# Monetary policy decision-making: how are household and firm heterogeneity incorporated in Hungary?[1]

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## Abstract

Studying the granularities in household and firm data may reveal important lessons for the transmission of monetary policy, for the economic outlook and for assessing the distributive effects of economic policies. Therefore, to make informed decisions about the economy, central banks need to consider that households and firms are heterogeneous. In this note, we review some of the heterogeneities present in the Hungarian economy and discuss how the Magyar Nemzeti Bank (MNB) takes these into account when formulating its policies. We argue that sufficient data which are available in a timely manner can greatly inform central bank decision-making. However, global discussions are needed on the practical lessons of incorporating heterogeneity into central banking to inform policymakers and experts alike. Accordingly, we contribute to this conversation by sharing the MNB's experience regarding two specific policies: a targeted lending programme aimed at small and medium-sized enterprises, and a set of borrower-based macroprudential measures aimed at addressing heterogeneities in household credit risk.

[1] The views of the authors do not necessarily reflect the official view of the Magyar Nemzeti Bank.

# 1. Introduction

In many aspects, strong differences can be found in the behaviour of households and firms. In recent years, growing emphasis has been placed on these differences and how they influence economic activity.

Addressing heterogeneity can improve our understanding of economic processes in a number of ways. Most importantly for central banks, differences between various households and firms affect the way monetary policy is transmitted to the economy (see, for example, Kaplan et al (2018)). Moreover, these differences may vary in time, also causing the attributes of the transmission mechanism to change. For instance, consider a household that, as a rule of thumb, consumes all income for a set period: this household does not weigh consumption-savings decisions. It is easy to see that the larger the share of such households, the weaker the central bank's ability to encourage household savings on an aggregate level.

In addition to affecting the transmission of monetary policy, exploring heterogeneities may lead to an enhanced understanding of the economic outlook or the distributional effects of economic policies. Overall, to make informed decisions about their policies, central banks need to take into account heterogeneities that are present across households and companies.

Hungary is no different in this regard. Heterogeneities present themselves in various forms: household net wealth, firm size, inflation expectations, etc. In line with international practice, the Magyar Nemzeti Bank (MNB) has been working on compiling data that present these differences in a meaningful way. The variety of households and companies is also considered in the decision-making process of the MNB.

In this note, we aim to provide an overview of the heterogeneities in the Hungarian economy and discuss how the MNB takes these into account when formulating its policies. The emphasis is on how the transmission of monetary policy is affected. We argue that for an inflation-targeting central bank, this is the aspect that must be the top priority. In addition, we also give practical examples that present the MNB's experience regarding certain programmes where heterogeneities were taken into account. We do so to facilitate conversation about the utility of these types of programmes, which may prove useful to economic policymakers.

Our note is organised as follows. In Section 2, we briefly review the transmission mechanism of monetary policy. In Section 3, we explore different aspects of heterogeneity and how they are present in the Hungarian economy. Perspectives of incorporating granular data into central bank decision-making are discussed in Section 4. In Section 5, we draw conclusions on certain programmes of the MNB that were designed with firm or household heterogeneities in mind. We conclude in Section 6.

## 2. A brief review of monetary policy transmission

Monetary policy transmission is the mechanism through which the actions of monetary policy affect and influence the economy. This mechanism may vary due to institutional attributes or the legal framework in which central banks operate (Balogh et al (2017)). As a result, different central banks follow slightly different schematic models of monetary policy transmission (see, for example, ECB (2000), Bank of England (1999), MNB (2012)). In the following, we briefly discuss the central channels of transmission (based on Felcser et al (2017)), along with the most relevant insights from the point of view of household and firm heterogeneity.

The interest rate channel is to be thought of as the channel responsible for governing consumption-savings decisions and therefore aggregate demand and price developments (Balogh et al (2017)). Assuming some degree of price stickiness, a change in the policy rate of the central bank leads to a shift in real interest rates as well, resulting in a re-evaluation of optimal consumption-savings and investment decisions and therefore in a shift in aggregate demand. The interest rate channel is generally considered to be fundamental and relatively strong, especially in developed economies (Bernanke et al (1999), Balogh et al (2017)).

The above process is subject to a central assumption; namely, that the interest rates that households and companies face also adjust in accordance with the change in the central bank policy rate. However, that is not necessarily the case. Indeed, empirical research has found significant regional and temporal variation regarding the pass-through of changes in the central bank's policy rate to retail interest rates (Beyer et al (2024), Andries and Billon (2016), Karagiannis et al (2010)). However, asset type, market structure, financial sector concentration, liquidity and the availability of deposits relative to profitable lending opportunities seem to matter, while cross-country heterogeneities can also manifest due to public policy decisions (Beyer et al (2024)).

Regarding retail interest rates, empirical results point to a greater degree of pass-through to lending rates relative to deposit rates (Karagiannis et al (2010)). In addition, there is also evidence that short-term lending rates and longer-term deposit rates adjust more following a change in the policy rate compared to long-term lending and short-term deposit rates (Andries and Billon (2016)). Overall, the pass-through of changes in the policy rate to retail interest rates seems to be incomplete even in the long run (Felcser et al (2017)). In particular, it was weaker and slower during the post-pandemic hiking cycle compared to past cycles (Beyer et al (2024)).

The interest rate channel in Hungary works in line with economic theory as described above and international experience. However, we observe weak pass-through to term deposit rates in the household sector in the last interest rate hike cycle that started in 2021.

The exchange rate channel of monetary policy transmission describes the effects of fluctuations in the exchange rate on price developments. For instance, a lower policy rate is consistent with a weaker domestic exchange rate, which raises consumer prices via price increases on imported goods, while net exports also increase. This mechanism is an especially important channel of policy transmission in small open economies.

The credit channel describes the changes in aggregate credit supply and demand that take place following a change in the policy rate. Regarding credit supply, a decrease in the policy rate may strengthen bank lending by lowering the profitability of banks and by making available more external funding possibilities, while also possibly increasing the search for yield. On the demand side, an easing in monetary conditions drives credit demand higher, with firms' propensity to invest and their creditworthiness increasing, due to stronger demand for their products and increasing firm value (Felcser et al (2017)). This financial accelerator effect complements the interest rate channel of monetary policy transmission (Bernanke et al (1999)).

When making a decision, actors in the economy take into consideration their expectations regarding the future – this is where the expectations channel plays a central role. This channel controls the feedback mechanism in which economic agents individually take some action based on their expectations and produce an aggregate result, which then feeds back into their expectations. For instance, fluctuations in market interest rates, exchange rates and prices tend to reflect the evolution of market participants' expectations regarding the future state of the economy. Similarly, if households expect inflation to be high, they might decide to spend more in the present in order to avoid the price increases. However, this leads to an increase in aggregate demand, to which companies may respond by raising prices, thus elevating actual inflation.

It is clear from the previous example that for inflation-targeting central banks, inflation expectations are crucial. More precisely, they need to be anchored around the central bank target. This notion is supported by empirical evidence that points to monetary policy playing an important role in macroeconomic stabilisation through the expectations channel (Kryvtsov and Petersen (2013)). Overall, theoretical and empirical results suggest that strengthening credibility improves the central bank's influence over expectations (Diegel and Nautz (2021), Coibion et al (2022), Amatyakul et al (2023)).

Household and firm heterogeneity affects the transmission of monetary policy. For instance, in the case of the interest rate channel, aggregate demand is likely to be sensitive to the degree of heterogeneity. Moreover, firms with poorer access to credit display a stronger investment response to a change in the policy rate (see, for example, Bernanke et al (1999)), which also seems to vary with firm size, age and product durability (Durante et al (2022)). Finally, the expectations channel may also be affected, as survey-based studies show that inflation expectations tend to be heterogeneous across age, gender, wealth, education, financial literacy and IQ (D'Acunto et al (2024)). However, although these aspects are worth exploring, the inquiry may be limited by the availability of data.

## 3. How does heterogeneity affect transmission in Hungary?

From the previous section, it is evident that heterogeneity affects the transmission of monetary policy. Therefore, to have a clear view of how the transmission mechanism develops, it is crucial to closely follow changes and trends in the granular data. In

recent years, the MNB has explored some related areas, and this section provides an overview of some of the most important developments.

## 3.1 Net wealth and indebtedness

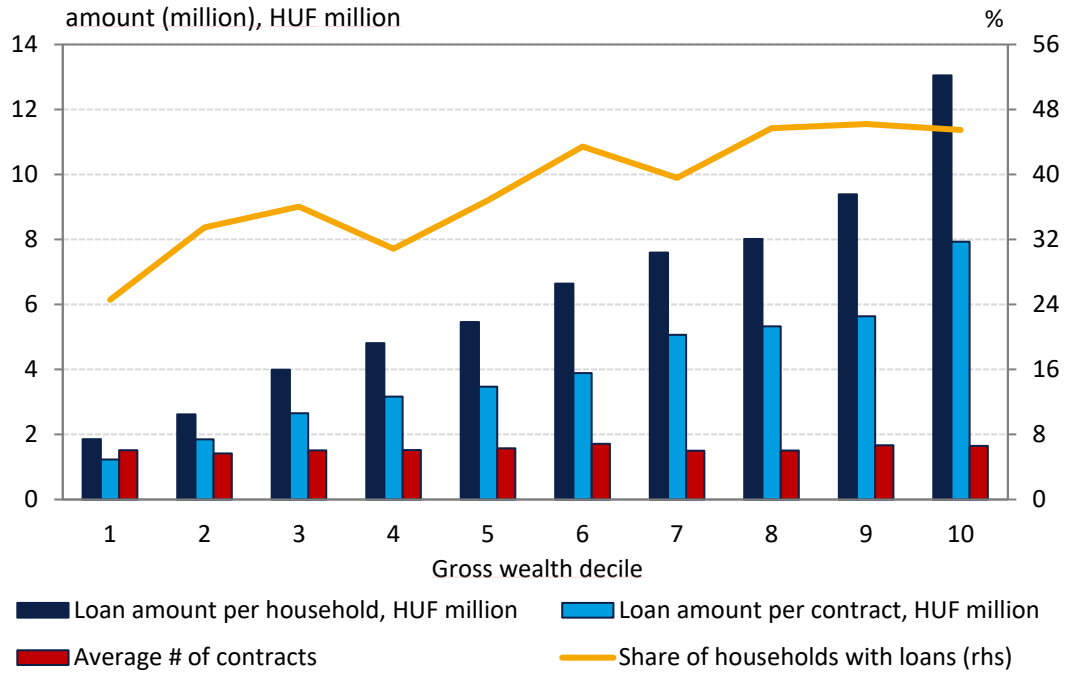
The MNB voluntarily coordinates the Hungarian version of the Household Finance and Consumption Survey (HFCS), a survey aimed at providing comparable data on the characteristics and distribution of household wealth, income and consumption across EU member states. In addition, the MNB collects household data on a quarterly basis in its Quarterly Survey of Households, as well as analysing registry data.

The main source of information for the asset side of households' balance sheets is the HFCS. However, currently, the latest available data come from 2020, and the responses for the 2023 wave of the survey are currently being processed. According to the results of the 2020 HFCS, approximately 40% of Hungarian households have some kind of debt, with higher-income households being relatively more indebted (Figure 1).

Households that are more indebted tend to adjust their consumption-savings decisions more markedly when facing a change in the interest rate environment (due to changes in net financial wealth). This suggests that a higher degree of household debt is associated with stronger transmission of monetary policy through the interest rate and credit channels.

Indebtedness of Hungarian households across gross wealth deciles

Figure 1




Source: MNB.

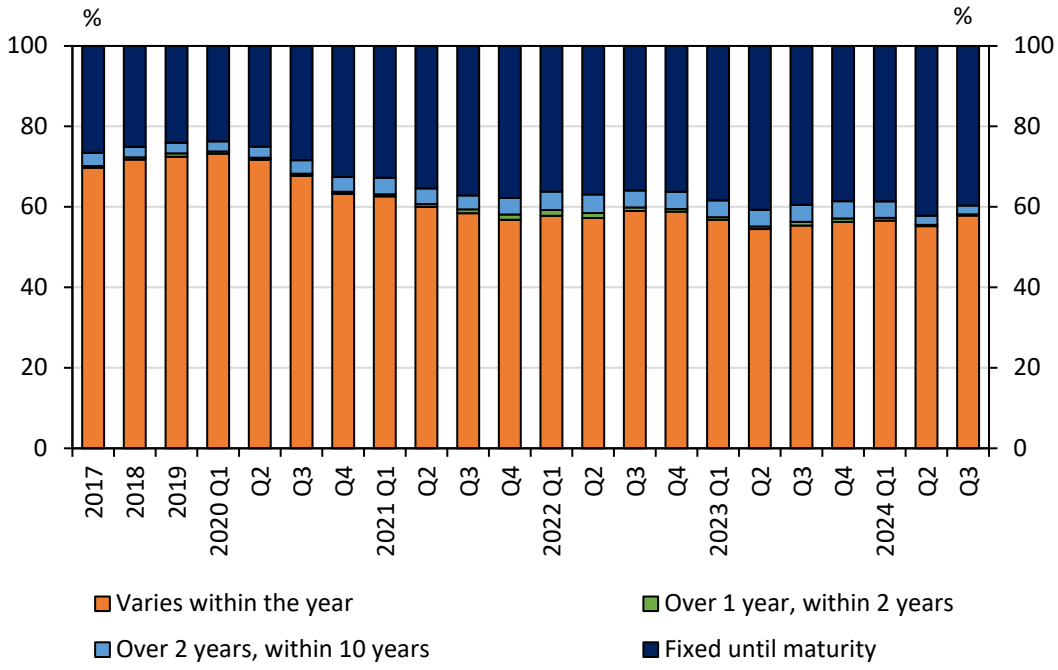
Furthermore, households with lower labour income generally behave in a "hand-to-mouth" way, ie they consume all of their income. When the central bank increases the policy rate, households with lower net wealth hit liquidity constraints (eg by losing creditworthiness). This forces them to adjust their consumption, once again strengthening transmission.

## 3.2 Variable and fixed rate lending

In Hungary, the share of loans with interest rates fixed until maturity has risen significantly in the corporate segment both in the outstanding loan portfolio and in new disbursements in recent years. In the outstanding non-financial corporate loan portfolio, the share of fixed rate loans was 24% at the end of 2019, but due to subsidised loan programmes introduced following the Covid-19 pandemic, their share increased to 38% by the end of 2021 (Figure 2). Since then, the share of fixed rate loans has stagnated within the loan portfolio, amounting to 40% in the third quarter of 2024.

Breakdown of the outstanding loan portfolio of non-financial corporations by interest rate period

Figure 2



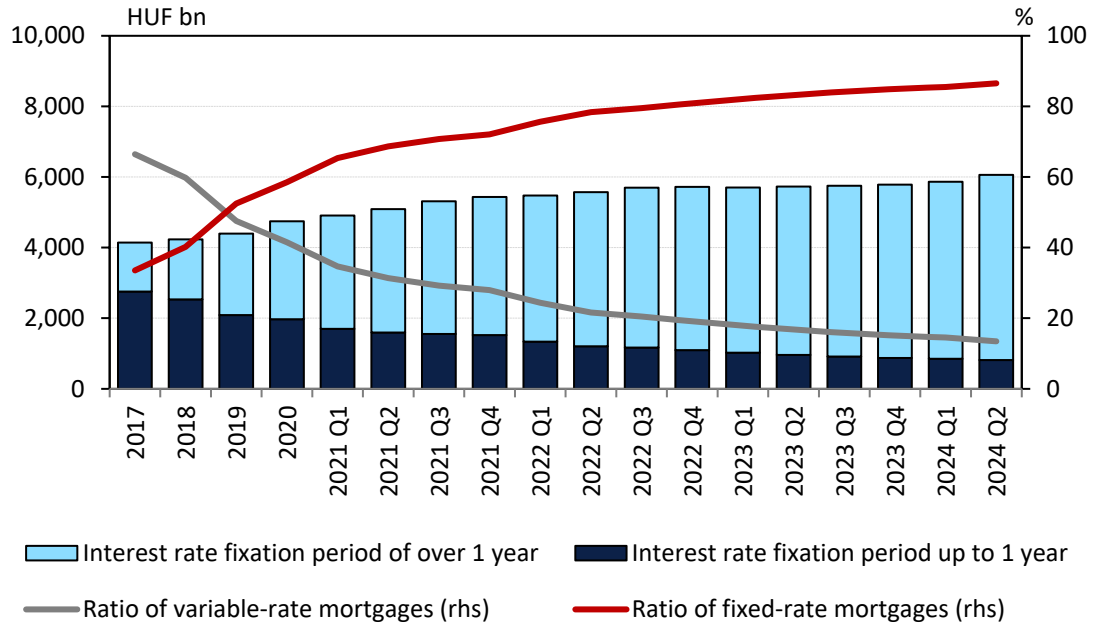

Source: MNB.

In parallel with this, the share of loans with fixed interest rates until maturity was 42% within new disbursements in 2022–23 and 39% in the first nine months of 2024. The share of fixed rate loans within new disbursements is relatively high, due to subsidised loan programmes (eg the Széchenyi Card Programme and the Baross Gábor Reindustrialisation Loan Programme).

For households, almost all new mortgage loans have their interest rate fixed for at least one year; the share of these loans is close to 90% within mortgage loans outstanding (Figure 3). By comparison, this ratio was only 34% at the end of 2017. The MNB has supported mortgage lending with a longer interest period via several measures, such as the introduction and promotion of the Certified Consumer-Friendly Housing Loans certification and the differentiation of regulatory limits based on the interest rate risk of housing loans. As a result, the share of mortgage loans with an interest rate fixed for a longer period rose significantly within new mortgage loan disbursements, and their ratio amounted to 98.6% in September 2024. Subsidised loan programmes, for example the Home Purchase Subsidy Scheme for Families (HPS), also supported the increase in the share of fixed rate mortgage loans. Longer-term interest rate fixation mainly refers to interest rates that are fixed for at least 10 years, but many mortgages have fixed interest rates until maturity.

Mortgage loans outstanding in the credit institution sector by interest rate period

Figure 3




Home Purchase Subsidy Plus Scheme for Families (HPS Plus) loans, available from January 2024, have been considered as fixed rate loans, as the client interest rate is fixed and cannot exceed 3%.

Source: MNB.

Fixed rate mortgages provide several benefits in terms of financial stability, such as offering stable, predictable instalments that shield borrowers from interest rate risk. This predictability may increase the shock resilience of households, resulting in lower credit losses over time. The stability in debt service costs can also lead to lower risk premia for borrowers. However, there are costs associated with fixed rate mortgages as well. Fixed rate loans usually have higher initial interest rates and after a time of high interest rates, borrowers might find themselves locked into high rates for extended periods.

Moreover, fixed rate loans may reduce the effectiveness of monetary policy transmission. However, this effect may be much more limited in small open economies such as Hungary, as it is counteracted by a strong exchange rate channel (Soós et al (2020)).

As the predictability of instalments supports financial stability and increases the room for manoeuvre of monetary policy without greatly affecting its transmission, in 2017 the MNB decided to shift the mortgage loan market towards longer interest rate fixation through a range of regulatory steps (MNB (2023)). Owing to these measures, variable rate mortgage lending practically came to a halt by the end of 2018 and fixed rate mortgages became the new norm. This has materially contributed to amortisation of the variable rate mortgage stock and has played a pivotal role in maintaining financial stability during the MNB's rate hike cycle that began in 2021, in response to high inflation.

## 3.3 Firm size heterogeneity

In Hungary, an overwhelming majority of firms are micro enterprises and small and medium-sized enterprises (referred to jointly as SMEs), making up over 99% of all enterprises. In addition, based on 2022 data, SMEs were responsible for approximately 67% of all domestic employment. However, at the same time, they only accounted for around 44% of value added by corporations and their share of total company revenues was only 36%. Value added by SMEs was approximately 38% of value added by large enterprises in 2022 (HCSO (2024)). Additionally, the growing number of SMEs in recent years mainly reflects a rise in micro enterprises, instead of small and medium-sized enterprises.

In general, the smaller a firm, the more difficulty it faces in raising funds. Not only are their internal funds limited, the financing premium of SMEs is also higher than that of large enterprises, resulting in less access to external funding. However, in Hungary, capital market financing is less pronounced, due to limited market development in that regard; therefore, credit markets provide the majority of external funds. Consequently, heterogeneities in firm size do not generally lead to restricted access to external funding for SMEs, but rather to differences in the price of credit.

Heterogeneities in the price of credit affect the transmission of monetary policy and have implications for financial stability as well. As the central bank raises the policy rate, SMEs face a larger increase in the interest rate environment due to their higher financing premium. On the one hand, this leads to more subdued investment activity by SMEs, as the projected profitability of their projects decreases significantly. On the other hand, this also means that monetary policy decisions can have a sizeable impact on SME credit risk, which the central bank also needs to consider. However, the SME sector in Hungary is often supported by subsidised loan programmes by the EU, the Hungarian government or the MNB, and therefore the sector's overall credit risk remains low even in a high interest rate environment.

## 3.4 Heterogeneity of inflation expectations

According to the MNB's Quarterly Survey of Households, the interquartile range of perceived inflation was relatively high in Hungary in recent quarters. In the third

quarter of 2024, average perceived inflation over the past year ranged from 9% in the second quartile to 16% in the third quartile (actual inflation decreased from above 10% to below 4% in the relevant period). In line with this, and partly due to their backward-looking nature, inflation expectations also display a large degree of heterogeneity.

Wide disagreements in households' inflation expectations can affect the transmission of monetary policy. There is evidence that large disagreements are mainly driven by a lack of information: some households misinterpret a pure monetary policy shock as a mixture of shocks, which results in a response that is markedly different from the one produced by benchmark models (Falck et al (2021)). Given the substantial range of expected inflation rates in Hungary, this may affect savings decisions and/or portfolio choices.

A further dimension of inflation expectation heterogeneity may be uncovered by looking at demographic breakdowns. International evidence suggests that expectations vary across age, gender, wealth and education (D'Acunto et al (2024)). Additionally, it would be worth exploring whether they display any sort of regional heterogeneity within one country. However, the short sample periods for available survey-based measures constrain addressing demographic questions on a granular data level.

## 4. Incorporating heterogeneity into the decision-making process in Hungary

We have seen that household and firm heterogeneities affect not only the transmission of monetary policy, but also financial stability in some cases. The question arises: how can economic policymakers and models take these aspects into consideration? In this section, we briefly explore the data-compiling and modelling activities of the central bank that revolve around heterogeneous household and firm data.

The MNB started to conduct a quarterly survey of household savings behaviour and expectations in the third quarter of 2021. Originally, the goal was to obtain a better understanding of the rapid changes in household balance sheets during the Covid-19 period. Since then, the survey has shifted more towards eliciting household expectations of main macro variables and introduced policies. Given the highly unusual recent economic environment and the short time frame that this survey has been in operation, quantitative studies rigorously analysing this data have not yet been completed. However, the survey results have nonetheless been able to inform the decision-making body of the MNB.

As mentioned previously in Section 3.1, the MNB also gathers HFCS and credit registry data. However, HFCS results are available with a significant reporting lag, and their historical coverage is limited, similarly to the quarterly surveys. Credit registry data are timely, but offer no breakdown regarding demographics. Consequently, the utility of these data sources for informing policymaking is narrow, especially in a rapidly changing environment.

Regarding macroeconomic modelling, the MNB takes into account precautionary motives in households' behaviour. After the Great Financial Crisis, it became evident that economic agents' debt and leverage constraints have significant macroeconomic effects, and thus the explicit incorporation of such cannot be neglected. The leverage constraints of households result in precautionary motives in households' behaviour, which have been incorporated into the MNB's main forecasting and policy model (Békési et al (2016)).

The wealth heterogeneity of households is reflected in two types of households: an indebted one and one with positive net financial assets. The precautionary motive results in household behaviour in the model that is in line with empirical results. On the one hand, the average marginal propensity to consume increases with precaution. On the other, the marginal propensity to consume for the poorer (indebted) households will be higher, while for richer households it will be lower. Furthermore, although not explicitly built into the modelling framework, the various levels of perceived inflation and different consumption-savings behaviours of households with different income levels are also taken into account.

Incorporating additional types of heterogeneity into a DSGE framework raises several technical and conceptual challenges. These include obstacles such as modelling complexity, computational costs and data calibration. First, the distribution of variables affected by heterogeneity can endogenously affect aggregate behaviour, and the multiple types of heterogeneity can cause externalities and other interactions in the model. Additionally, the presence of heterogeneity can affect optimal monetary policy, creating conflicts between different versions of the model. Furthermore, in many cases, solving the framework may require numerical approximations rather than analytical solutions. Finally, detailed micro data are needed for the calibration of the model, some of which are not available at the desired granularity or timeliness.

## 5. Main lessons for central bank policies

Central bank policies need to take household and firm heterogeneity into account to facilitate macroeconomic stabilisation. However, there are multiple ways of achieving this. On the one hand, monetary policy can introduce targeted measures that support a specific group of households or companies. One example of a targeted programme is the MNB's Funding for Growth Scheme (FGS), which provided funding specifically for SMEs.

On the other hand, household heterogeneity can influence financial stability and the effectiveness of monetary policy as households have heterogeneous credit risk characteristics. Macroprudential policy tools can efficiently target these heterogeneities to manage risk proportionately and give monetary policy more room for manoeuvre.

In this section, we present the Hungarian experience in these aspects. Specifically, we discuss the lessons from two MNB programmes: the FGS, aimed at SMEs, and the borrower-based measures that are able to address household heterogeneity.

## 5.1 The FGS

The MNB launched its first targeted lending incentive instrument, the FGS, in June 2013. The FGS played an important role in halting years of decline in the SME loan stock following the 2008 crisis and subsequently fostering increasingly dynamic growth. In the later phases of the scheme, the focus increasingly shifted to investment loans. The Covid-19 pandemic that hit Hungary at the beginning of 2020 prompted an extension of the scheme. The resulting "FGS Go!" provided funding to the SME sector under more favourable conditions than before, with a wide range of use options, and was one of the most important crisis management tools.

The phases of the FGS to date have provided some 75,000 enterprises (more than 8% of all SMEs in Hungary in 2022) with access to favourable funds in the amount of approximately HUF 6,400 billion (comparable to 10% of Hungarian GDP in 2022). The scheme had a positive impact not only on the credit volume but also on the composition of the loan stock, significantly increasing the proportion of predictable loans without any interest rate and exchange rate risk. According to the MNB's estimates, the FGS contributed to economic growth by more than 6 percentage points between 2013 and 2023 and, on a micro level, it significantly improved the efficiency and productivity of participating enterprises.

## 5.2 Hungary's borrower-based macroprudential measures

Heterogeneities in household credit risk may stem from their balance sheet and income structure, shock adaptability and financial literacy. In this regard, the amount of liquid assets and cash reserves, the share of total debt and its risk characteristics (denomination, interest rate fixation, etc) and the amount and stability of income are pivotal. From a monetary policy perspective, the interest rate risk and FX risk exposure of households' liabilities are particularly important, as a high share of household foreign currency debt or a high share of variable rate loans could materially amplify the financial stability risks and real economic costs of monetary policy tightening.

Macroprudential policy tools, such as borrower-based measures (BBMs) can efficiently manage these risks proportionately and give monetary policy more room for manoeuvre. The two most widespread approaches to BBMs are affordability or sensitivity tests, and the application of differentiated limits.

- **Sensitivity/affordability tests:** Borrowers and collateral are expected to meet the applied BBM regulatory limits even assuming various stress events such as interest rate shocks, currency depreciation, income or real estate price drops, etc. The advantage of this approach is its direct risk proportionality, while a potential disadvantage is its complexity, which makes it difficult to interpret for less informed borrowers.
- **Differentiated limits:** Different regulatory limits can be set according to the risk characteristics of various loans and borrowers. For instance, different loan-to-value or debt service-to-income limits could be set depending on the currency denomination of the loans, the length of interest rate fixation of mortgages, the income of borrowers, the purpose of property purchase, the energy efficiency of the financed real estate, etc. While differentiation of limits may be less risk

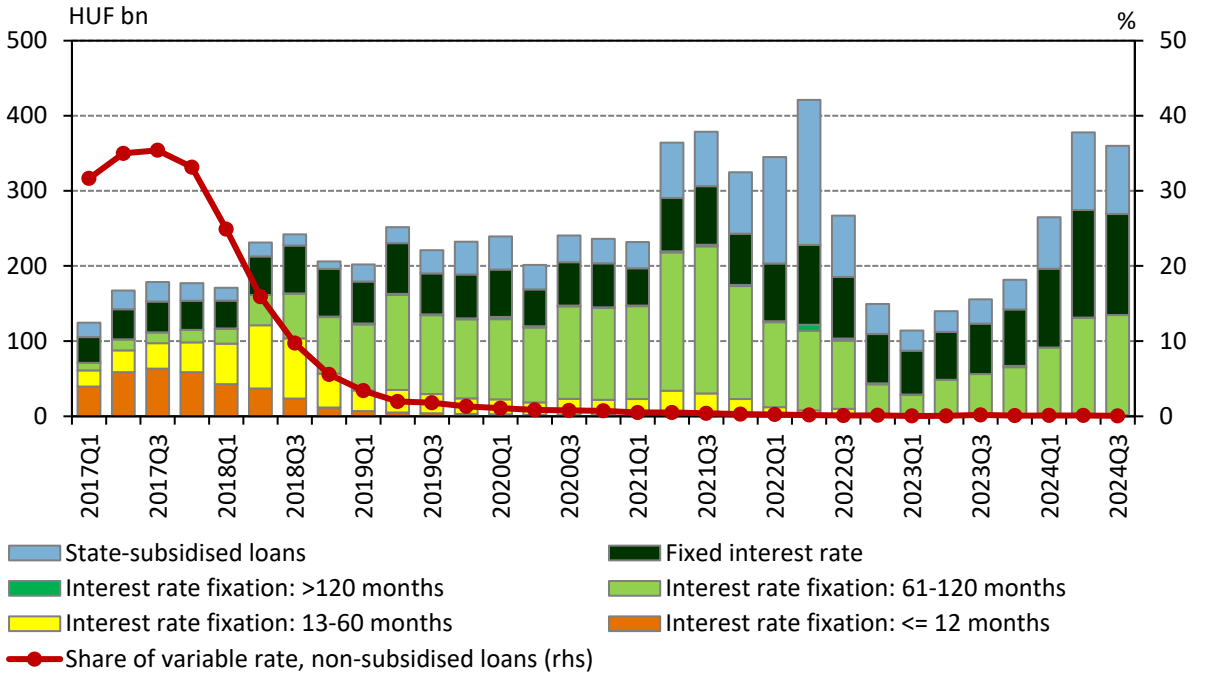
proportionate in comparison to sensitivity tests, its simplicity and transparency makes this an effective solution for ensuring proportionality.

To limit excessive household indebtedness and ensure a resilient structure of household debt, in 2015 the MNB established a legally binding loan-to-value (LTV) and debt service-to-income (DSTI) framework which applies a range of differentiation dimensions. In order to preserve the simplicity of the measures while accounting for credit risk heterogeneity, differentiated regulatory limits were applied depending on the currency denomination of the loans, and on the income of borrowers in the case of DSTI. Since their introduction, the applicable differentiation dimensions have been extended several times to align the rules with the newly arising financial stability risks as well as to minimise any potential negative side effects of the regulation (Fáykiss et al (2018)). For instance, in 2023 the MNB decided to apply lower LTV limits for first-time home buyers starting in 2024 (Grosz et al (2023)). From 2025, lower LTV and DSTI limits will apply for energy-efficient mortgages and for loans with energy efficiency increasing purposes (MNB (2024)).

The BBM framework has established an income and collateral buffer that is proportional to the heterogeneity in the risk profile of borrowers (Figure 4). This has contributed to financial stability in general and especially to the high level of portfolio quality seen in recent years in the Hungarian banking sector, despite the macroeconomic shocks since 2020. Furthermore, by specifically targeting FX and interest rate risks, monetary policy has also had more room for manoeuvre without negative financial stability consequences.

New housing lending by interest rate fixation

Figure 3




The interest rate fixation periods are depicted only for non-subsidised loans, whereas state-subsidised loans are shown separately, as they do not entail interest rate risk for borrowers.

Source: MNB.

# 6. Conclusion

Our analysis sheds light on how heterogeneity affects monetary transmission and what central banks might do about it. In our discussion, we also present practical aspects of how the MNB deals with granular economic data and what policies it uses to address heterogeneity. With this hands-on approach, we aim to facilitate discussion related to how heterogeneity can be effectively incorporated into central bank decision-making.

The MNB regularly collects data and tracks the evolution of heterogeneity to have a better understanding of its effects on the transmission of monetary policy. In addition, the central bank incorporates some of the data – explicitly or implicitly – into its forecasting models; however, due to lags in data publication and limited historical coverage, the immediate utility of incorporating granular data into the policy model is currently limited.

Over the years, the MNB has addressed heterogeneities directly when designing economic policy. For instance, the Funding for Growth Scheme has provided favourable funding of approximately 10% of domestic GDP over 10 years, targeting SMEs specifically. To complement monetary policy, the MNB also addressed the heterogeneity in household credit risk by introducing differentiated regulatory limits. These measures contributed to establishing a sound financial system and high debt portfolio quality, therefore securing room for manoeuvre in monetary policy.

Nonetheless, challenges remain. In some areas, collection of granular data has only recently started. Once sufficient data become available in a timely manner, they can greatly inform central bank decision-making. Finally, discussion needs to be furthered about concrete policy tools that are designed to address heterogeneity. This may help policymakers learn about international best practice and enable experts to overcome technical difficulties.

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