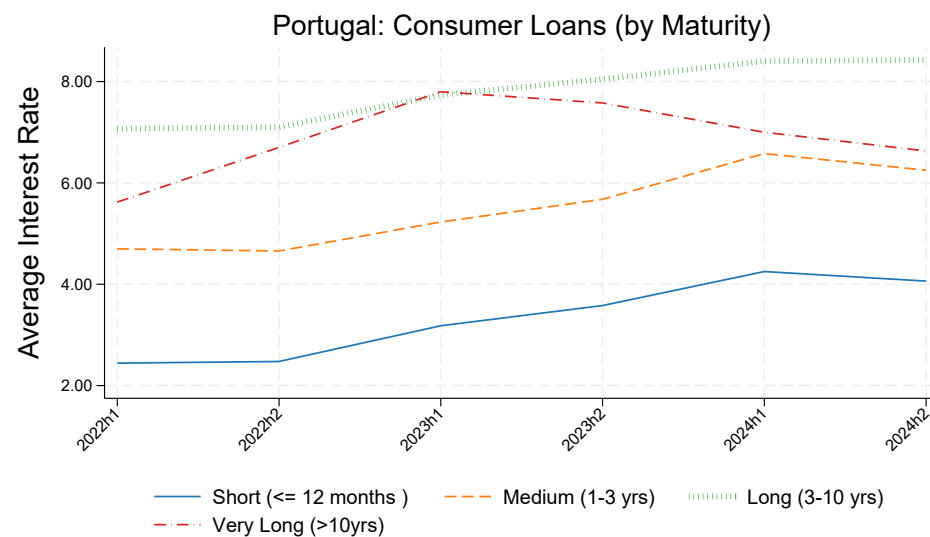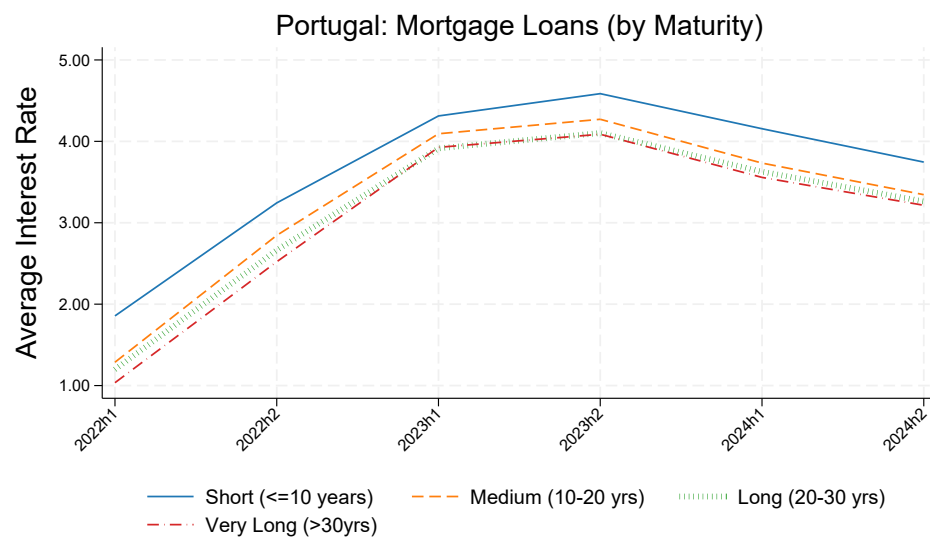
Figure E.9: Maturity breakdown: Slovakia

Slovakia: Mortgage Loans (by Maturity)

Slovakia: Consumer Loans (by Maturity)

Slovakia: Mortgage Loans (by Maturity)

Slovakia: Consumer Loans (by Maturity)
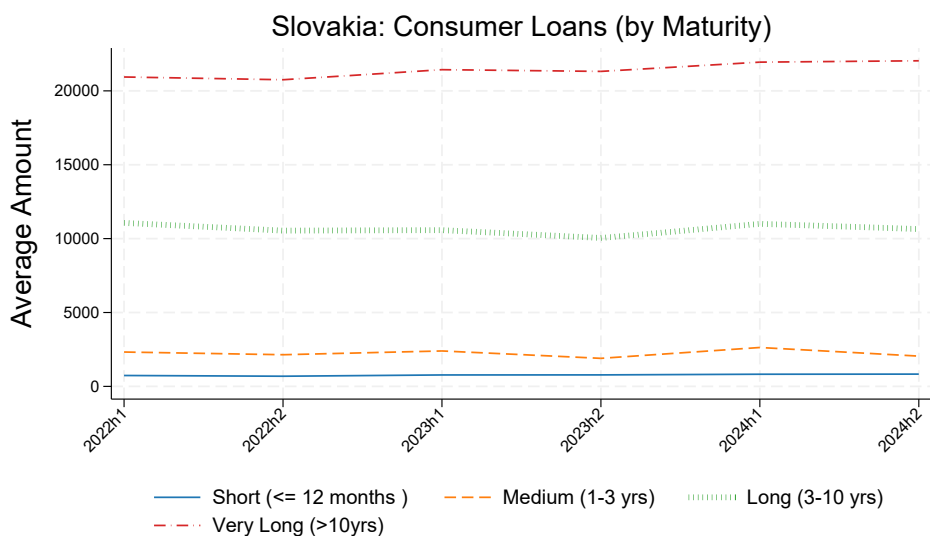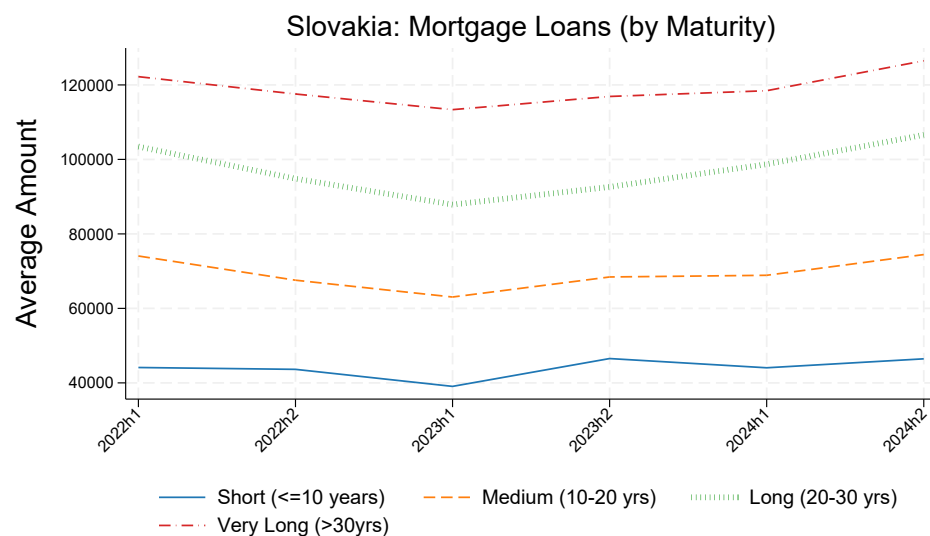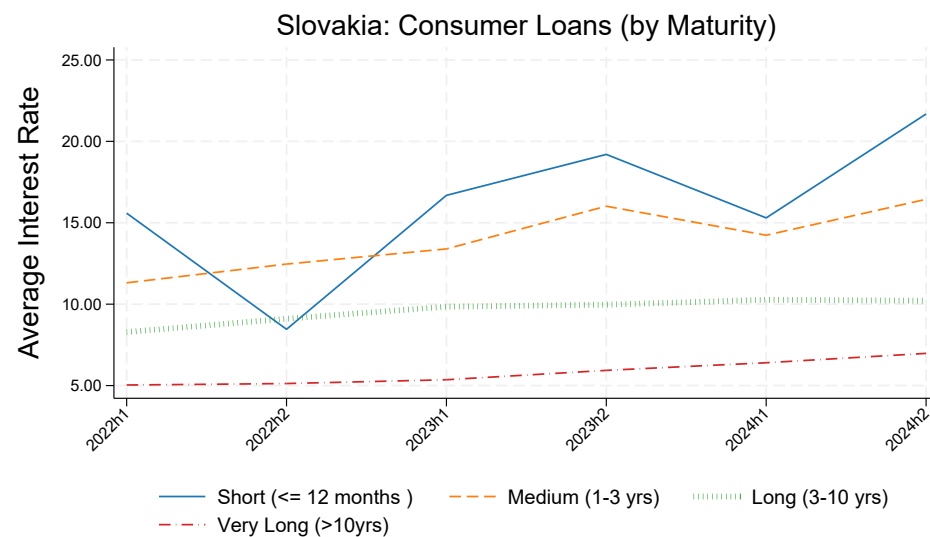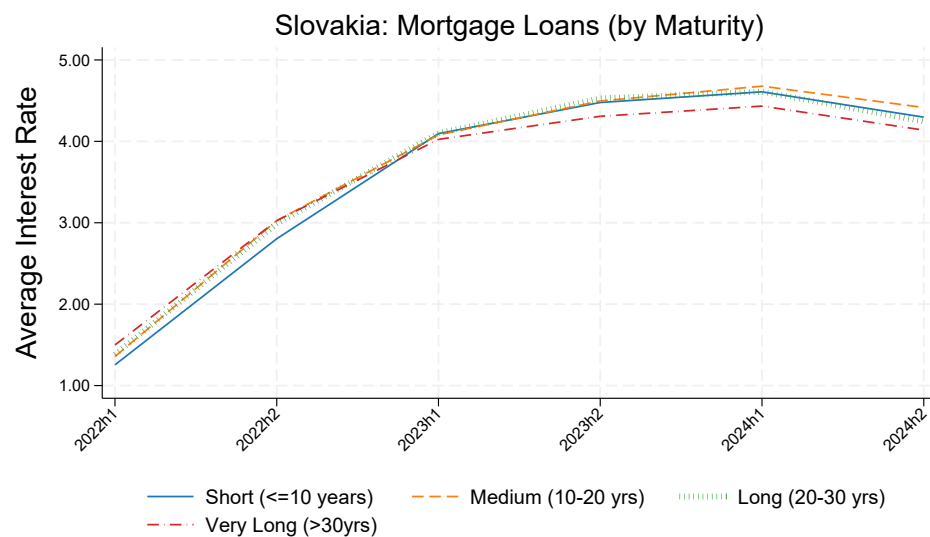
F. Household credit: split by borrower age

Figures F.1–F.9 This set of figures presents a breakdown of new household loans by the age group of the borrower. Each figure corresponds to a single country and covers the period from 2022:H1 to 2024:H2.

For each country, the figure is structured into four panels:

- The top-left panel shows the average interest rate on newly originated **mortgage loans**, disaggregated by borrower age.

- The top-right panel presents the same statistic for new **consumer loans**.

- The bottom-left panel reports the average loan amount for new **mortgage loans** by borrower age.

- The bottom-right panel shows the average amount of new **consumer loans** by age group.

Borrowers are grouped into six age categories: *Under 25*, *25–34*, *35–44*, *45–54*, *55–64*, and *65 and older*. The graphical layout enables an assessment of how borrowing terms and loan sizes differ across age cohorts and evolve over time.

These figures facilitate comparisons of both price and volume of household credit across age groups, helping to uncover demographic patterns in credit market access, demand, and pricing. The countries included are: Belgium (F.1), Spain (F.2), Ireland (F.3), Italy (F.4), Hungary (F.5), Lithuania (F.6), Latvia (F.7), Portugal (F.8), and Slovakia (F.9).

Figure F.1: Age breakdown: Belgium

Belgium: Mortgage Loans (by Age)

Belgium: Consumer Loans (by Age)

Belgium: Mortgage Loans (by Age)

Belgium: Consumer Loans (by Age)
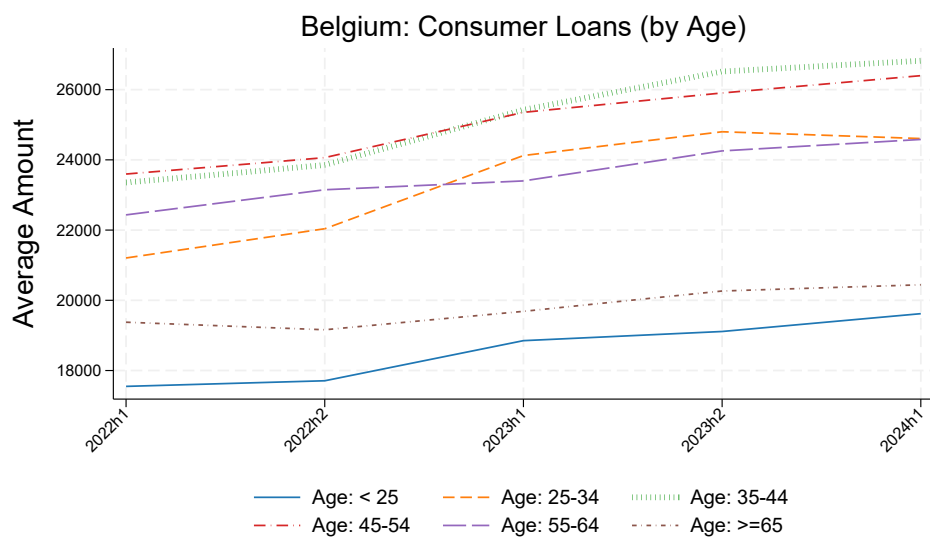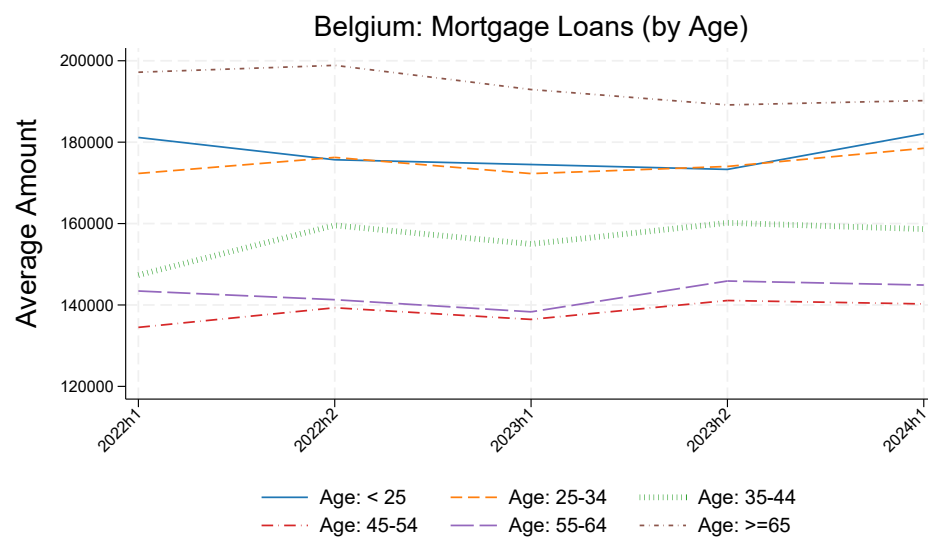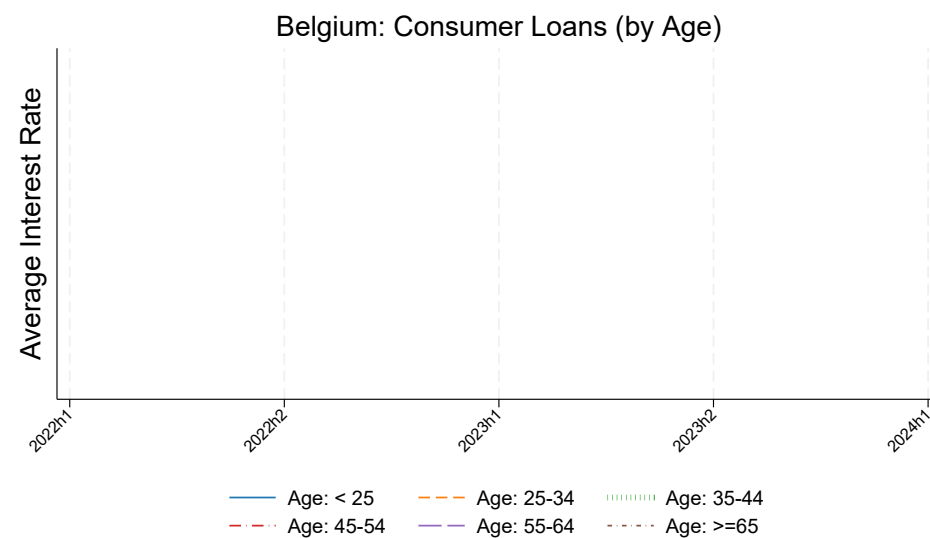
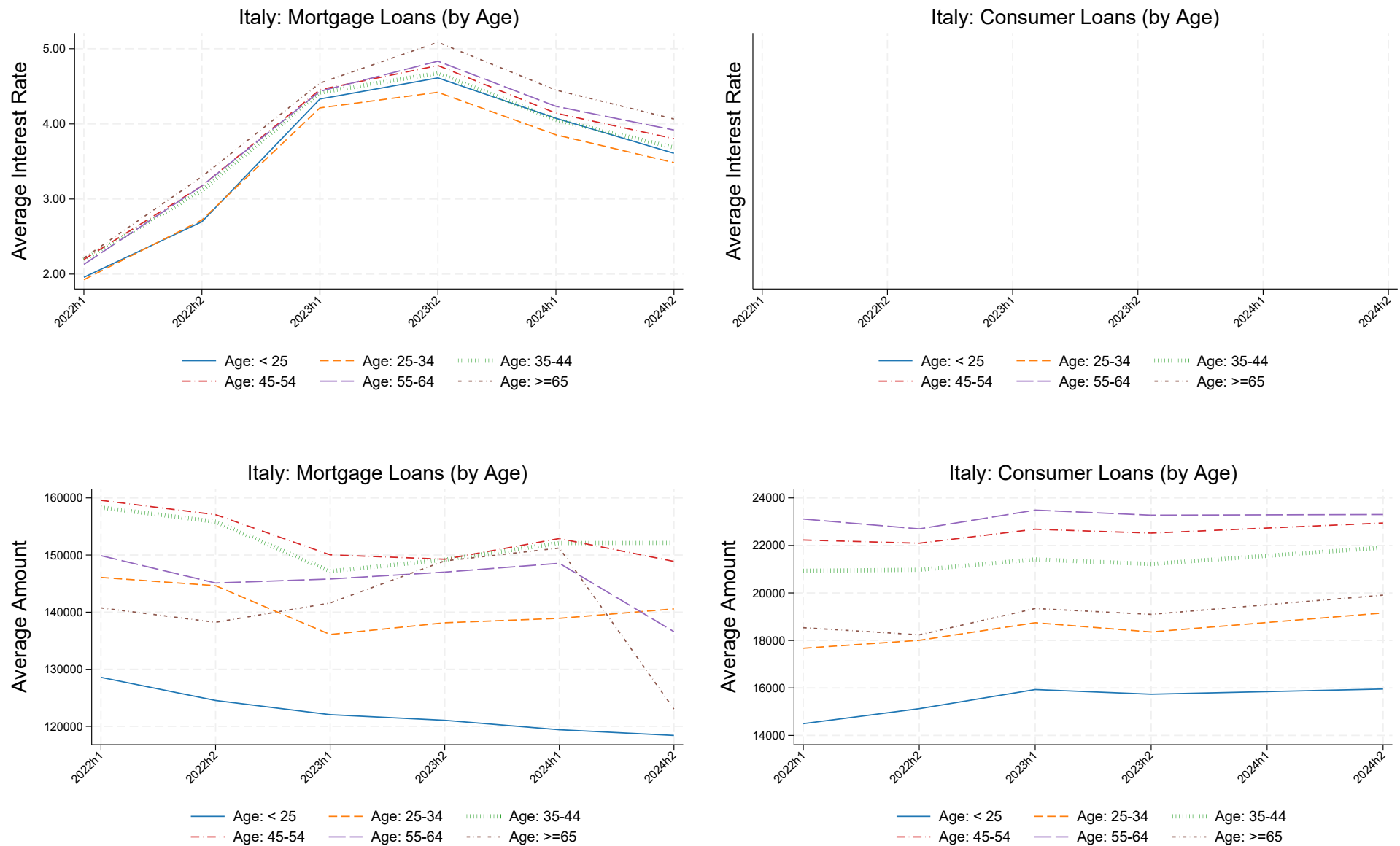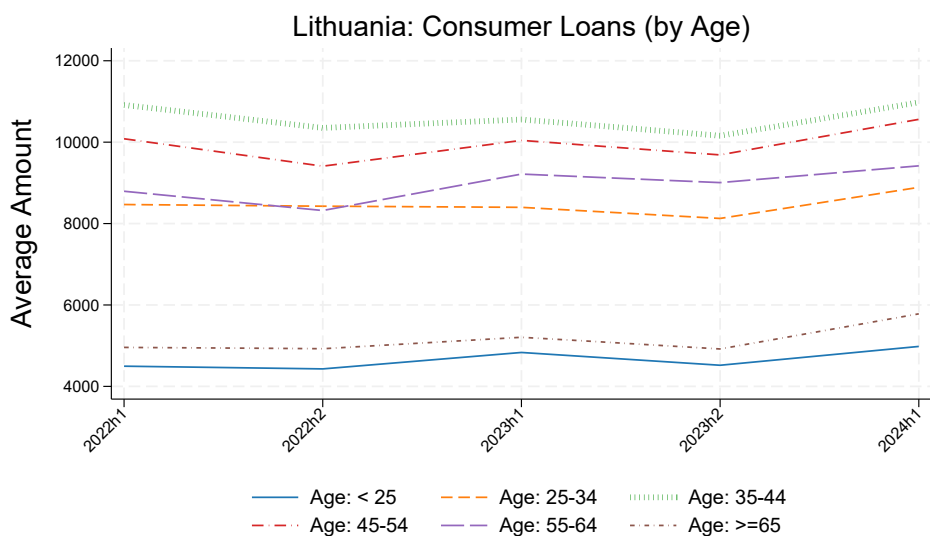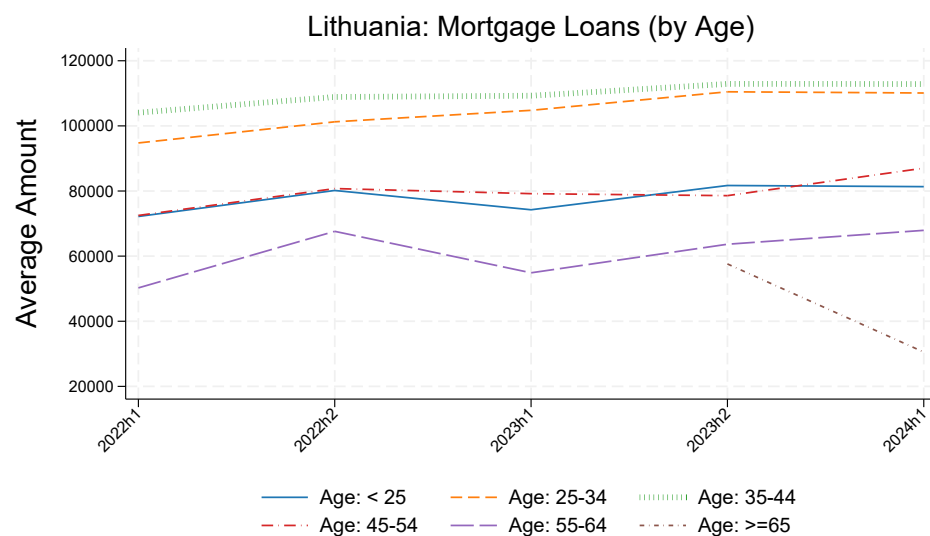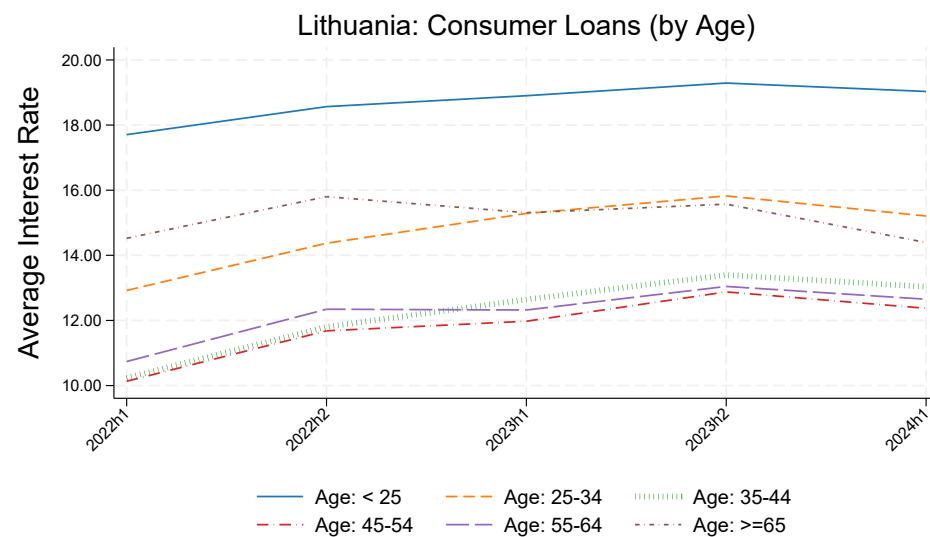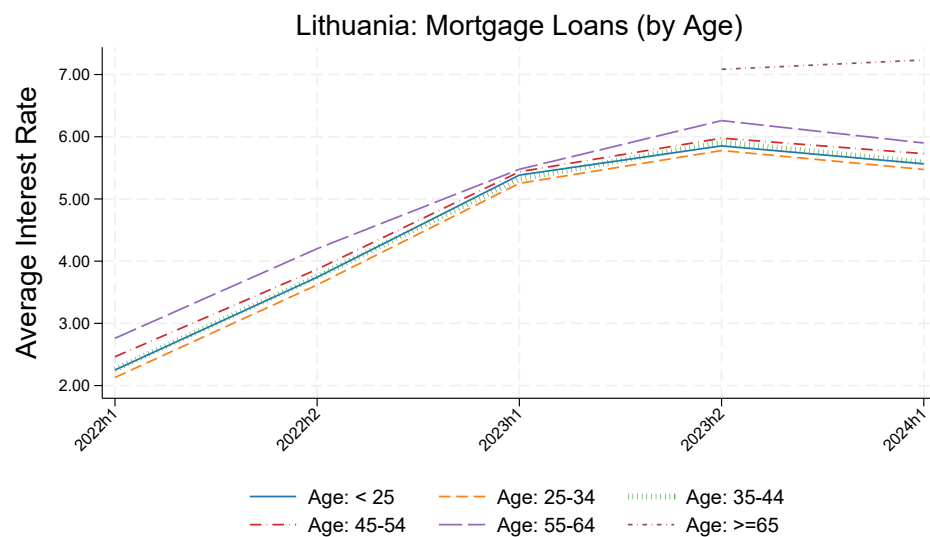Figure F.2: Age breakdown: Spain

Household Borrowing and Monetary Policy Transmission:
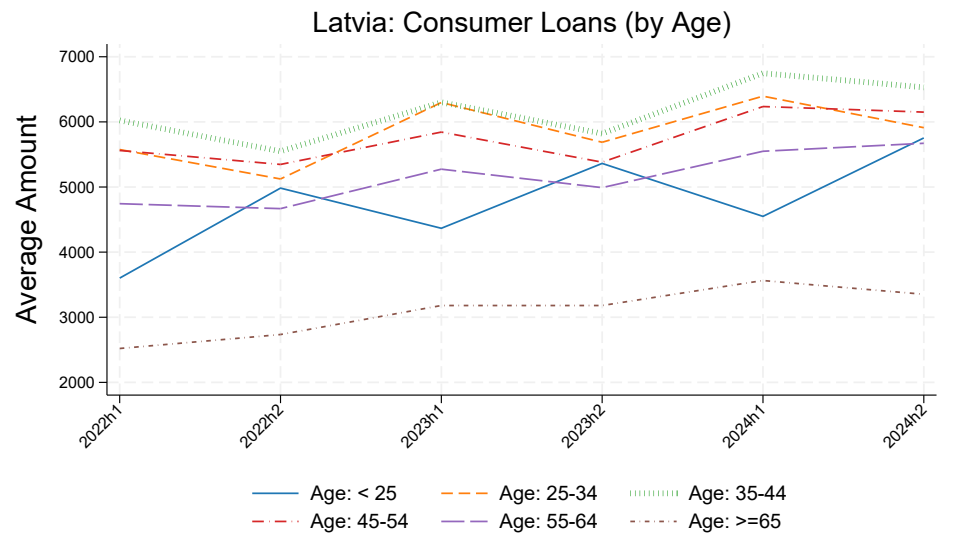Post-Pandemic Insights from Nine European Credit Registers | NBS Working Paper | 16/2025

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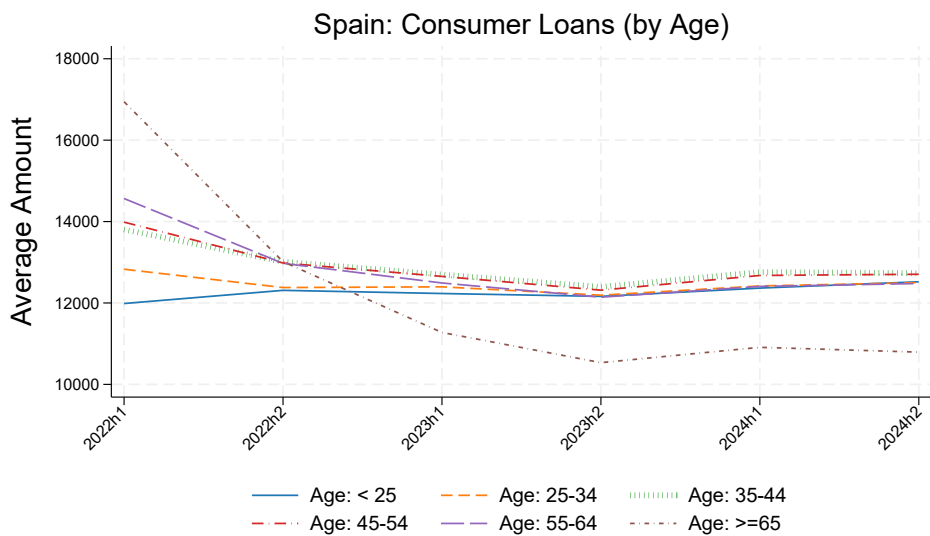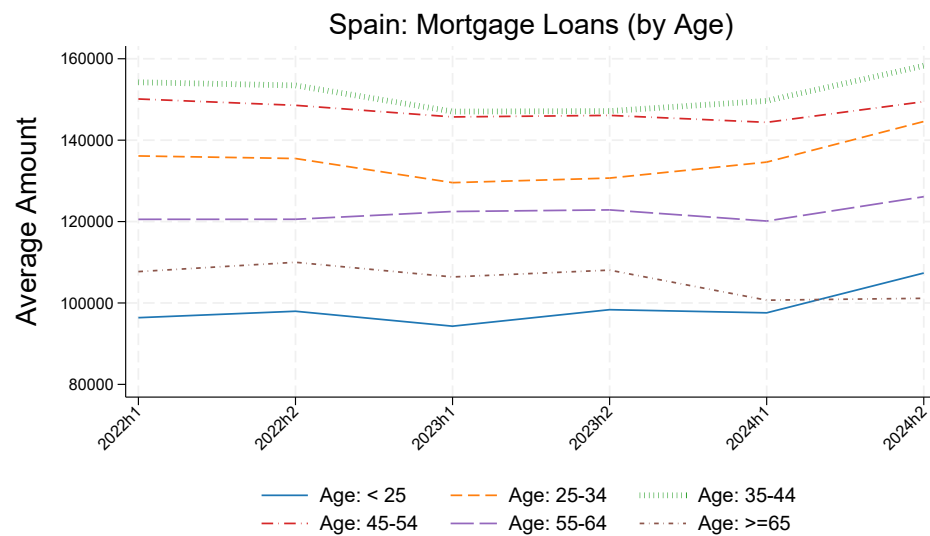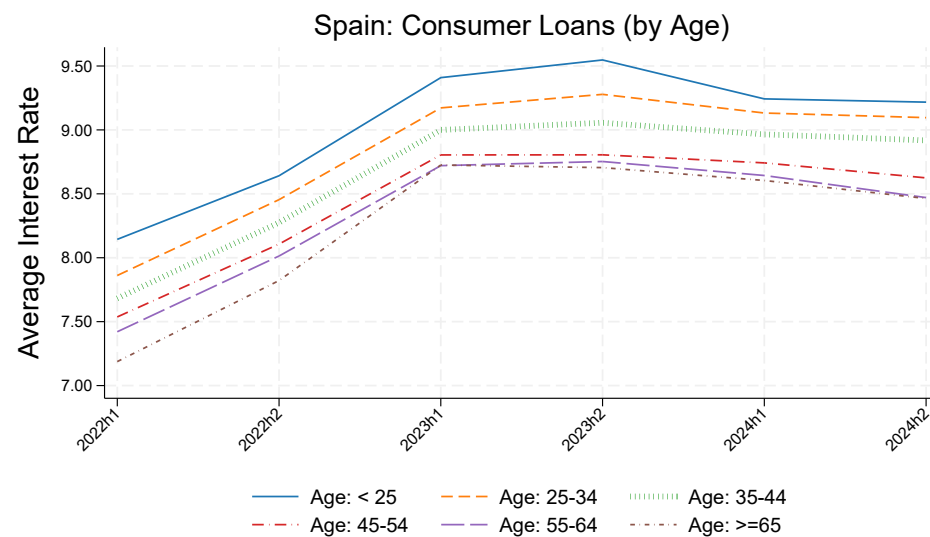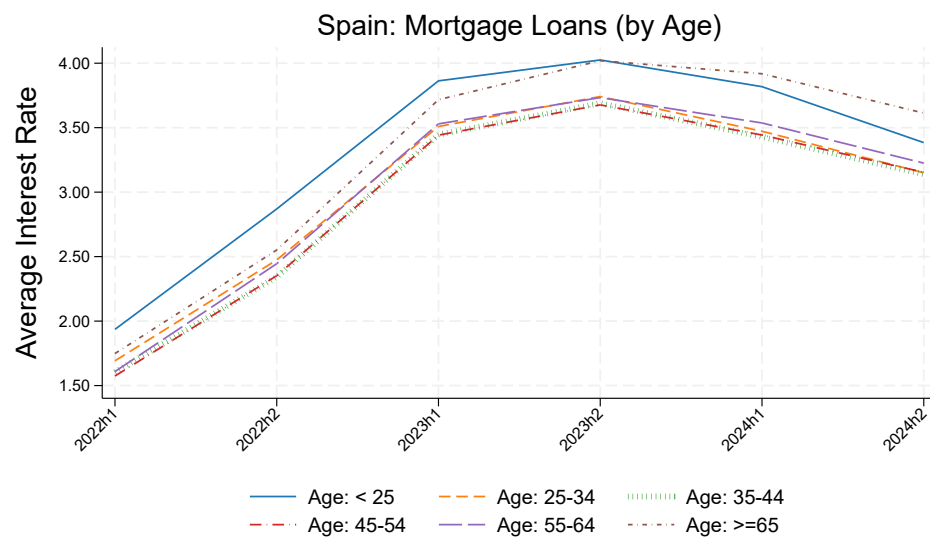
Figure F.3: Age breakdown: Ireland
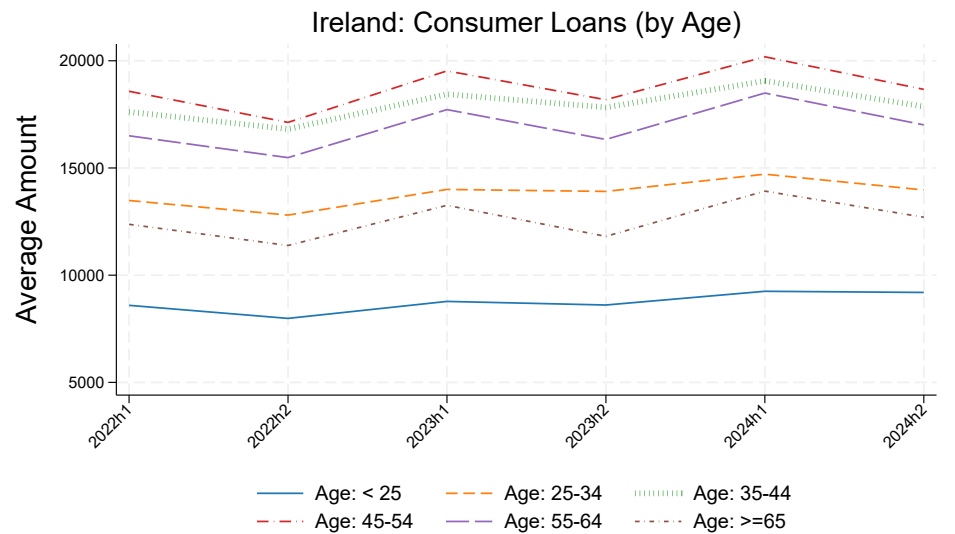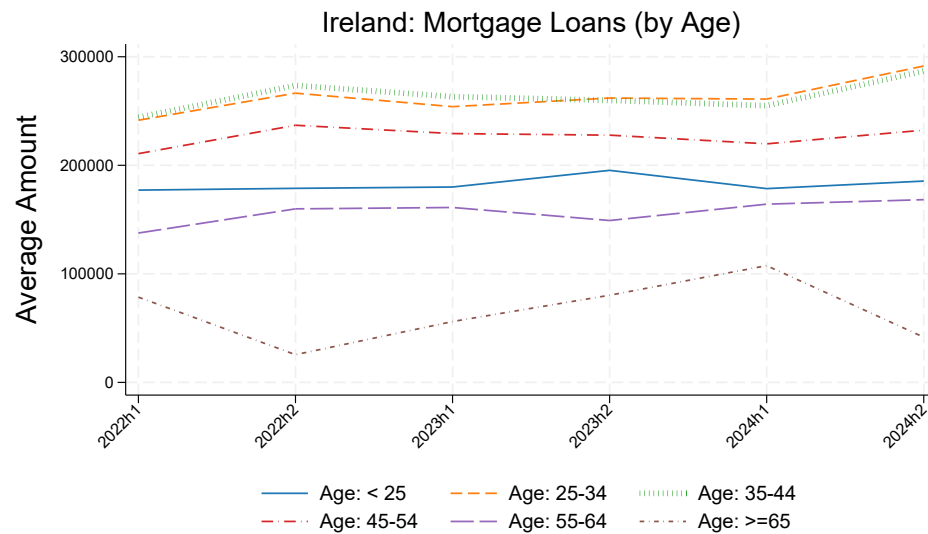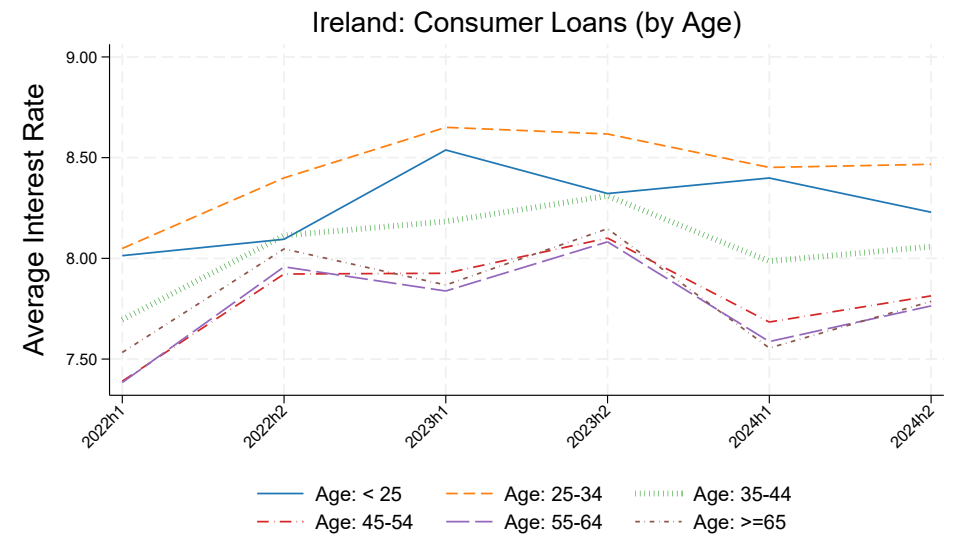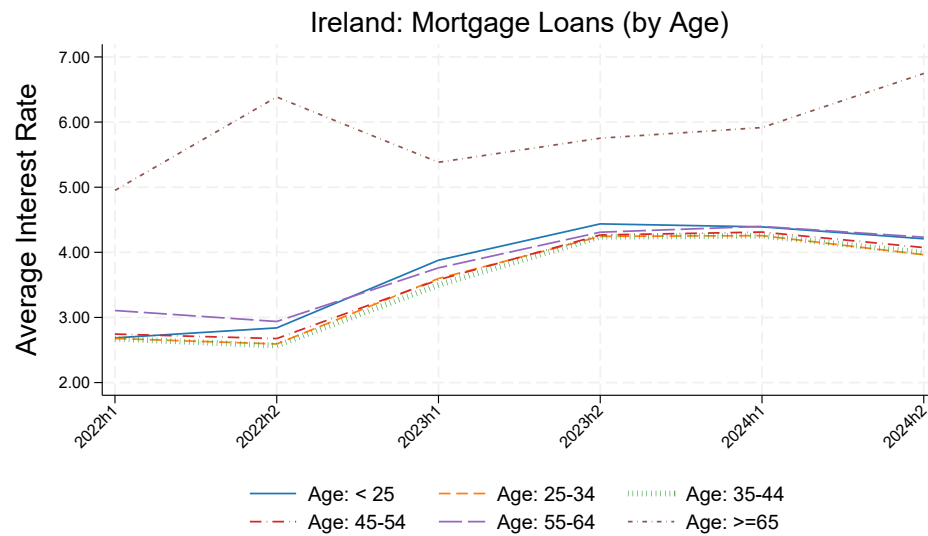
Figure F.4: Age breakdown: Italy

Figure F.5: Age breakdown: Hungary

Household Borrowing and Monetary Policy Transmission:
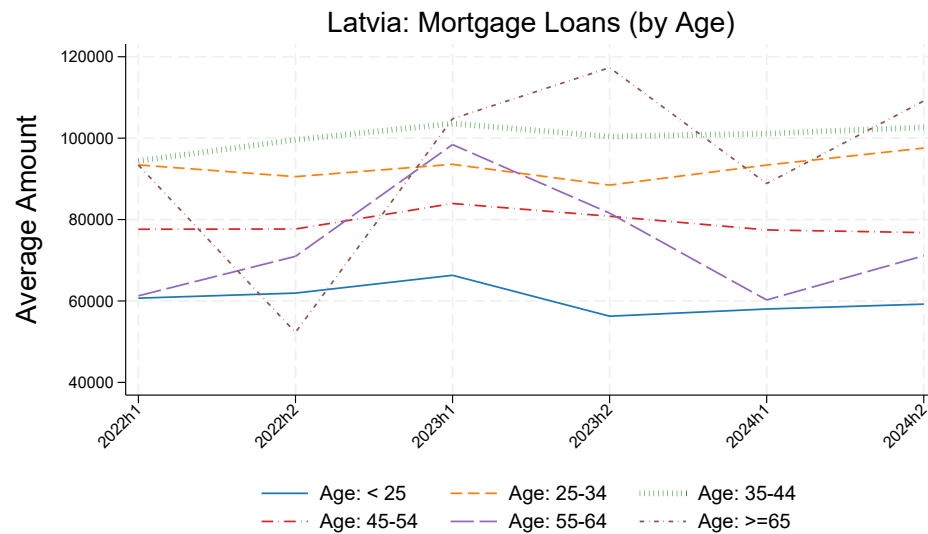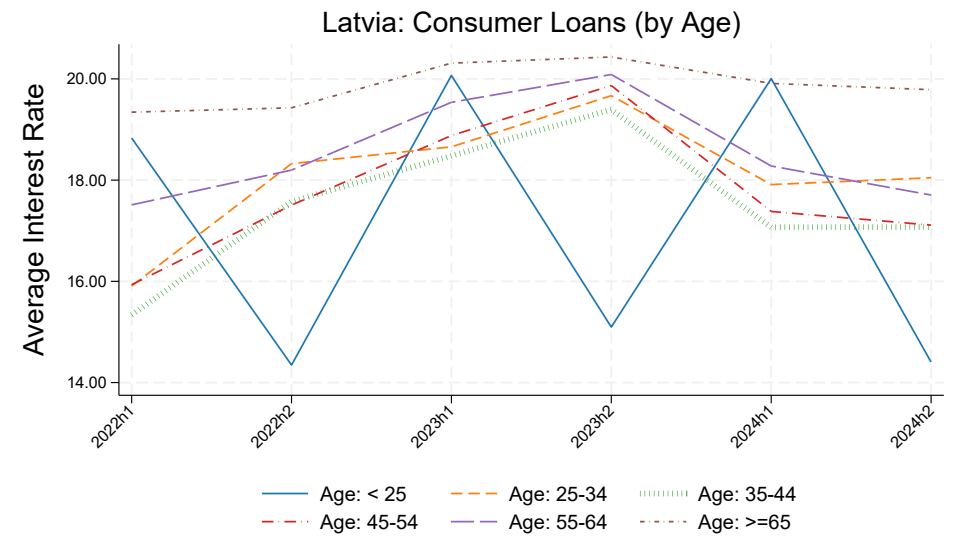Post-Pandemic Insights from Nine European Credit Registers | NBS Working Paper | 16/2025

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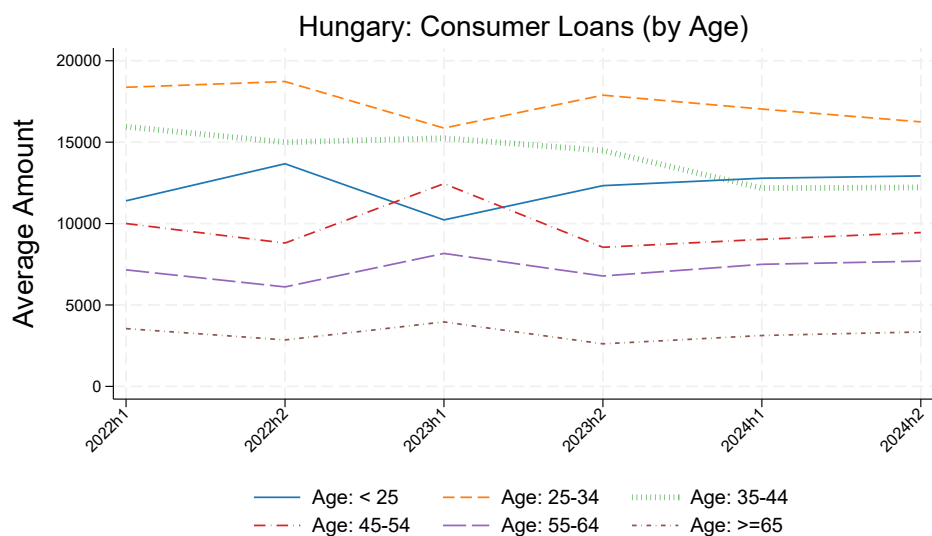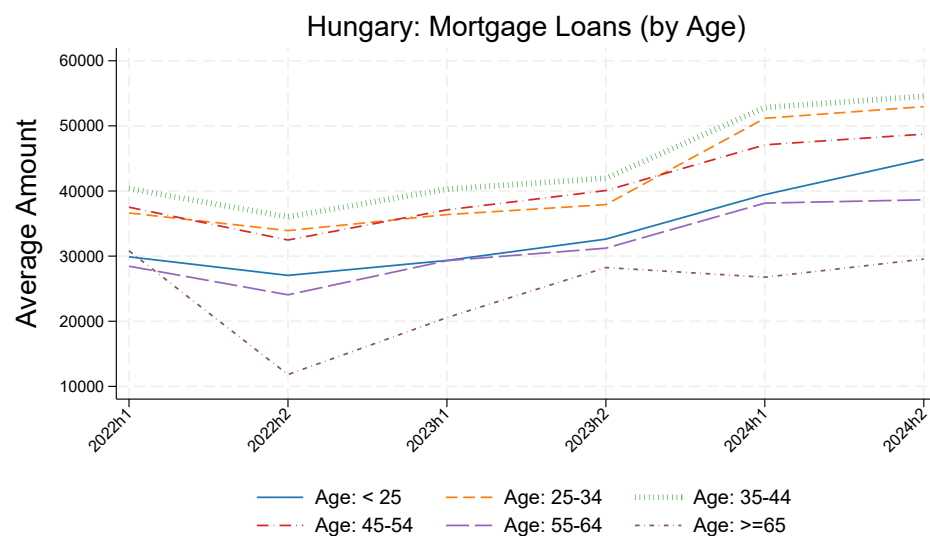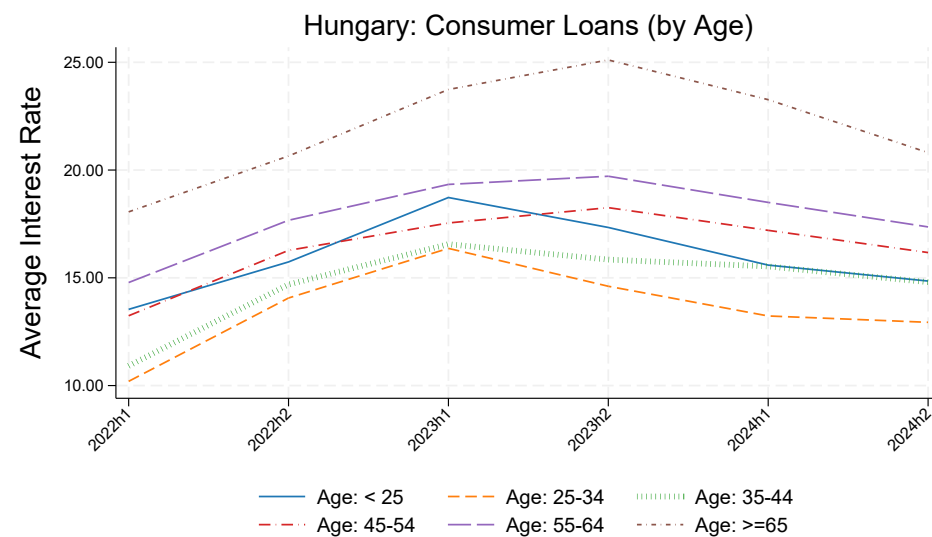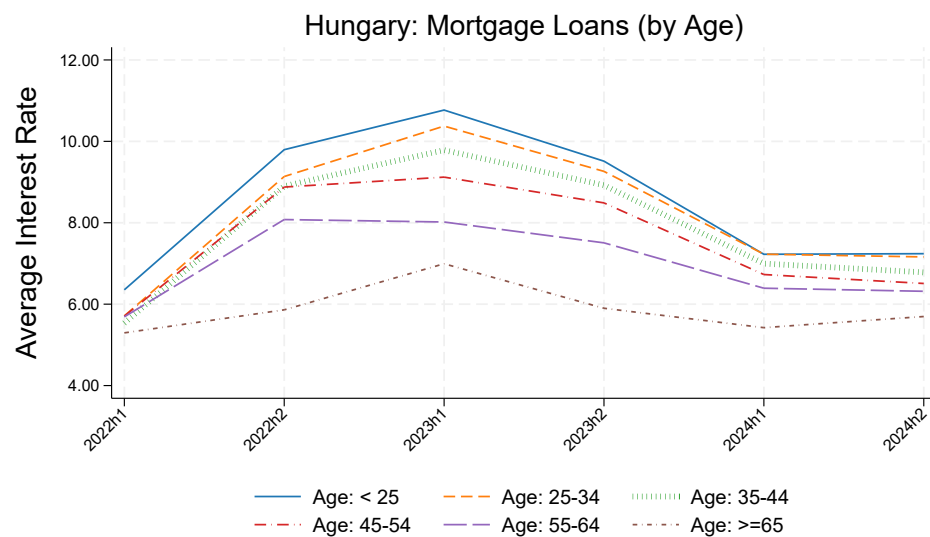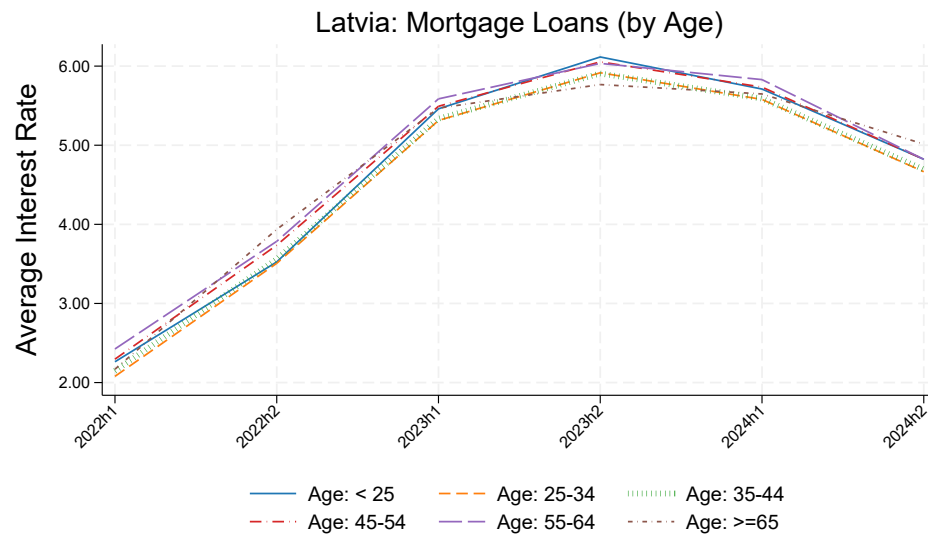
Figure F.6: Age breakdown: Lithuania

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Latvia: Mortgage Loans (by Age)

Latvia: Consumer Loans (by Age)

Latvia: Mortgage Loans (by Age)

Latvia: Consumer Loans (by Age)

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Portugal: Mortgage Loans (by Age)

Portugal: Consumer Loans (by Age)

Portugal: Mortgage Loans (by Age)

Portugal: Consumer Loans (by Age)

Figure F.9: Age breakdown: Slovakia
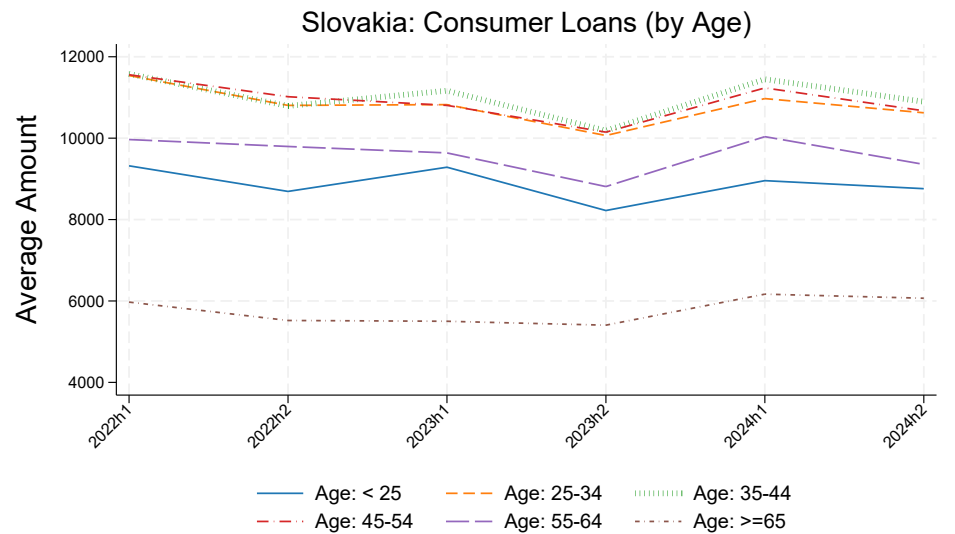
G.   Stylized Facts: number of contracts (like Fig. 1 and 2)

Figure G.1: Breakdown of new loan contracts (number) by age, maturity and interest rate fixation period

Notes: This figure presents the composition of the **number** of new loan contracts with respect to borrower age (left), loan maturity (middle)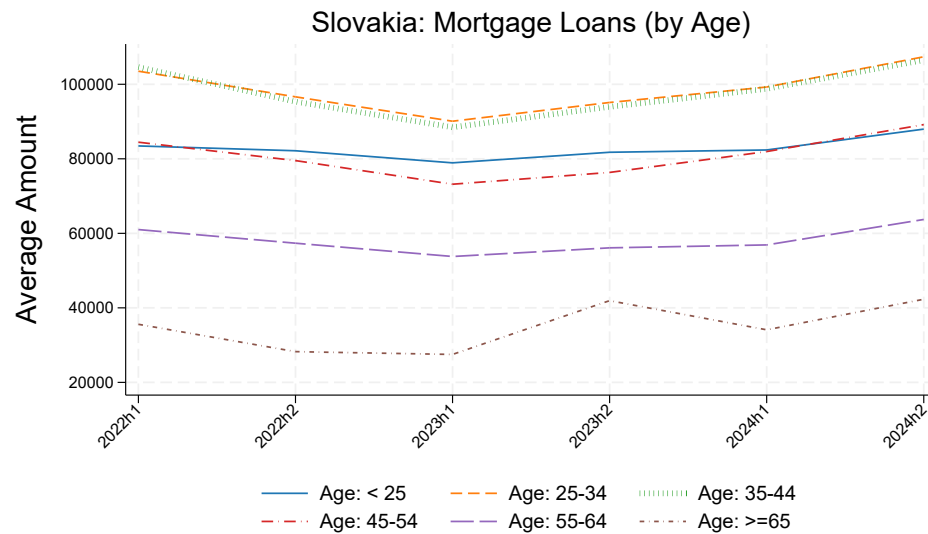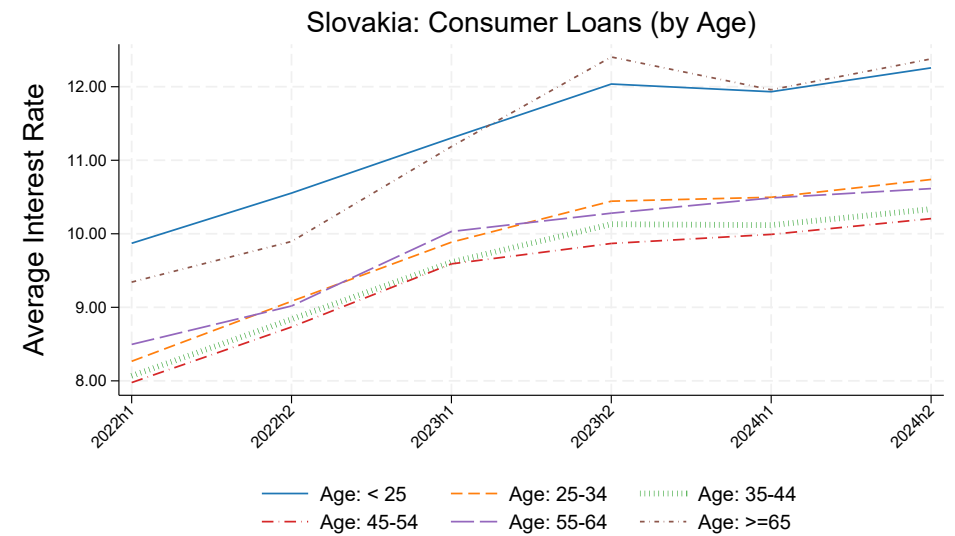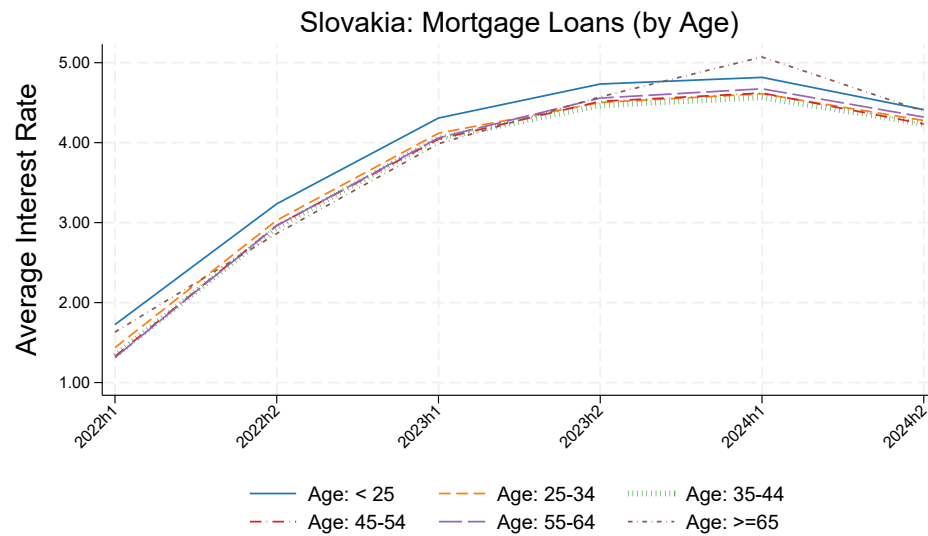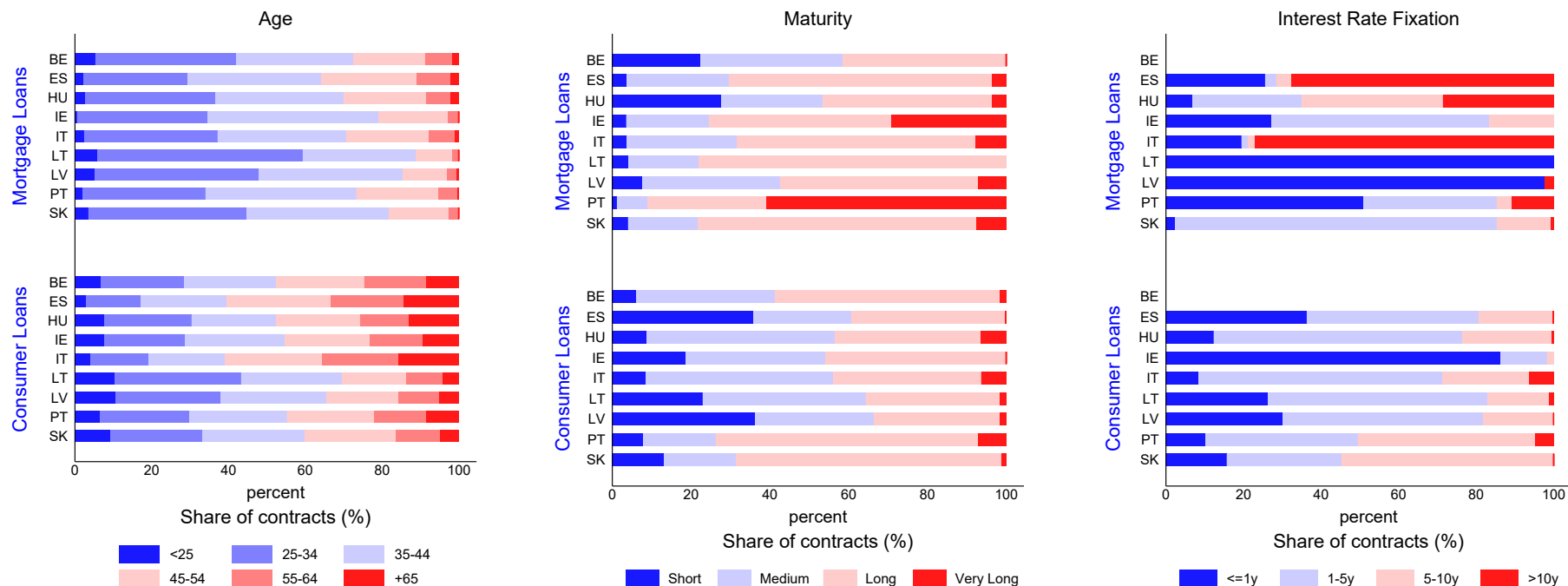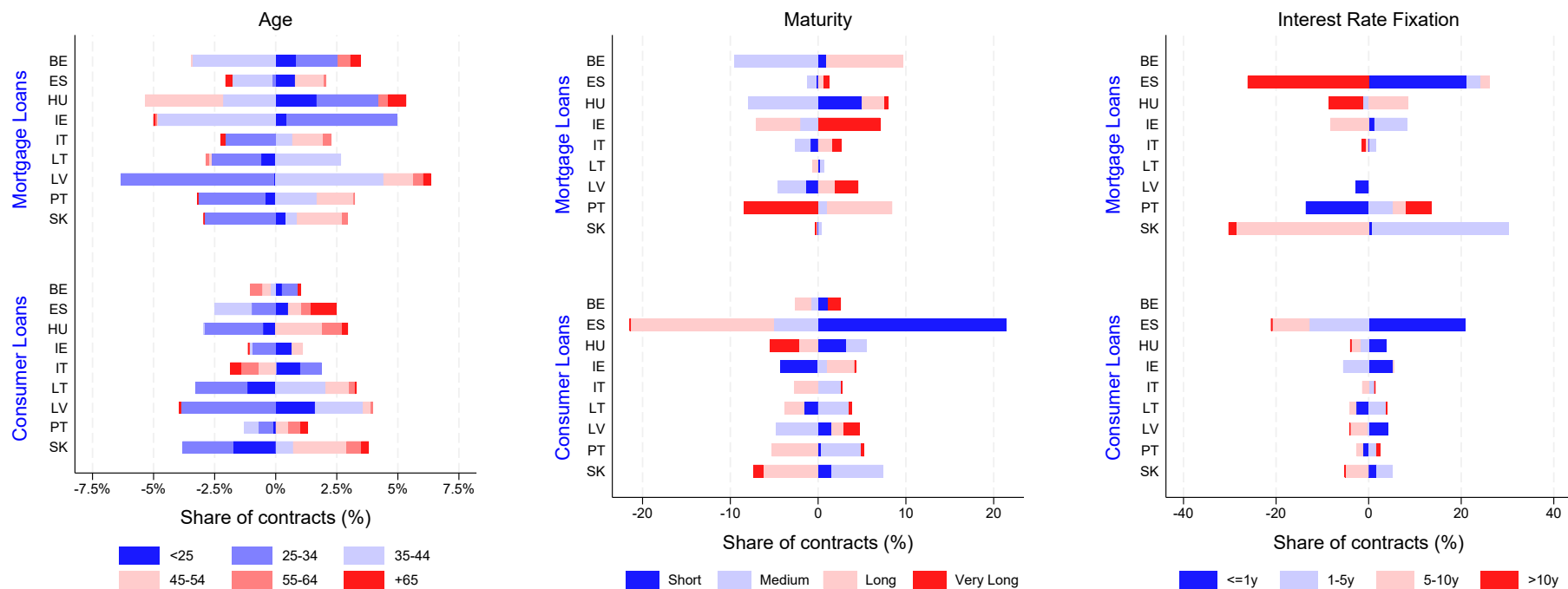, and interest rate fixation (right) across two different credit products (Mortgage Loans (top) and Consumer Loans (bottom)) for selected European countries. Each bar represents the percentage distribution of the value of new loan contracts by age/maturity/IRF group. Maturity bins are different for mortgage and consumer credit. For **mortgages**, we distinguish between short-term (≤10 years), medium-term (10–20 years), long-term (20–30 years), and very long-term (>30 years) maturities. For **consumer loans**, the four bins are: short-term (≤1 year), medium-term (1–3 years), long-term (3–10 years), and very long-term (>10 years). The graph is based on new credit contracts initiated between January 2022 and December 2024. The countries included in the analysis are Belgium (BE), Spain (ES), Hungary (HU), Ireland (IE), Italy (IT), Lithuania (LT), Latvia (LV), Portugal (PT), and Slovakia (SK). The graph is based on loan-level data, aggregated by country and credit product.

Figure G.2: Share changes over a tightening episode (number): Breakdown by age, maturity and IRF

Notes: This figure presents the change in the composition of the number of new loan contracts with respect to borrower age (left), loan maturity (middle), and interest rate fixation (right) across two different credit products (Mortgage Loans (top) and Consumer Loans (bottom)) for selected European countries. Each bar represents the percentage change in the share of new loan contracts by age/maturity/IRF group between two time periods (2022H1 and 2023H2). Maturity bins are different for mortgage and consumer credit. For **mortgages**, we distinguish between short-term (≤10 years), medium-term (10–20 years), long-term (20–30 years), and very long-term (>30 years) maturities. For **consumer loans**, the four bins are: short-term (≤1 year), medium-term (1–3 years), long-term (3–10 years), and very long-term (>10 years). The countries included in the analysis are Belgium (BE), Spain (ES), Hungary (HU), Ireland (IE), Italy (IT), Lithuania (LT), Latvia (LV), Portugal (PT), and Slovakia (SK). Positive values indicate an increase in the share of new loan contracts for a given group, while negative values indicate a decline. The graph is based on loan-level data, aggregated by country and credit product, with percentage point changes computed relative to the total number of new loan contracts in each country and product category.

H. Robustness: Table 6, including standard errors

Table H.1: Heterogeneity in the pass-through: Robustness

VARIATION	MORTGAGES			CONSUMER CREDIT		
	(1)	(2)	(3)	(4)	(5)	(6)
	no 2024	no BE/IT	no IE	no 2024	no IE	no IE + Collateral
Dependent variable: Average interest rate on new contract						
Reference Rate	0.874***	0.950***	0.904***	0.686***	0.966***	1.009***
	(0.071)	(0.056)	(0.053)	(0.147)	(0.165)	(0.166)
BE × Reference Rate	0.183**		0.181***			
	(0.069)		(0.055)			
ES × Reference Rate	-	-	-	-	-	-
HU × Reference Rate	0.023	0.063	0.065	-0.295***	-0.260***	-0.255***
	(0.094)	(0.071)	(0.077)	(0.074)	(0.073)	(0.074)
IE × Reference Rate	-0.620***	-0.628***		-0.515***		
	(0.031)	(0.035)		(0.105)		
IT × Reference Rate	0.211***		0.176***			
	(0.044)		(0.037)			
LT × Reference Rate	0.008	-0.036	0.005	-0.430***	-0.453***	-0.437***
	(0.071)	(0.054)	(0.051)	(0.104)	(0.110)	(0.110)
LV × Reference Rate	0.030	-0.049	-0.011	1.016***	0.554***	0.549***
	(0.065)	(0.051)	(0.047)	(0.213)	(0.193)	(0.192)
PT × Reference Rate	0.055	-0.037	0.015	-0.094	-0.066	-0.047
	(0.058)	(0.051)	(0.048)	(0.078)	(0.066)	(0.067)
SK × Reference Rate	0.024	0.085	0.141**	0.382***	0.451***	0.438***
	(0.073)	(0.059)	(0.065)	(0.100)	(0.098)	(0.098)
Age: < 25 × Ref. Rate	0.074***	0.063***	0.064***	0.026	-0.009	-0.014
	(0.022)	(0.015)	(0.020)	(0.064)	(0.076)	(0.076)
Age: 25–34 × Ref. Rate	0.032***	0.026***	0.027***	0.028	0.028	0.026
	(0.011)	(0.006)	(0.010)	(0.017)	(0.022)	(0.022)
Age: 35–44 × Ref. Rate	-	-	-	-	-	-
Age: 45–54 × Ref. Rate	-0.002	0.002	0.000	0.008	0.009	0.010
	(0.008)	(0.006)	(0.008)	(0.021)	(0.025)	(0.025)
Age: 55–64 × Ref. Rate	-0.024	-0.017	-0.017	0.038	0.060*	0.061*
	(0.025)	(0.029)	(0.028)	(0.026)	(0.032)	(0.032)
Age: >=× Ref. Rate	-0.165***	-0.176***	-0.146***	0.138***	0.187***	0.184***
	(0.041)	(0.050)	(0.046)	(0.034)	(0.044)	(0.044)
Short × Ref. Rate	-0.273**	-0.431***	-0.343**	-0.459***	-0.632***	-0.676***
	(0.109)	(0.139)	(0.132)	(0.153)	(0.173)	(0.179)
Medium × Ref. Rate	0.012	-0.003	0.003	-0.144	-0.271**	-0.293**
	(0.010)	(0.012)	(0.012)	(0.095)	(0.123)	(0.125)
Long × Ref. Rate	-	-	-	-	-	-
Very Long × Ref. Rate	-0.027	-0.028	-0.037	0.352*	0.344	0.570**
	(0.021)	(0.022)	(0.025)	(0.199)	(0.229)	(0.276)
IRF: <= 1yr × Ref. Rate	-	-	-	-	-	-
IRF: 1–5yrs × Ref. Rate	0.472***	0.402***	0.416***	-0.085	-0.378***	-0.401***
	(0.128)	(0.083)	(0.092)	(0.125)	(0.125)	(0.119)
IRF: 5–10yrs × Ref. Rate	-0.127	-0.168*	-0.201**	-0.047	-0.356***	-0.383***
	(0.139)	(0.085)	(0.092)	(0.122)	(0.117)	(0.123)
IRF: >10yrs × Ref. Rate	-0.207	-0.284***	-0.209**	-0.427***	-0.671***	-0.763***
	(0.147)	(0.098)	(0.099)	(0.109)	(0.098)	(0.104)
Collateralized × Ref. Rate						-0.265***
						(0.088)
Observations	1949	2071	2623	1775	2380	2380
Adj. R-squared	0.91	0.91	0.92	0.89	0.87	0.87

Notes: This table presents heterogeneity in the pass-through on new household loans, distinguishing between **mortgages** (Columns 1–3) and **consumer credit** (Columns 4–6). The top row indicates how the specification differs from the benchmark. The main independent variable is the reference interest rate, interacted with four sets of characteristics. Variables, weighting, clustering and fixed effects are as in 3 and 4. Statistical significance is denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

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