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Decomposition of retail loan growth*

Martin Cesnak[1]

Abstract

Retail loan growth, especially housing loan growth, in Slovakia continues to be one of the highest within the euro area, even during and after the COVID-19 pandemic. We decompose the annual growth rate of retail housing and consumer loans into the main factors enabling this high growth. These factors include growth of collateral value related to the strong price acceleration of residential real estate, income growth, the long-term decline of market interest rates and the extension of loan maturity. The latter is mainly used for refinancing loans and represents the strongest factor enabling increase of principal. Using microdata of individual retail loans granted in Slovakia, we show that the growth of housing loans would have been at least a third lower without these factors. The recent decrease of the consumer loan stock is explained by the strongly declining demand for consumer loans, triggered after the outbreak of the pandemic.

JEL Code: G21, G51

Keywords: factor decomposition, retail loan growth, housing loan growth, borrowing capacity, collateral value, real estate development.

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Nontechnical summary

Retail loans, especially housing loans, in Slovakia continue to exhibit the highest growth in the euro area. Understanding the underlying causes of this development is important for macroprudential authorities, as it can become a source of future financial instability.

In this paper, we decompose the growth rate into primary factors that directly contribute to or allow this high growth. The main factors considered in this paper are the growth of borrowers' income, changes in interest rates, loan maturity extensions and the growth of collateral value. We use a unique, loan-level micro-database where data have been collected since mid-2018. For each loan, we calculate a counterfactual size, i.e., a hypothetical size of the loan assuming that the values of the key loan size determinants would have remained constant. The gap between the actual size of a loan and its counterfactual size is attributed to the abovementioned factors. The remaining loan growth component can be interpreted as "natural growth" in demand for loans. In addition, we estimate the contribution of each factor and examine their dynamics. The decomposition results can be used as complementary information for macroprudential policy when assessing retail loan growth to identify possible causes of excessive growth.

Based on our estimates, the growth of housing loans would have been at least one-third lower without the abovementioned factors in each of the three years under review. The main drivers are the growth of borrowers' income and the growth of collateral value. Moreover, the impact of collateral value growth has gradually increased in importance and became the dominant factor in 2021. This is in line with the strong price acceleration of residential real estate in Slovakia in recent years. The substantial increase in prices especially affected loans for owner-occupied housing, forcing borrowers to reduce the size of dwellings to meet their borrowing capacity. The long-term trend of declining market interest rates has also contributed to this growth. However, the rates have already reached historically low levels; thus, there has been little room for further decline. In fact, interest rates already started to rise in 2022, which could place downward pressure on future loan growth. The extension of loan maturity is particularly used for refinancing loans and represents the strongest factor enabling principal increases. Borrowers often extend their housing loan maturities by more than 5-6 years on average, which creates space for further debt deepening. Moreover, it increases the share of loans with maturities beyond borrowers' retirement age and thus raises concerns from a financial stability perspective.

Regarding consumer loans, however, we observe a decline in demand and a gradual decrease in the consumer loan stock. We also observe increasingly frequent refinancing transformations of consumer loans into less expensive housing loans.

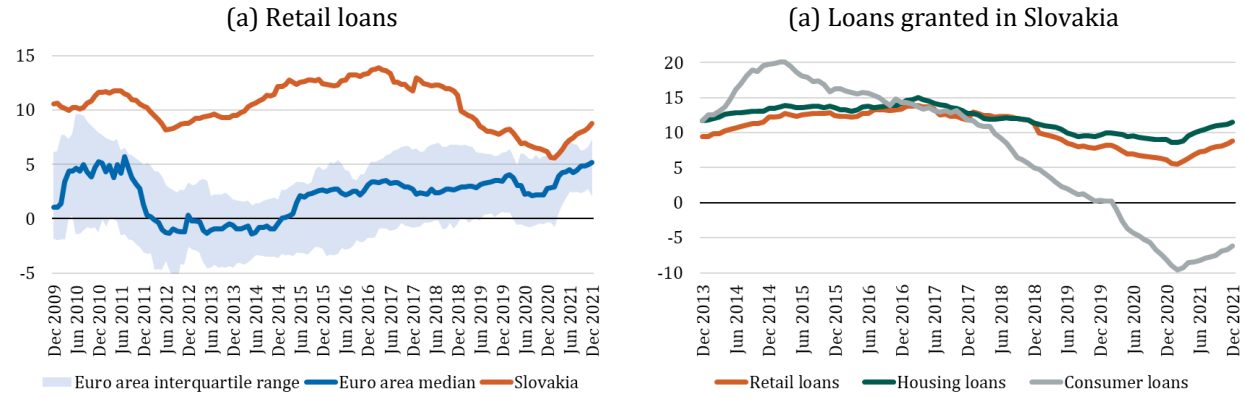
Nearly half of all housing loans and more than half of all consumer loans were granted to already indebted borrowers in all years under review. Therefore, a significant proportion of borrowers do not amortize their debt. Instead, they do the opposite and contribute to the

already high indebtedness of households in Slovakia. This implies clear risks for financial stability in the future.

Introduction

Retail loan growth, especially housing loan growth, in Slovakia has been well above most of the euro area countries since the global financial crisis (Chart 1). This requires more attention from macroprudential authorities as sustained excessive credit growth is one of the most reliable early indicators of future financial instability and may even foreshadow an incoming financial crisis. (Borio and Lowe, 2002; Borio and Drehmann, 2009; Gertler and Hofmann, 2018; Grešl and Seidler, 2011; Jorda et al., 2014; Jorda et al., 2021).

Chart 1 Annual change in stock of loans (% p.a.)



Note: Euro area represents countries of euro area excluding Slovakia.
Source: NBS, Euro Area Statistics, author's own computation.

One way to approach the loan growth more sophisticatedly, is to decompose it into factors that allow or contribute to this growth. Such a study was conducted by Jacobsen and Naug (2004), who decompose the growth of household debt in Norway, concluding that most of the growth in period from 2002Q1 to 2004Q1 is attributed to the developments in the housing market and declining interest rates. Another Norwegian study (Lindquist et al., 2017) introduces us to microdata-based decomposition, using the Blinder-Oaxaca method[2]. The authors decompose the increase in average household debt between years 2010 and 2015 into the contributions of fundamental variables, such as household income, house value or age of main income earner. The decomposition was calculated across different, mutually exclusive sub-samples of households, representing specific stages of their life cycle. The authors conclude that households' debt growth to a large extent reflects higher income and higher house values. Moreover, for first-time buyers the debt growth can be fully attributed only to the growth in house prices. Unfortunately, the authors did not have access to data containing household-specific interest rates, which should have been included in the analysis as an explanatory variable as well. Therefore, an implicit interest rate for indebted household was calculated, resulting in insignificant effect on average debt shift.

[2] A statistical method invented by Blinder (1973) and Oaxaca (1973), who proposed a way to decompose the difference in the mean-dependent variable between two groups or time periods into the contributions of fundamental variables.

We use the advantage of having access to the micro-database of individual retail loans granted in Slovakia, where all necessary information about each loan's parameters is available. Specifically, we focus on parameters determining the loan size. The relationship between the loan size and the parameters is expressed by two equations. The combination of borrowers' income, loan maturity and interest rate determines the loan size from a borrowing capacity perspective, the collateral value describes the size through borrowers' leverage. A change in any of the considered parameters may potentially affect the size of the loan. Increase of income, maturity extension or decline in interest rate increase the borrowing capacity and thus allow borrowers to take a higher loan. Conversely, increase of property prices (translated into collateral value) forces borrowers to take higher loans, as the collateral is usually also a subject of purchase financed by the given loan in the case of secured lending. In summary, four main factors affecting the growth of loans are considered in this paper, including growth of borrowers' income, growth of collateral value, change in interest rates and loan maturity extensions.

Based on the two equations mentioned above, we calculate a counterfactual size for every loan, i.e., a hypothetical size of the loan assuming that the values of parameters would not have changed year-on-year while keeping the actual values of leverage ratio and debt-service burden ratio. The gap between the actual size and counterfactual size of loans is attributed to the impact of the factors. The rest of the growth represents a "natural" growth in demand for loans - an indicator of whether the loans are being granted faster than they are being repaid. The key question is what the loan growth rate would have been if income, collateral value, interest rates and loan maturities had been constant over the observed period. In addition, we estimate the contribution of each factor to the growth and look into their dynamics. The micro-data used in the calculations has been collected since mid-2018, therefore the annual growth of housing and consumer loans is decomposed in years 2019, 2020 and 2021.

At this point, it is necessary to underline that the goal of this paper is to attribute the loan growth to actual changes in loan size determining parameters (from a technical point of view), not to estimate and quantify the supply/demand side factors affecting this growth, although there is a wide range of literature covering this topic as well. Many of them confirm the existing relationship between our selected factors and the credit/debt dynamics. For example, Jarmuzek and Rosenov (2019), Turinetti and Zhuang (2011) or Meng et al. (2013) agrees on decreasing interest rates and increasing house prices being associated with high credit/debt growth. Vokorokosová and Peller (2013), or Kearns et al. (2020) add rising incomes to that.

The paper is organized as follows. The next section introduces the decomposition method used. Section 2 describes the results achieved. Finally, we conclude.

1. Decomposition method

1.1. Loan dynamics

The aim of this method is to decompose the growth in stock of loans and quantify the impact of the factors allowing or contributing to this growth. In other words, we use an internal micro-database of individual retail loans on both housing and consumer loans to explain their dynamics in more detail.

We start with analyzing the stock of loans at the initial time T and its dynamics during the observed period $\langle T, T+1\rangle$. First, there is a share of loans whose status remains unchanged. Second, there is a share of loans which are fully repaid until the time $T+1$, either by an early repayment of the entire loan, or simply by regular installments. A certain share of loans is refinanced or re-negotiated. In this case there is an option to increase (so-called top-up) or decrease the outstanding principal of the refinanced loans. Moreover, it is possible to refinance consumer loans together with housing loans into one housing loan, which on the one hand increases the stock of housing loans, but on the other hand decreases the stock of consumer loans. Finally, the stock increases by a share of new loans granted during the period considered (so-called new business). Naturally, all loans are amortized, either by an early repayment of part of the loan, or by regular installments.

Based on the above the dynamics of loans can be split into categories depending on their contribution (Table 1).

Table 1 Contributions to the loan growth

Positive contributions	Negative contributions
• Newly granted loans • Principal increase related to refinancing/re-negotiating • Consumer loans refinanced into housing loans[3]	• Fully repaid loans • Principal decrease related to refinancing/re-negotiating • Amortization of debt excluding fully repaid loans and principal decrease

Source: Author.

Transforming consumer loan into housing loan is considered as a relocation of debt and although a change in quality, it does not contribute to the overall growth of debt. Therefore, the focus is on newly granted loans and principal increase related to refinancing/re-negotiating, for which we capture the possible impact of the factors allowing or contributing to the growth.

[3] This scheme applies to housing loan growth. In the case of consumer loan growth, transformation of consumer loans into housing loans contributes negatively to the growth.

The size of each loan provided to borrowers is affected by several parameters. The first set of parameters are borrowers' monthly income (Y_i), interest rate (I_i; monthly) and maturity of a loan (M_i; in years). These parameters determine the size of the loan in terms of borrowers' repayment burden via debt service-to-income ratio ($DSTI_i$):

$$LOAN_i = DSTI_i \times f(I_i, M_i) \times Y_i = L_i^{DSTI}(I_i, M_i, Y_i), \quad (1)$$

where $f(I_i, M_i) = \frac{1-(1+I_i)^{-M_i \times 12}}{I_i}$. Higher income or loan maturity, or lower interest rate allows borrowers to take a higher volume of loan while having the same debt service burden. In particular, the size-increasing effect of maturity is popularly used in refinancing loans with top-up. Maturity extension allows the borrowers to deepen the debt while having the same or even lower debt service burden. As pointed out in (NBS, 2021b), extension of the loan maturity raises several issues concerning financial stability. Borrowers may increase the maturity of their housing loan, so it exceeds their retirement age. Risks stemming from this issue were discussed in more detail in (NBS, 2021a).

Each house purchase loan must be secured by the property of borrowers (i.e. residential real estate). The higher the value of collateral (C_i), the higher size of loan the bank is willing/able to grant, taking into account the borrowers' leverage (loan-to-value ratio = LTV_i):

$$LOAN_i = LTV_i \times C_i = L_i^{LTV}(C_i). \quad (2)$$

Usually, the collateral is also the subject of the purchase. Therefore, more expensive property (translated into collateral value) **forces** borrowers to take a higher loan, which requires higher borrowing capacity. On the contrary, higher borrowing capacity **allows** borrowers to take a higher loan which allows them to buy more expensive property.

Equations (1) and (2) imply that the increase in loan volume is possible only with a simultaneous increase in the borrowing capacity and collateral value, provided that the repayment burden and the leverage are maintained. We will use this assumption later to calculate a counterfactual size of the loan to assess the impact of the change in the mentioned loan parameters on the overall loan growth.

The maximum size of the loan available for individual borrowers also depends on the bank's decision based on their risk assessment. However, it must be in line with borrower-based measures implemented by the National Bank of Slovakia. So far, a comprehensive set of regulatory lending limits has been imposed, including DSTI, LTV, debt-to-income (DTI) and maturity limits.[4]

[4] An overview of implementation and gradual tightening of borrower-based measures is available in Cesnak et al. (2021b). Current setting of instruments for retail loans: https://www.nbs.sk/en/financial-market-supervision1/macroprudential-policy/current-status-of-macroprudential-instruments/current-setting-of-instruments-for-retail-loans.

To sum up, the considered main factors that allow or contribute to the growth of loans are:

- growth of borrowers' income;
- growth of collateral value;
- change in interest rates;
- loan maturity extensions.

The remaining growth represents growth without the direct impact of the factors, i.e. if values of income, interest rate, maturity and collateral have not changed since the previous period.

The first part of this growth results from the difference between natural increase of loans (increased volume unaffected by factors) and natural decrease of loans (amortization of debt that would have occurred even if no new loan and principal increasing refinancing loan had been granted in the period under review). This difference is an indicator of whether the loans are being granted faster than they are being amortized, regardless of other factors. It can be considered as a "natural growth" in demand for loans. This demand originates either from new borrowers or existing borrowers based on the proportion of increased debt held by newly indebted borrowers (borrowers not having any other loans) or already indebted borrowers (borrowers having at least one more loan or borrowers refinancing their debt) respectively.

The second part of the remaining growth is due to consumer loans refinanced into housing loans. Their contribution to the growth also represents some sort of indicator explaining the increase in demand for housing loans and conversely the decrease in demand for consumer loans.

In summary, the growth of loans unaffected by the factors is explained by:

- growth in demand from new borrowers;
- growth in demand from existing borrowers;
- consumer loans refinanced into housing loans.

A detailed summary and categorization of loan growth contributions are shown in Appendix A.

1.2. Impact of the factors on newly granted loans

We have already identified four main factors that affect the volume of newly granted loans. The magnitude of their impact is implied by the gap between the actual size of each loan and its counterfactual size. The counterfactual size is based on equations (1) and (2), considering unchanged values of the loan parameters between the two consecutive periods.[5] To simplify the notation, we refer to period $(T-1, T\rangle$ as period T and period $(T, T+1\rangle$ as period $T+1$.

If a loan is granted in period $T+1$, we do not observe the values of borrowers' income, interest rate, maturity or collateral corresponding to period T. Therefore, we must estimate these backward-looking values. To do so, we assume that the changes of these parameters between period T and $T+1$ are relative to the changes in average values[6] of considered parameters of all newly granted loans:

$$P_i = P_{i,T+1} = P_{i,T} \times \left(1 + \Delta P_{i,T+1}\right) \approx P_{i,T} \times \left(1 + \frac{\bar{P}_{T+1} - \bar{P}_T}{\bar{P}_T}\right) = P_{i,T} \times \frac{\bar{P}_{T+1}}{\bar{P}_T}, \tag{3}$$

$$P_{i,T} \approx \hat{P}_i = P_i \times \frac{\bar{P}_T}{\bar{P}_{T+1}}, \tag{4}$$

where P represents any of the considered parameters, the top line above denotes an average and the hat symbol denotes the estimated value corresponding to period T.

Substituting variable P in equation (4) by the selected parameters gives us the estimates of income, interest rate, maturity, and collateral value of the i-th loan in period T:

$$\hat{Y}_i = Y_i \times \frac{\bar{Y}_T}{\bar{Y}_{T+1}}, \qquad \hat{I}_i = I_i \times \frac{\bar{I}_T}{\bar{I}_{T+1}}, \qquad \hat{M}_i = M_i \times \frac{\bar{M}_T}{\bar{M}_{T+1}} \qquad and \qquad \hat{C}_i = C_i \times \frac{\bar{C}_T}{\bar{C}_{T+1}}{}^{7} \tag{5}$$

respectively.

We use these values to calculate the counterfactual size of the i-th loan (the volume of loan without the impact of factors), while ensuring that actual DSTI and LTV ratios are not exceeded:

$$\widehat{LOAN}_i^{DSTI} = L_i^{DSTI}\left(\hat{I}_i, \hat{M}_i, \hat{Y}_i\right), \tag{6}$$

$$\widehat{LOAN}_i^{LTV} = L_i^{LTV}\left(\hat{C}_i\right), \tag{7}$$

$$\widehat{LOAN}_i = min\left[\widehat{LOAN}_i^{DSTI}, \widehat{LOAN}_i^{LTV}\right]{}^{8}. \tag{8}$$

[5] Since collateral value is not available for consumer loan, only equation (1) is used for consumer loan growth decomposition.

[6] Due to the presence of the outliers in the data, the average income and collateral value were calculated after trimming the lower and upper 0.5% of the values.

[7] This equation is left out when decomposing the consumer loan growth, since collateral value is not assessed when asking for consumer loan.

[8] In case of consumer loans: $\widehat{LOAN}_i = \widehat{LOAN}_i^{DSTI}$.

In other words, it is the amount which borrowers could take one period earlier, while having the same (or lower) debt service burden and leverage:

$$\widehat{DSTI}_i \leq DSTI_i, \tag{9}$$

$$\widehat{LTV}_i \leq LTV_i, \tag{10}$$

Now, a common impact of the factors on the volume of the i-th loan can be expressed as a difference between its actual ((1) or (2)) and its counterfactual size (8):

$$Factors_i = LOAN_i - \widehat{LOAN}_i. \tag{11}$$

To redistribute this impact among the factors, we first calculate the impacts of these factors separately:

$$Income_i = L_i^{DSTI}(I_i, M_i, Y_i) - L_i^{DSTI}(I_i, M_i, \hat{Y}_i), \tag{12}$$

$$Int\_rate_i = L_i^{DSTI}(I_i, M_i, Y_i) - L_i^{DSTI}(\hat{I}_i, M_i, Y_i), \tag{13}$$

$$Maturity_i = L_i^{DSTI}(I_i, M_i, Y_i) - L_i^{DSTI}(I_i, \widehat{M}_i, Y_i), \tag{14}$$

$$Collateral_i = L_i^{LTV}(C_i) - L_i^{LTV}(\hat{C}_i), \tag{15}$$

and then we proportionally alter them, so that the common impact of the factors (11) is equal to the sum of the impacts of the factors (12), (13), (14), (15):

$$Factors_i = Income_i + Int\_rate_i + Maturity_i + Collateral_i.^{9} \tag{16}$$

The factors can affect the volume of newly granted loan negatively as well. It means that borrowers could take a higher loan one period earlier, while having the same (or lower) debt service burden and leverage. This could be the consequence of decrease in their income or increase of market interest rates (decrease of the borrowing capacity) along with the decrease of the collateral value.

All observations, for which the proportional decomposition (16) gives unreasonable results are omitted.[10]

[9] Equation (15) is not used in consumer loan growth decomposition, therefore the contribution of collateral value change to the overall impact of the factors is always zero.

[10] Due to the nonlinear relationship between borrowing capacity factors and collateral value, implied by equation (8), observations may occur where proportional decomposition reverses the signs of separate impacts, or exaggerates these impacts.

1.3. The impact of the factors on the principal increase related to refinancing/ re-negotiating

The approach is similar to the approach concerning newly granted loans. We also follow equations (1) and (2) for calculating the actual granted amount of the i-th refinancing loan.[11] In addition, linking refinanced loans with refinancing loan gives us an opportunity to capture the actual changes in borrower's income, collateral value, interest rate and maturity for each refinancing loan.

We estimate the values of considered parameters at which all refinanced loans (those refinanced into the i-th refinancing loan) were repaid during the previous period. Estimating the interest rate and time to maturity is straightforward, as these values are available for all refinanced loans. If several loans are refinanced into one loan, we calculate the value of interest rate ($\hat{I}_i$) using the weighted average of interest rates of all refinanced loans (weighted according to the respective outstanding amounts). The same applies to the estimation of time to maturity ($\widehat{M}_i$). Given that the income of borrowers is assessed only at the granted date, we index this value using an average household income per person or average wages[12] from the Statistical Office of Slovak Republic (SOSR)[13], resulting in an estimation of the borrowers' income in the previous period ($\hat{Y}_i$). If several loans are refinanced into one loan, we use the average indexed income as an estimate. Likewise, the collateral value is not re-assessed each quarter/year, hence it is indexed as well using data from Property Price Map (PPM). Consequently, the sum of indexed collateral values of all refinanced loans is considered as an estimation of collateral value in the previous period ($\hat{C}_i$).[14] If only consumer loans are refinanced into a housing loan, we do not consider the collateral value as the factor which contributes to/allows the growth.

Substituting these estimates into equation (8), we calculate the size of the i-th refinancing loan without the impact of the factors. Equation (8) represents the counterfactual amount which borrowers could potentially take if interest rates and average time to maturity of all refinanced loans was maintained, income and collateral had been constant since the previous period, and the actual debt service burden and leverage were not exceeded ((9) and (10)).

The common impact of the factors on increased principal of the i-th loan can now be expressed as a difference between its actual value and its counterfactual value, or as a difference between its actual value and refinanced amount RA_i (sum of outstanding amounts of all loans refinanced into the i-th loan), whichever is lower:

$$Factors_i = min\left(LOAN_i - \widehat{LOAN}_i, LOAN_i - RA_i\right). \quad (17)$$

[11] Equation (2) is not used in consumer loan growth decomposition.

[12] Data on average household income per person are available until 2019. We use average wages to index income in following years.

[13] http://datacube.statistics.sk/#!/lang/en

[14] If the same collateral appears in multiple refinanced loans, only the latest assessed value is considered.

The minimum function guarantees that the common impact of the factors on the principal increase is not higher than the increase itself. That is the situation when refinancing under the estimated circumstances (using values $\hat{I}_i, \widehat{M}_i, \hat{Y}_i, \hat{C}_i$) would not allow for the top-up, only if higher DSTI or LTV ratios were accepted.[15]

The common impact of the factors (17) is proportionally redistributed among the factors (12), (13), (14) and (15), so that the condition (16) is met.

We accept the possibility of a negative impact of the factors on top-up. Negative impact of factors can occur in situations in which borrowers could have asked for a higher top-up while having the same (or lower) DSTI and LTV ratio, if they had decided to refinance a bit earlier (their income level and collateral value decreased in the meantime). Another possible option is that borrowers refinanced their loans under less favorable conditions (higher interest rate or shorter time to maturity than before refinancing). Or, both options combined.

1.4. Alternative approaches

We are aware of the non-triviality when it comes to decomposition using endogenous variables. However, the goal of this method is not to estimate and quantify the supply/demand side factors affecting the growth of loans but rather to attribute this growth to actual changes in each parameter determining the size of a loan.

We discuss alternative approaches of redistribution of impact among the factors in Appendix B, where the interactions among factors are incorporated in a certain way. These approaches add an extra step before the redistribution. They consider the impact of borrowing capacity factors and collateral value separately and assign weights to them accordingly. The redistribution is then performed with respect to those weights. Another advantage of these approaches is that they markedly reduce the number of omitted observations due to unreasonable proportional decomposition results (16). The results of decomposition are consistent across all proposed approaches, including the baseline one.

To work around the whole issue of correlations among factors, we also propose simplification of the decomposition method in Appendix C, where the redistribution of factors, described by equation (16), is left out. The housing loan growth is explained by the dynamics of borrowing capacity and collateral value separately.

[15] This situation occurs if at least one of the inequalities $\hat{C}_i < \frac{C_i^{Ref}}{1+\Delta LTV_i} < C_i$ or $\widehat{BC}_i < \frac{BC_i^{Ref}}{1+\Delta DSTI_i} < BC_i$ holds, where BC represents the borrowing capacity ($BC = f(I, M) \times Y$), the upper index Ref indicates the values of parameters of refinanced loans, ΔLTV and $\Delta DSTI$ denote the actual percentage changes in LTV and DSTI indicators due to refinancing. Estimated values ("values of previous period" denoted with a hat symbol) of collateral or borrowing capacity are lower than needed to maintain the size of debt with regards to the actual LTV and DSTI changes. Actual values of collateral and borrowing capacity are always higher than these "maintainable" values, otherwise the principal increase would not be possible.

2. Results

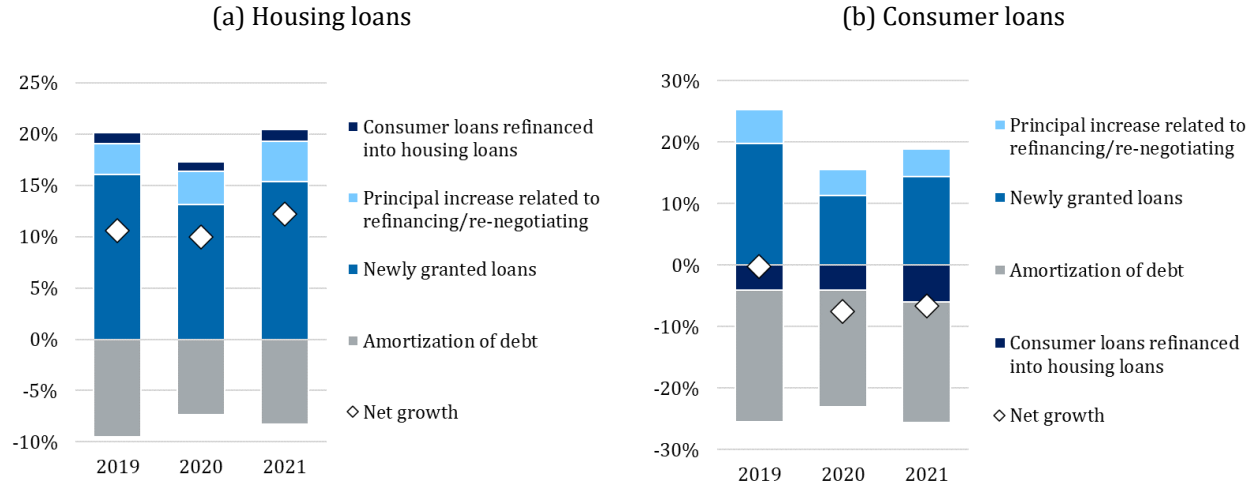
Data of individual retail loans have been collected since mid-2018, therefore we are able to decompose the annual loan growth in 2019, 2020 and 2021. We decompose housing loan growth in each region separately as well, distinguishing them based on the location of the collateral.

2.1. Overall loan growth (basic contributions)

The annual growth of housing loans reaches two-digit numbers: 10.6%, 10.0% and 12.2% in years 2019, 2020 and 2021 respectively (Chart 2(a)). The main driver is the volume of newly granted loans which contributes to the growth by more than 13 p.p. each year. Another 3.0-3.9 p.p. of the growth is due to the principal increase related to refinancing/re-negotiating. About 1% of increase in the stock is caused by refinancing of consumer loans into housing loans. The annual growth is decelerated by amortization of all loans, which decrease the stock of loans by 7.4-9.5%.

The stock of consumer loans is gradually decreasing: -0.2%, -7.5% and -6.6% p.a. in years 2019, 2020 and 2021. The repayment of the debt in years 2020, 2021 is even faster than both granting and principal increasing together (Chart 2(b)). Each year more than 4% of the stock is refinanced into housing loans, which deepens the overall decrease of the stock even more.

Chart 2 Contributions to the annual growth of loans



Source: NBS, author's own computation.
Note: **Amortization of debt** includes fully repaid loans, principal decrease via refinancing/re-negotiating/ regular installments/early repayment of the part of the loan.

2.2. Newly granted loans

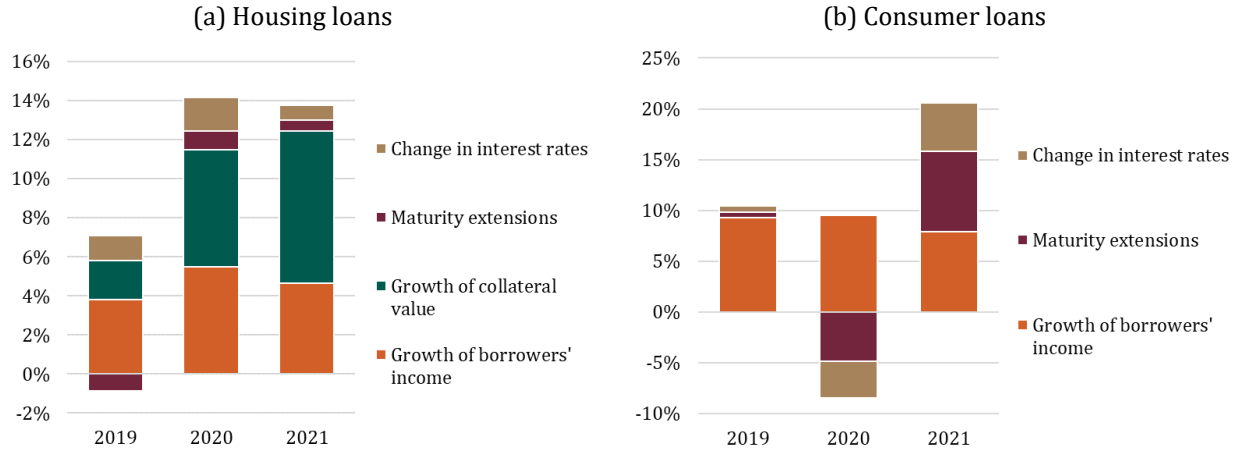
Newly granted housing loans were affected the most in 2020 and 2021, in which around 14% of the total granted volume can be attributed to the impact of the factors (Chart 3(a)). It means that the total volume of newly granted housing loans would have been 14% lower in each year if borrowers' income, collateral value, loan maturity preference and market interest rates had

not changed year-on-year. The overall impact in 2019 is much lower (6%). The most significant among the factors are growth in borrowers' income and growth of collateral value. Collateral value has been contributing increasingly due to the strong price acceleration on the residential real estate market in recent years. The growth of prices has even outpaced the growth in income, forcing borrowers to reach for smaller and smaller properties to meet their borrowing capacity
(see BOX 1). Even the decline in interest rates does not increase the capacity sufficiently. There has not actually been much room for a sharper decline as the rates have already been at relatively low levels since 2018 (1.46% p.a. in average). Its impact on newly granted housing loans is therefore minimal. Since 2020, borrowers have been taking loans with higher maturity, resulting in a shift of the average maturity by almost 1 year in 2021 compared to 2019. However, the impact is negligible compared to other factors.

Growth of the income of borrowers plays a major role in the overall impact of the factors on consumer loan growth (Chart 3(b)). Each year at least 8 % of the total granted volume is attributed to the income growth. There is a noticeable co-movement of the impact of interest rates and maturity extensions. In 2020 they even contributed negatively.[16] The following year, interest rates decreased again, and maturities were extended. Although the average maturity shifted by only half a year, it was enough to contribute to the growth of loans by 8 p.p. as the average maturity of consumer loans is short in general (4-5 years).

Results of factor decomposition of newly granted housing loans are consistent across multiple approaches (see comparison of results in Appendix B). More details about changes in parameters across all regions and for both housing and consumer loans are shown in Appendix D.

Chart 3 Factors affecting the volume of newly granted loans



Source: NBS, author's own computation.

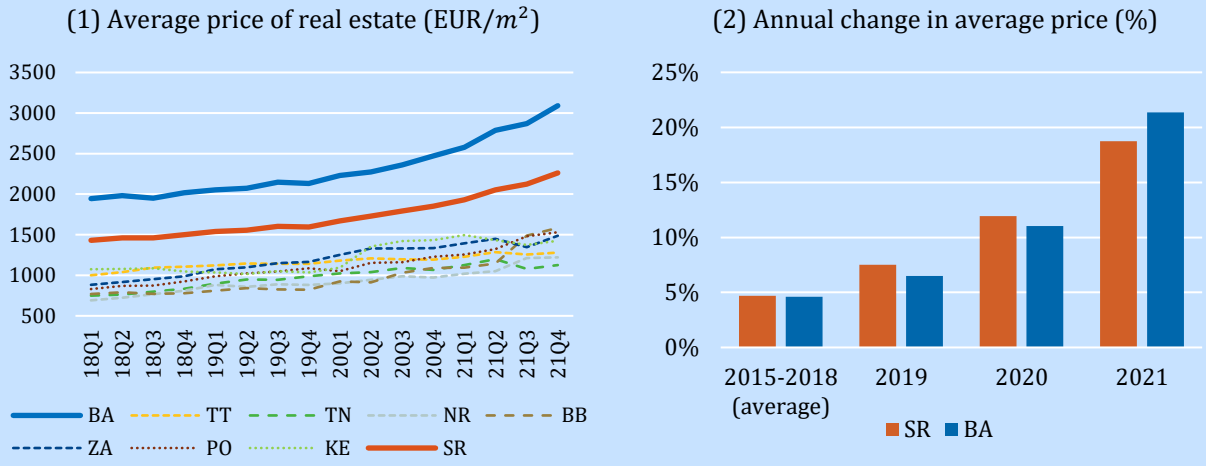
[16] Increase in the margins on riskier loans due to the pandemic crisis is one of the factors contributing to the increase in consumer loan interest rate in 2020 (NBS, 2020).

BOX 1 Residential real estate price versus size

Recent development in the residential real estate (RRE) market is not very favorable for borrowers. Especially for those taking a debt to buy a residence they want to use as their primary dwelling. The ongoing trend of increasing prices started accelerating in recent years, reaching almost 19% annual growth in 2021 (Chart A).

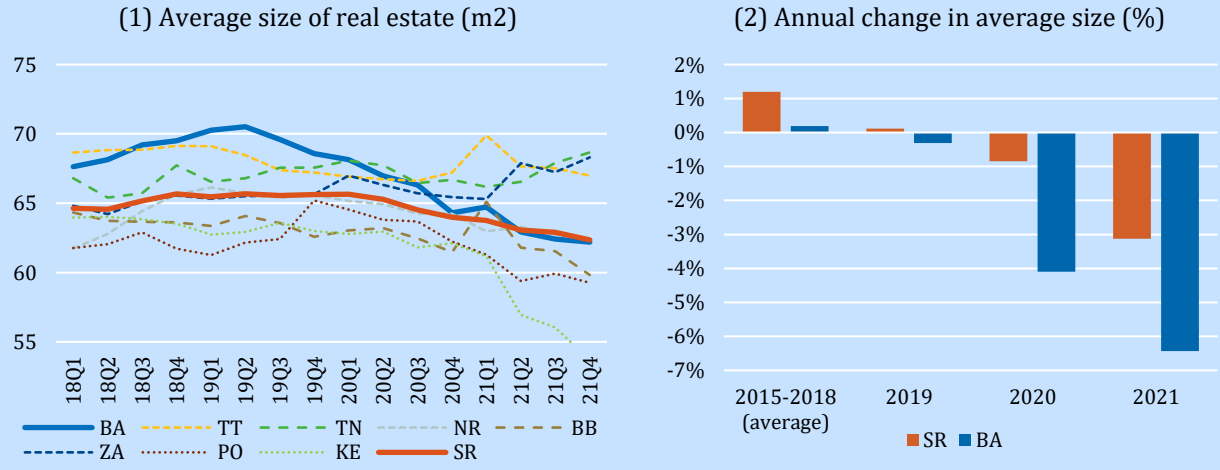
Growth in property prices was mild and stable in years 2015-2018. Thanks to increasing income an average borrower was able to secure a bit larger property each year (Chart B). However, there was a turning point in 2019, since when borrowers have been settling for smaller properties. Average purchased size started to decrease, reaching the annual growth of –3% in Slovakia and even –6.5% in the Bratislava region in 2021.

Chart A Development of average price of real estates



Source: Property Price Map, author's own computation.
Note: **BA** = Bratislava region; **TT** = Trnava region; **TN** = Trenčín region; **NR** = Nitra region; **BB** = Banská Bystrica region; **ZA** = Žilina region; **PO** = Poprad region; **KE** = Košice region; **SR** = Slovakia.

Chart B Development of average size of purchased real estates

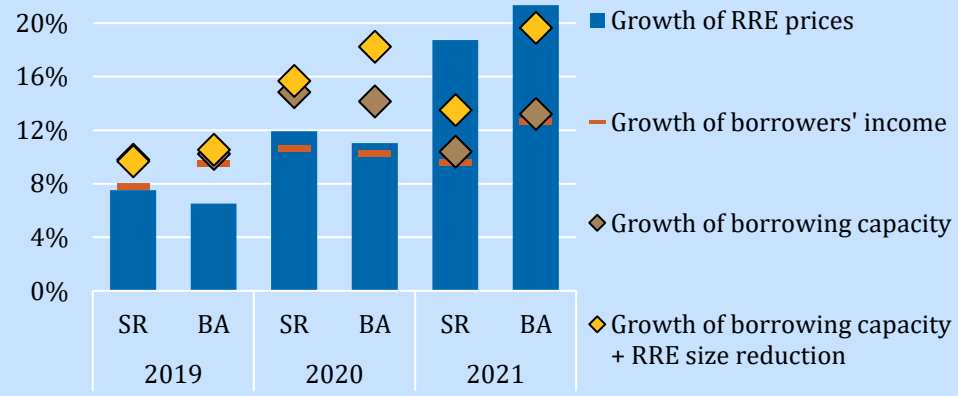


Source: Property Price Map, author's own computation.
Note: Average size of real estates are smoothed using centered moving averages. **BA** = Bratislava region; **TT** = Trnava region; **TN** = Trenčín region; **NR** = Nitra region; **BB** = Banská Bystrica region; **ZA** = Žilina region; **PO** = Poprad region; **KE** = Košice region; **SR** = Slovakia.

While in 2019 growth of income[17] was still above growth of RRE prices, in 2021 it compensated for only half of price growth (Chart C). Although income growth was no longer catching up with price growth in 2020, the gap was sufficiently covered with decline in interest rates[18]. Along with income growth, it pushed the growth of borrowing capacity back above the level of price growth.[19] Therefore, the change in average size of purchased property was mild – less than 1% downwards (Chart B(2)). With continuing acceleration of RRE prices, the gap between borrowing capacity growth and price growth widened. This called for even more significant size reduction in 2021 – 3% in Slovakia and 6.5% in Bratislava region. However, it was still not enough to cover growth of prices and thus a certain proportion of potential loan applicants could be cut off.

Since 2020 the borrowing capacity has also weakened due to DSTI limit tightening from 80% to 60% with a few exceptions up to 80%. However, quantifying such an impact is challenging. In general, tightening of any borrower-based measure (BBM) has a different impact on different types of borrowers (depending on the level of education, income level, age, ...). Although some borrowers are "forced" to apply for loans with lower DSTI than they would potentially wish, another proportion of borrowers is "encouraged" to take higher loans, closer to the newly introduced limit. The impact therefore works in both directions. The DTI limit affects the growth of borrowing capacity as well. If borrowers are already at the DTI limit, even the decline in interest rates will not allow them to take a higher loan. Therefore, the growth of their borrowing capacity is lower than shown in Chart C (but at least equal to the growth in their income). More about the impact of BBMs is documented in Cesnak et al. (2021b). In conclusion, the growth of collateral value in the years under review is purely price driven.

Chart C Residential real estate (RRE) price growth compensation (% p.a.)



Source: NBS, Property price Map, author's own computation.
Note: **SR** = Slovakia; **BA** = Bratislava region.

[17] The average income of borrowers taking a new housing loan.
[18] The average interest rate on a new housing loan.
[19] Borrowing Capacity = $DSTI \times f(interest\ rate, maturity) \times income$, where $f(r,m) = \frac{1-(1+r)^{-m\times 12}}{r}$. Since we calculate the maximum borrowing capacity attainable for the average borrower, we assume the maturity of loan at the maximum possible level, which is set by NBS to 30 years since 2017. Therefore, the maturity does not contribute to the growth of borrowing capacity in the years under review.

2.3. Refinancing loans

The results confirm that borrowers make extensive use of maturity extension to increase their debt. This is responsible for 27-33% of the annual increase in the principal of housing loans each year (Chart 4(a)). The same applies in the case of consumer loans, where maturity extension accounts for most of the overall impact of the factors (Chart 4(b)). Refinanced housing loans postpone maturity by more than 5-6 years on average while consumer loans by 1.5-2 years. These shifts push the maturities closer to the upper limits established by National Bank of Slovakia (30 years for housing loans and 8 years for consumer loans), often back to the original maturities or even beyond.

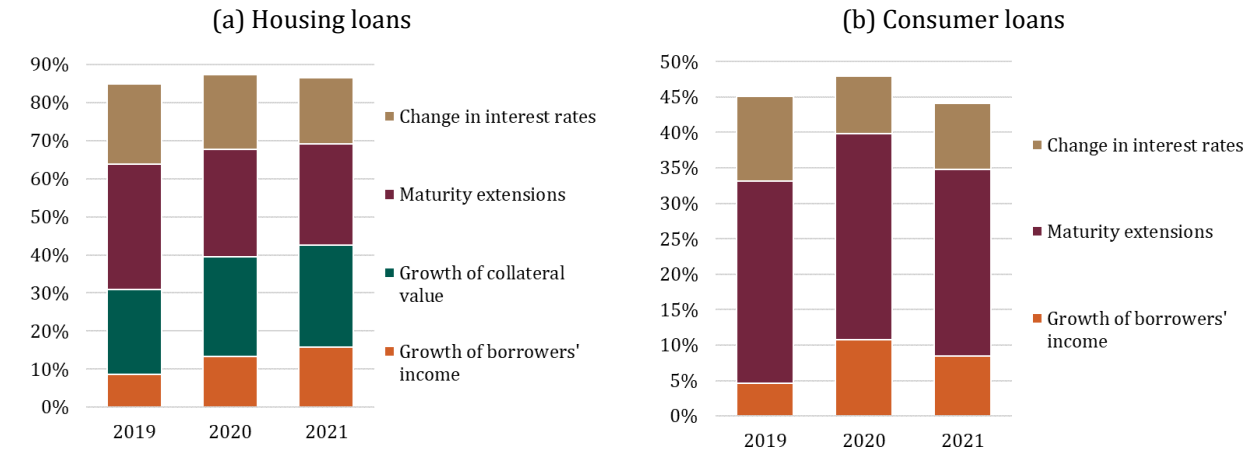
Unlike with new loans, growth of collateral value is largely outpacing growth in borrowers' income. As collateral is already in the possession of borrowers, the value is not limited by their borrowing capacity. The growth rate follows or even outpaces the price development on the residential real estate market, which has been recently the highest since 2008. This is significantly reflected in the volume of increased principal of which 21-27% is attributed to growth of collateral value each year (Chart 4(a)).

Borrowers lower their interest rates by 1.8-2.3 p.p. on average, when refinancing into housing loans. In an environment of low market interest rates, this represents a reduction of more than half. Besides gradually decreasing market interest rates, the option of refinancing consumer loans into housing loans also supports the decrease of interest rates. The estimated impact of the change in interest rates on the principal increase of consumer and housing loans is around 10% and 20% respectively.

Growth in income of borrowers has the lowest impact of all considered factors on the housing loan principal increase. However, it increases its impact with each year (from 9% to 16%), as does the collateral value growth (from 21% to 27%), both at the expense of the other two factors (from 54% to 44%). Around 5-11% of the increase in the principal of consumer loans is attributed to growth of borrowers' income.

Overall, the factors are responsible for more than 80% of the principal increase of housing loans and almost 50% of the principal increase of consumer loans every year. Results of factor decomposition of refinancing housing loans are consistent across multiple approaches (see comparison of results in Appendix B). More details about changes in parameters across all regions and for both housing and consumer loans are shown in Appendix E.

Chart 4 Factors affecting principal increase related to refinancing/re-negotiating

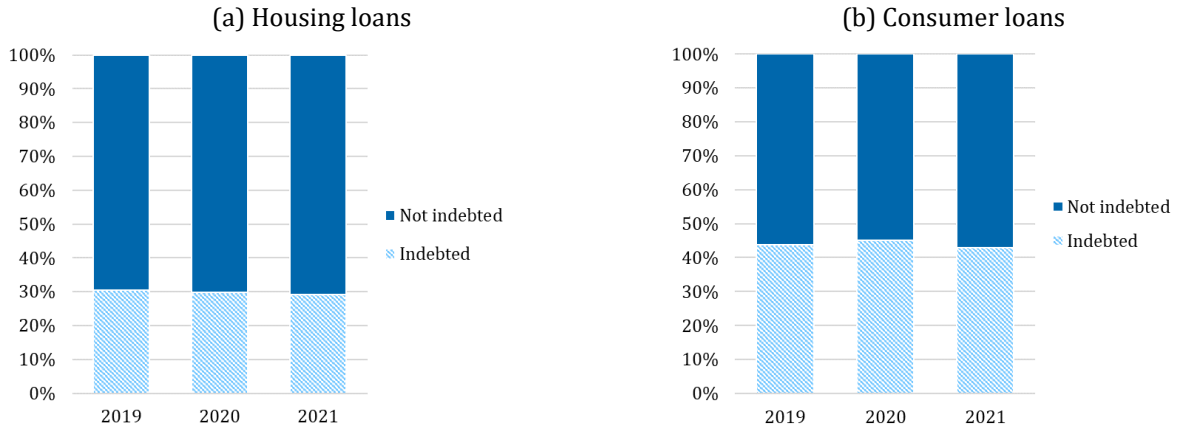


Source: NBS, author's own computation.

2.4. Decomposed loan growth

A significant proportion of borrowers do not amortize their debt. Each year, almost one third of the volume of new housing loans and almost half of the volume of new consumer loans is provided to already indebted borrowers (Chart 5). If we also include the volume increased by refinancing we find that almost 45% of housing loans and up to 60% of consumer loans are used to deepen the debt of existing borrowers (Chart 6).

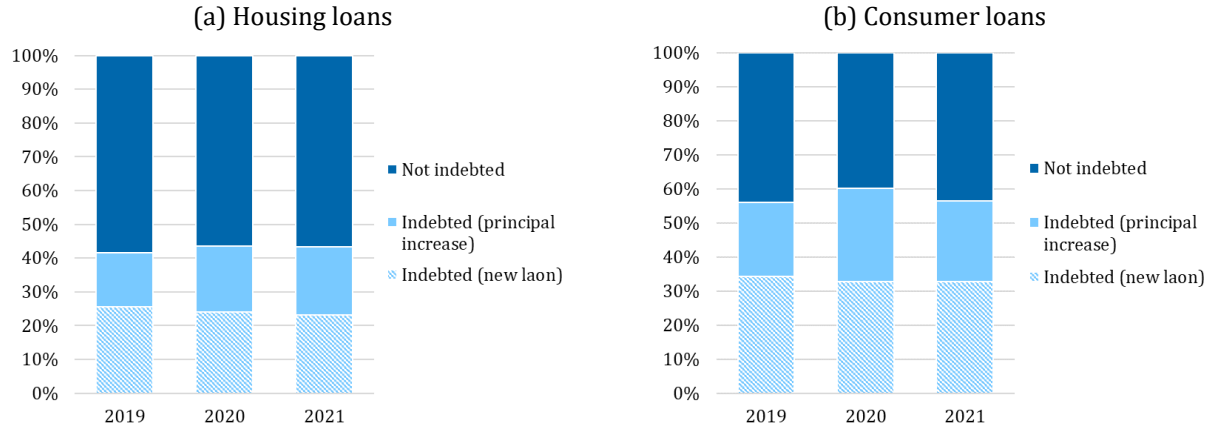
Chart 5 The share of indebted/not indebted borrowers on volume of newly granted loans



Source: NBS, author's own computation.

Note: **Not indebted** = borrowers who took a new loan without having any other housing or consumer loan; **Indebted** = borrowers who took a new loan while already having at least one housing or consumer loan.

Chart 6 The share of indebted/not indebted borrowers on volume of newly granted loans and principal increase



Source: NBS, author's own computation.

Note: **Not indebted** = borrowers who took a new loan without having any other housing or consumer loan; **Indebted (principal increase)** = borrowers who increased the principal of their existing loans; **Indebted (new loan)** = borrowers who took a new loan while already having at least one housing or consumer loan.

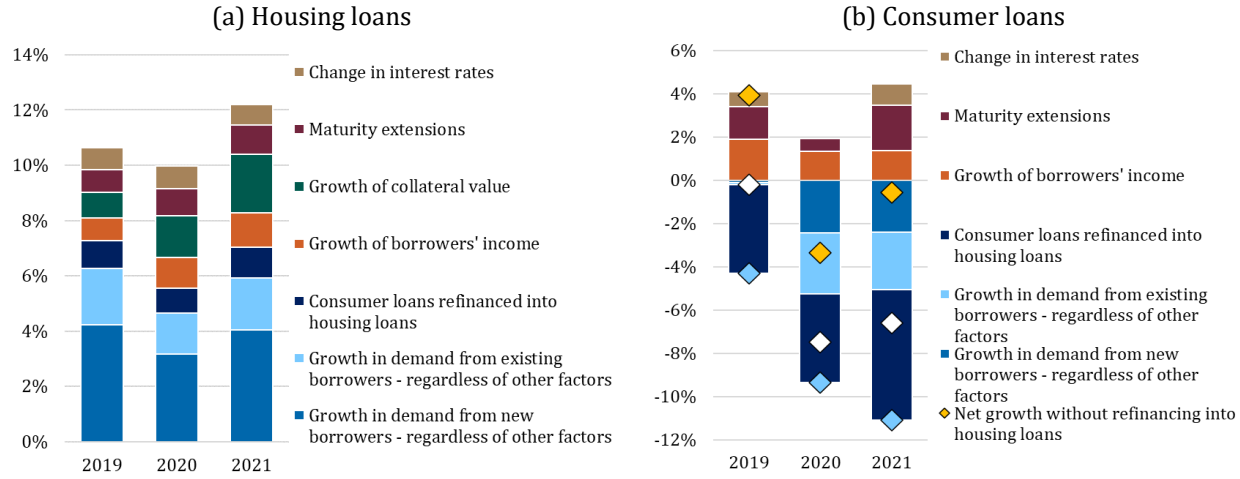
The factors explain a significant proportion of housing loan growth. At least a third of the growth is due to the impact of the factors in each observed year (Chart 7(a)). The rest of the growth is assigned to strong, persistently increasing demand for housing loans, whether through new businesses or through refinancing. The factors contribute to the increase of consumer loans significantly as well (by 2-4.5 p.p.). The negative trend in demand for consumer loans, however, mitigates this impact, and since 2020 even absorbs all the impact of the factors (Chart 7(b)). Moreover, households widely use the option of refinancing consumer loans into cheaper housing loans, which lowers the stock of consumer loans even more. Each year more than 4% of the consumer loan stock is used this way, which in turn contributes to the growth of housing loan stock by around 1 p.p.

Year 2020 was hit by the COVID-19 pandemic, causing deterioration on the labor market, and therefore increase of household credit risk and worsening of household expectations. This led to a reduction in household consumption as well as a tightening of bank credit standards (NBS, 2020). This is largely reflected in the sudden drop in demand for consumer loans in 2020, when net new lending and net increase in the principal (the volume of new loans and principal increase without impact of factors) decreased by about a third compared to 2019 (Chart 8(b)). Insufficient demand for consumer loans mostly explains the overall decline of the consumer loan portfolio. On the contrary, we observe only a small decline in demand for housing loans in 2020. Although net new lending together with net volume of increased principal declined considerably, with the support of the payment moratorium programme[20] the amortization rate decreased as well, keeping growth of demand comparable to its pre-crisis level (Chart 8(a)).

[20] The debt payment moratorium programme was implemented in 2020 in response to the increasing credit risk due to the COVID-19 crisis. This measure allowed households to defer their payments by 6 to 9 months, which helped them to offset a temporary loss of their income. The share of indebted households opting for loan payment deferral reached more than 7% during the summer of 2020, representing more than 10% of the overall retail loan portfolio (see Cesnak et. al, 2021a).

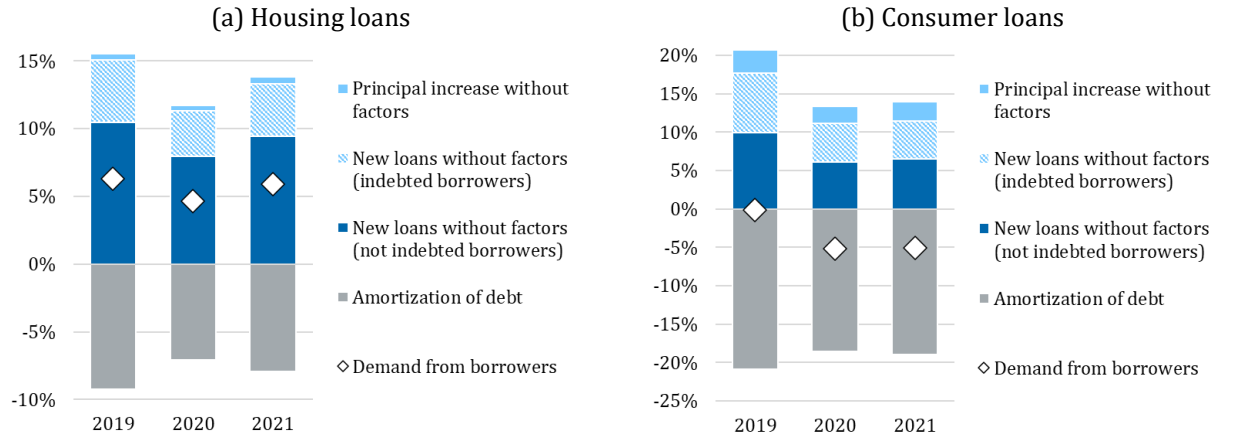
Despite the economic upturn in 2021, the growth of demand for consumer loans has not been restored. However, the growth of demand for housing loans hit its pre-crisis level, contributing to the annual housing loan growth of more than 12%. The growing demand for housing loans after the crisis is also noticeable in the form of an increasing share of consumer loans refinanced into housing loans (from 4% in 2020 to 6% in 2021). This, in turn, explains most of the decline in consumer loan stock in 2021.

Chart 7 Decomposition of annual loan growth



Source: NBS, author's own computation.

Chart 8 Growth in demand from borrowers – regardless of other factors



Source: NBS, author's own computation.

The results of the decomposition of an annual housing loan growth in each region separately are shown in Appendix F.

2.5. Policy implications

The decomposition can be used as complementary information for macroprudential policy when assessing retail loan growth (see NBS, 2021b and NBS, 2022). The results provide information about how the changes in loan parameters jointly affect the annual growth of loan volume. However, when interpreting results of individual drivers there are caveats which need to be mentioned. First, we focused only on factors which affect the loan size directly. If a different constellation of factors is used, the results may differ. Second, estimates of individual

factors slightly vary across proposed approaches and there is also a concern of present endogeneity (which could be the subject of further research). However, besides the estimation of these impacts in numbers, the decomposition gives an information about the pace of factors, if longer time series are used. This information could be useful especially in countries like Slovakia, where loan growth has been excessively high for several years, for identifying the possible causes of unsound growth.

Conclusion

The retail loan market in Slovakia has been experiencing one of the highest growth rates among the euro area countries since the Great Recession. The high growth of loans is closely related to the high growth of households' indebtedness, which was identified as one of the main systemic risks concerning financial stability in Slovakia. Although the loan growth was on a decelerating path, after the COVID-19 pandemic the trend of growth rate changed course and started to rise again, with even the strongest pace in a decade.

In this paper we decomposed the growth rate into main factors, which contribute or allow this excessive growth. The main factors can be divided into two sets. The first set of factors consists of growth of borrowers' income, change in interest rates and loan maturity extensions. All three factors determine the change in the borrowers' credit capacity. The second set consists of the growth of collateral value, which is closely related to the changes in prices on the residential real estate market and therefore concerns housing loans only. We used an internal micro-database of individual retail loans and decomposed both housing and consumer loan growth separately. Due to the short period of data collecting, we were able to decompose the annual growth rates for years 2019, 2020 and 2021. Finally, we compared estimated results with estimations achieved by multiple alternative approaches. Results are consistent across all approaches considered.

Based on our estimates, we detected the key factors contributing to the high growth of housing loans in Slovakia in recent years. The first is the growth of borrowers' income and the second is the growth of residential real estate prices translated into the growth of collateral value. The impact of the collateral value growth has been gradually increasing its share among factors and became the most dominant in 2021. This is closely related to the trends on the residential real estate market, where prices have accelerated significantly in recent years. The growth of prices is largely outpacing the growth of borrowers' credit capacity, which has led to borrowers starting to settle for smaller sized dwellings. Declining market interest rates have been contributing to the growth as well, however they have already been at the historically lowest levels, thus there has not been much room for further decline. In fact, interest rates have already started rising, which could put downward pressure on the loan growth. Maturity extension also affects the loan growth significantly. It is predominantly used in refinancing loans with principal increase. Borrowers often postpone their housing loan maturities by more than 5-6 years on average, which creates a space for further debt deepening.

All these factors together are responsible for more than a third of the growth and since 2020 even for almost half of the growth on the housing loan market. In other words, if the income of borrowers, collateral value, market interest rates and loan maturity had been constant year-on-year, the housing loan growth would have been almost half lower in these years. This implies a growth of not more than 6-7% each year. Although the factors significantly support the growth of consumer loans as well, the stock is gradually diminishing. This is explained by the strong decline of demand for consumer loans, triggered after the outbreak of the pandemic. It

is particularly noticeable in the form of increasingly frequent refinancing of consumer loans into cheaper housing loans.

Almost half the housing loans and more than half the consumer loans were granted to already indebted borrowers in the years under review. Therefore, a significant proportion of borrowers do not amortize their debt, but exactly the opposite, they contribute to the already high indebtedness. This could have serious consequences for financial stability in the future.

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Appendix A Loan growth contributions

Table A.1 Detailed summary of loan growth contributions

	1. Newly granted loans
1.a	Growth of borrower's income
1.b	Growth of collateral value
1.c	Change in interest rates
1.d	Loan maturity extensions
1.e	Newly granted loans w/o impact of factors
	2. Principal increase related to refinancing/re-negotiating
2.a	Growth of borrower's income
2.b	Growth of collateral value
2.c	Change in interest rates
2.d	Loan maturity extensions
2.e	Principal increase w/o impact of factors
	3. Consumer loans refinanced into housing loans
3.a	Consumer loans refinanced into housing loans
	4. Natural amortization
4.a	Fully repaid loans
4.b	Principal decrease related to refinancing/re-negotiating
4.c	Amortized volume of refinanced loans
4.d	Amortized volume of refinancing loans relative to the unincreased portion
4.e	Amortized volume of loans with unchanged status (via regular installments/early repayment of the part of the loan/early repayment of the entire loan)

Note: We consider the contributions in categories 1, 2 and 3 being already amortized by respective amortization rates. **1.e + 2.e** = Natural increase of loans. **4** = Natural decrease of loans.
Source: Author.

Appendix B Decomposition of the impact of factors - alternative approaches

One of a few steps of the decomposition method, in which the values are not explicitly derived from the data is the redistribution of the overall impact of factors among the individual impacts of factors. The baseline approach proposes the proportional decomposition of these impacts. There are however other possible options to deal with this issue.

Approach 1

The problem of whether the dynamics of some factors affect the dynamics of other factors remains unsolved. Is the growth of real estate driven by the growth in income? Or, conversely, does the growth of real estate stimulate the income growth? Is the maturity extension a consequence of increasing prices of real estate? Or are the prices increasing because of the increasing volume of housing loans due to the maturity extension or the decline in interest rates? It all leads to the conclusion that growth in real estate prices interacts with all three other factors, which determine the borrowing capacity. This makes sense in terms of secured lending - higher borrowing capacity allows borrowers to take a higher loan, which allows them to buy more expensive property. On the contrary, more expensive property forces borrowers to take a higher loan which drives them to increase their borrowing capacity (e.g., through maturity extension). This approach reflects to some extent the mentioned interaction between the borrowing capacity side and the leverage side.

An impact of the factors on the side of borrowing capacity as well as on the leverage side is calculated separately using actual loan size (1) or (2), and its counterfactual sizes (6) and (7):

$$Factors_i^{DSTI} = LOAN_i - \widehat{LOAN}_i^{DSTI}, \tag{18}$$

$$Factors_i^{LTV} = LOAN_i - \widehat{LOAN}_i^{LTV}. \tag{19}$$

The corresponding weights are then calculated given the extent of the impacts (18) and (19) on loan growth:

$$w_i^j = \begin{cases} \dfrac{Factors_i^j}{Factors_i^{DSTI} + Factors_i^{LTV}} & ; Factors_i^j \geq 0 \; \forall j \in \{DSTI, LTV\} \\ 0.5 & ; Factors_i^j < 0 \; \forall j \in \{DSTI, LTV\} \\ 0 & ; Factors_i^j < 0 \leq Factors_i^k; \; j,k \in \{DSTI, LTV\}: j \neq k \\ 1 & ; Factors_i^k < 0 \leq Factors_i^j; \; j,k \in \{DSTI, LTV\}: j \neq k. \end{cases} \tag{20}$$

In the case of a positive contribution of both borrowing capacity growth and collateral value growth, the corresponding weights are calculated proportionally. If they both contribute negatively to the loan growth, the weights are equivalent. It means that both the collateral value and the borrowing capacity allowed to take a higher loan in the previous period than actually taken. However, only the lower one of the two would be attainable for the borrowers with respect to the actual values of DSTI and LTV (conditions (9) and (10)). Therefore, the decrease in attainable loan amount is affected by both simultaneously. If the borrowing capacity factors

contribute positively and at the same time the growth of collateral value contributes negatively to the loan growth, the whole impact of the factors is assigned to factors of borrowing capacity and no impact is assigned to growth of collateral value (the collateral value has already allowed to take such a loan in the previous period, however the borrowing capacity did not). The same applies vice versa.

Finally, the impact of collateral value is expressed as:

$$Factors_i \times w_i^{LTV} = Collateral_i, \tag{21}$$

and the impacts of factors (12), (13) and (14) are proportionally decomposed to satisfy the following equation:

$$Factors_i \times w_i^{DSTI} = Income_i + Int\_rate_i + Maturity_i. \tag{22}$$

This approach is intended for secured lending only, therefore, it is used only for the purpose of housing loan growth decomposition.

Approach 2

The approach is based on the same assumptions as the previous one, with a minor change in the calculation of weights:

$$w_i^j = \begin{cases} \dfrac{Factors_i^j}{2 \times Factors_i} & ; Factors_i^k \geq Factors_i^j \geq 0;\ j,k \in \{DSTI, LTV\}: j \neq k \\ 1 - \dfrac{Factors_i^j}{2 \times Factors_i} & ; Factors_i^j \geq Factors_i^k \geq 0;\ j,k \in \{DSTI, LTV\}: j \neq k \\ 0.5 & ; Factors_i^j < 0\ \forall j \in \{DSTI, LTV\} \\ 0 & ; Factors_i^j < 0 \leq Factors_i^k;\ j,k \in \{DSTI, LTV\}: j \neq k \\ 1 & ; Factors_i^k < 0 \leq Factors_i^j;\ j,k \in \{DSTI, LTV\}: j \neq k. \end{cases} \tag{23}$$

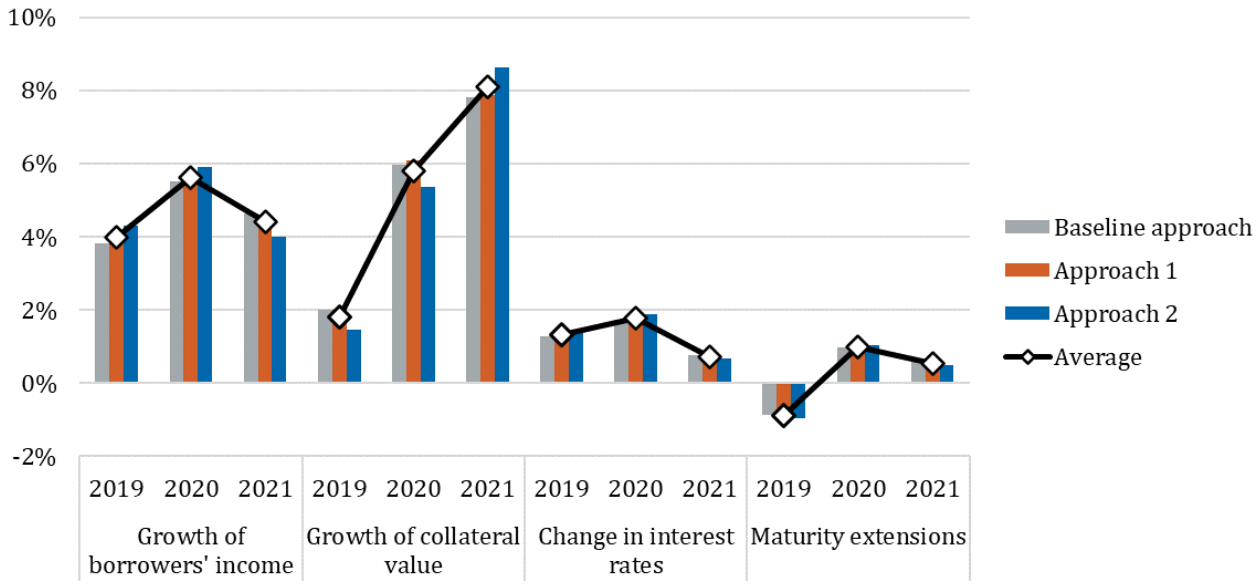
The weights (23) are constructed to amplify the impact of factors that play the major role in loan size increasing (doubling the impact of factors on exactly that part of the increased volume that they affect independently).[21]

[21] For example, if the impact of growth in borrowing capacity (BC) on loan growth was +10,000 Eur and the impact of growth of collateral value was +5,000 Eur, approach 2 would assign 75% weight to the BC growth and 25% to the collateral value growth (instead of 67% and 33% as approach 1 would have assigned).

Comparison of results

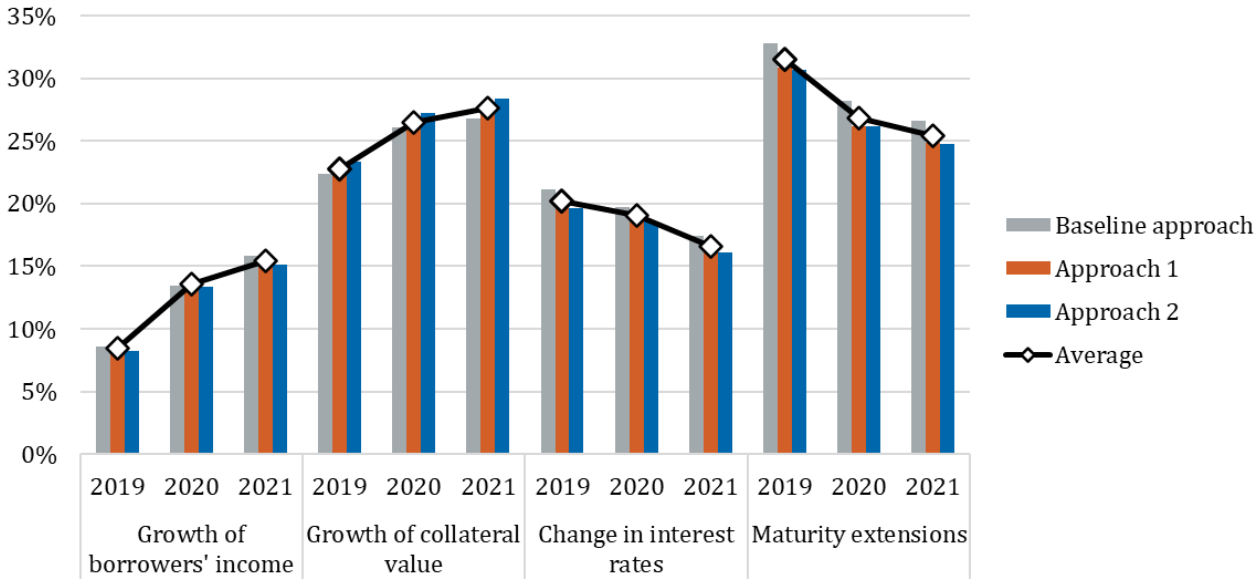
As can be seen in Chart B.1 and Chart B.2, the results are relatively consistent across all approaches considered (including the baseline approach).

Chart B.1 Estimates of factors' impact on newly granted housing loans



Source: NBS, author's own computation.

Chart B.2 Estimates of factors' impact on housing loan principal increase



Source: NBS, author's own computation.

Appendix C The role of the borrowing capacity dynamics and collateral value dynamics in housing loan growth

The borrowing capacity (the combination of borrowers' income, loan maturity and interest rate) and collateral value determine the size of a loan (equation (1) and (2)). Although they both interact, we will now focus on each of them separately.

As described in section 1.2, we assume the loan parameters of all newly granted loans to shift by the percentage change in their overall averages. This results in the same percentage changes of parameters for every single loan. Therefore, the minimum function in equation (8) selects either one of the counterfactual values (6) or (7) for every loan. The impact of factors (11) is then equal to the impact of borrowing capacity growth (18) or to the impact of collateral value growth (19) for all loans.

Unlike newly granted loans, the principal increase due to refinancing/re-negotiating is analyzed individually loan-by-loan. The impacts of factors vary across all refinancing loans and so both the separate impacts ((18) and (19)) are less than the overall impact (11) in total.[22] Even a situation in which the sum of both separate impacts is less than the overall impact may arise due to the occurrence of negative factor contributions (as can be seen in Figure C.2 for 2019).[23]

Results

Figure C.1 and Figure C.2 describe how much of the volume of newly granted loans and the volume of increased principal respectively would not have been granted if

(i) all loan parameters did not change year-on-year;
(ii) parameters determining borrowing capacity did not change year-on-year;
(iii) collateral value did not change year-on-year,

with respect to the actual values of DSTI and LTV (conditions (9) and (10)).

In the first two years, the overall impact of the factors on the volume of newly granted loans is explained by the changes in borrowing capacity. In 2019, half of the overall impact would have occurred even if collateral value had not changed at all. However, the growth of collateral value increased its influence in the following years and in 2021 even outpaced the impact of borrowing capacity growth. But even then, most of the increase in newly granted loans would not be possible without change in borrowing capacity as well.

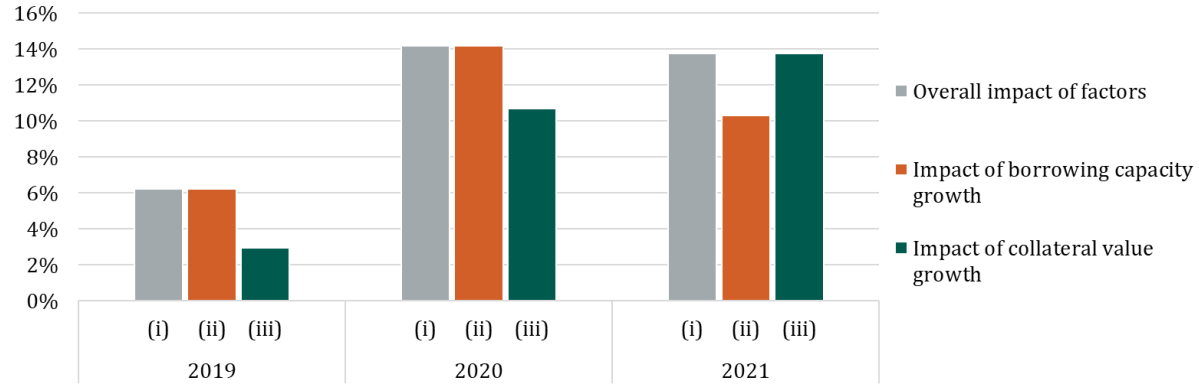
Even though the borrowing capacity growth mostly explains the volume of increased principal (especially through maturity extensions or interest rate reductions), each year, borrowers

[22] It takes only two loans with a certain constellation of impacts. E.g., in the first loan 10% is attributed to borrowing capacity growth and 5% to collateral value growth. In the second loan exactly the opposite. The overall impact of factors on the volume of both loans is 10%, however the impact of borrowing capacity growth and collateral value growth is 7.5% each.

[23] E.g., a loan in which 10% of the volume is attributed to borrowing capacity growth and -5% is attributed to collateral value growth. The overall impact is 10%, but the sum of both separate impacts is 5%.

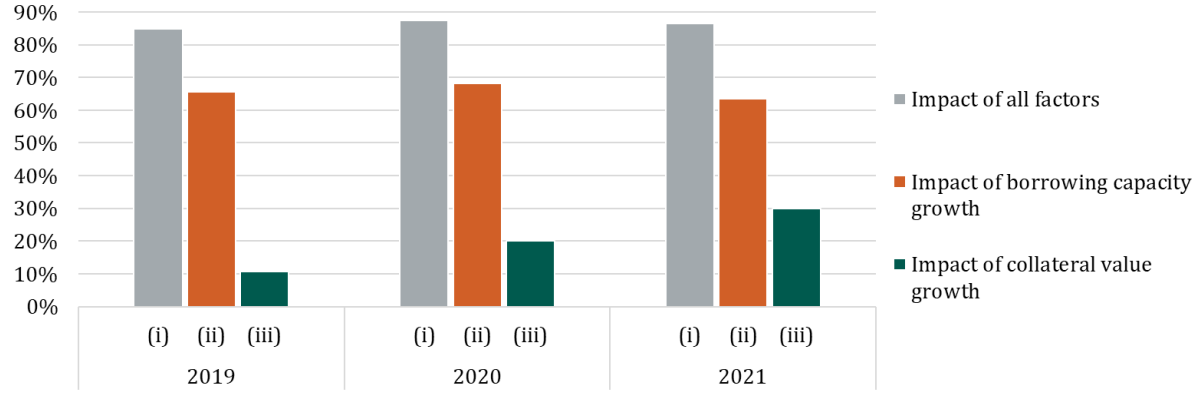
increase their principal more and more through the growth of collateral value (either due to rising prices of owned property or by including another property into collateral).

Figure C.1 Impact of factors on the volume of newly granted loans



Source: NBS, author's own computation.

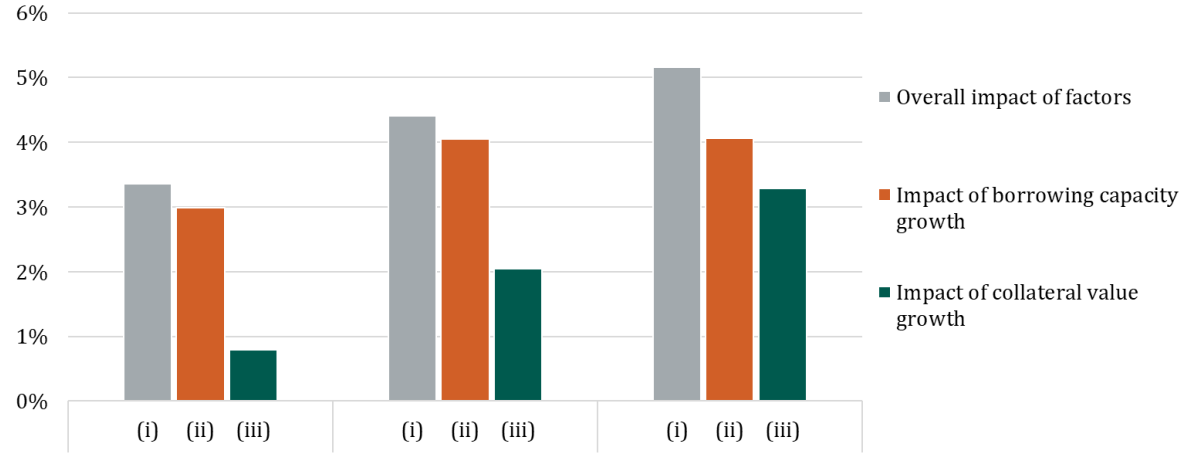
Figure C.2 Impact of factors on the volume of principal increase



Source: NBS, author's own computation.

We can observe that collateral value growth increases its influence gradually both on the volume of newly granted loan and on the volume of increased principal and thus on the overall growth of loans (Figure C.3). However, the higher share of impact is still explained by the growth of borrowing capacity.

Figure C.3 Contributions of factors to the annual loan growth



Source: NBS, author's own computation.

Appendix D Average values of income, collateral, interest rate and time to maturity of newly granted loans

Table D.1 Average monthly income of borrowers (EUR)

Loan	Region	2018	2019	Δ (%)	2019	2020	Δ (%)	2020	2021	Δ (%)
HL	BA	2 120	2 320	**9.4**	2 320	2 550	**9.9**	2 550	2 830	**11.0**
	TT	1 520	1 680	**10.5**	1 680	1 780	**6.0**	1 780	1 930	**8.4**
	TN	1 410	1 510	**7.1**	1 510	1 650	**9.3**	1 650	1 800	**9.1**
	NR	1 390	1 480	**6.5**	1 480	1 680	**13.5**	1 680	1 790	**6.5**
	BB	1 380	1 460	**5.8**	1 460	1 720	**17.8**	1 720	1 820	**5.8**
	ZA	1 450	1 590	**9.7**	1 590	1 730	**8.8**	1 730	1 920	**11.0**
	PO	1 430	1 520	**6.3**	1 520	1 690	**11.2**	1 690	1 840	**8.9**
	KE	1 550	1 580	**1.9**	1 580	1 790	**13.3**	1 790	1 940	**8.4**
	SR	1 710	1 810	**5.8**	1 810	2 010	**11.0**	2 010	2 190	**9.0**
CL	SR	890	980	**10.1**	980	1 050	**7.1**	1 050	1 150	**9.5**

Source: NBS, author's own computation.

Note: **HL** = Housing Loans; **CL** = Consumer Loans; **BA** = Bratislava region; **TT** = Trnava region; **TN** = Trenčín region; **NR** = Nitra region; **BB** = Banská Bystrica region; **ZA** = Žilina region; **PO** = Poprad region; **KE** = Košice region; **SR** = Slovakia. The averages are calculated after trimming the lower and upper 0.5% of the values in respective year.

Table D.2 Average interest rate (% p.a.)

Loan	Region	2018	2019	Δ (p.p.)	2019	2020	Δ (p.p.)	2020	2021	Δ (p.p.)
HL	BA	1.44	1.32	**-0.12**	1.32	1.06	**-0.26**	1.06	0.97	**-0.09**
	TT	1.53	1.38	**-0.15**	1.38	1.13	**-0.25**	1.13	1.01	**-0.12**
	TN	1.50	1.34	**-0.16**	1.34	1.08	**-0.26**	1.08	0.98	**-0.10**
	NR	1.50	1.34	**-0.16**	1.34	1.11	**-0.23**	1.11	1.00	**-0.11**
	BB	1.52	1.34	**-0.18**	1.34	1.09	**-0.25**	1.09	0.96	**-0.13**
	ZA	1.44	1.28	**-0.16**	1.28	1.04	**-0.24**	1.04	0.95	**-0.09**
	PO	1.42	1.26	**-0.16**	1.26	1.03	**-0.23**	1.03	0.93	**-0.10**
	KE	1.47	1.31	**-0.16**	1.31	1.06	**-0.25**	1.06	0.96	**-0.10**
	SR	1.46	1.31	**-0.15**	1.31	1.07	**-0.24**	1.07	0.97	**-0.10**
CL	SR	12.15	11.83	**-0.32**	11.83	13.28	**+1.45**	13.28	10.83	**-2.45**

Source: NBS, author's own computation.

Note: **HL** = Housing Loans; **CL** = Consumer Loans; **BA** = Bratislava region; **TT** = Trnava region; **TN** = Trenčín region; **NR** = Nitra region; **BB** = Banská Bystrica region; **ZA** = Žilina region; **PO** = Poprad region; **KE** = Košice region; **SR** = Slovakia.

Table D.3 Average time to maturity (years)

Loan	Region	2018	2019	Δ (yrs)	2019	2020	Δ (yrs)	2020	2021	Δ (yrs)
HL	BA	26.2	25.8	**-0.4**	25.8	26.1	**+0.3**	26.1	26.2	**+0.1**
	TT	25.7	25.5	**-0.2**	25.5	26.0	**+0.5**	26.0	26.2	**+0.2**
	TN	25.0	25.0	**0.0**	25.0	25.5	**+0.5**	25.5	25.9	**+0.4**
	NR	25.4	24.7	**-0.7**	24.7	25.4	**+0.7**	25.4	26.1	**+0.7**
	BB	24.3	23.9	**-0.4**	23.9	24.7	**+0.8**	24.7	25.2	**+0.5**
	ZA	24.7	24.7	**0.0**	24.7	25.2	**+0.5**	25.2	25.6	**+0.4**
	PO	24.5	24.1	**-0.4**	24.1	24.6	**+0.5**	24.6	25.2	**+0.6**
	KE	24.7	24.3	**-0.4**	24.3	25.2	**+0.9**	25.2	25.5	**+0.3**
	SR	25.4	25.1	**-0.3**	25.1	25.6	**+0.5**	25.6	25.9	**+0.3**
CL	SR	4.4	4.5	**+0.1**	4.5	4.3	**-0.2**	4.3	4.8	**+0.5**

Source: NBS, author's own computation.

Note: **HL** = Housing Loans; **CL** = Consumer Loans; **BA** = Bratislava region; **TT** = Trnava region; **TN** = Trenčín region; **NR** = Nitra region; **BB** = Banská Bystrica region; **ZA** = Žilina region; **PO** = Poprad region; **KE** = Košice region; **SR** = Slovakia.

Table D.4 Average value of collateral (EUR)

Region	2018	2019	Δ (%)	2019	2020	Δ (%)	2020	2021	Δ (%)
BA	158 100	166 500	**5.3**	166 500	184 300	**10.7**	184 300	219 600	**19.2**
TT	108 300	115 300	**6.5**	115 300	127 300	**10.4**	127 300	144 300	**13.4**
TN	91 400	98 500	**7.8**	98 500	110 400	**12.1**	110 400	122 400	**10.9**
NR	89 500	94 600	**5.7**	94 600	106 400	**12.5**	106 400	118 700	**11.6**
BB	81 200	86 500	**6.5**	86 500	101 300	**17.1**	101 300	119 800	**18.3**
ZA	101 500	110 100	**8.5**	110 100	122 000	**10.8**	122 000	138 700	**13.7**
PO	91 300	96 900	**6.1**	96 900	107 000	**10.4**	107 000	128 000	**19.6**
KE	98 800	101 300	**2.5**	101 300	115 900	**14.4**	115 900	137 200	**18.4**
SR	120 200	123 800	**3.0**	123 800	138 600	**12.0**	138 600	160 800	**16.0**

Source: NBS, author's own computation.

Note: **BA** = Bratislava region; **TT** = Trnava region; **TN** = Trenčín region; **NR** = Nitra region; **BB** = Banská Bystrica region; **ZA** = Žilina region; **PO** = Poprad region; **KE** = Košice region; **SR** = Slovakia. The averages are calculated after trimming the lower and upper 0.5% of the values in respective year.

Appendix E Average values of income, collateral, interest rate and time to maturity before and after refinancing with the principal increase

Table E.1 Average monthly income of borrowers (EUR)

Loan	Region	2018	2019	Δ (%)	2019	2020	Δ (%)	2020	2021	Δ (%)
HL	BA	1 960	2 140	**9.2**	1 980	2 200	**11.1**	2 080	2 330	**12.0**
	TT	1 560	1 690	**8.3**	1 560	1 720	**10.3**	1 590	1 800	**13.2**
	TN	1 470	1 560	**6.1**	1 500	1 650	**10.0**	1 500	1 710	**14.0**
	NR	1 460	1 580	**8.2**	1 430	1 630	**14.0**	1 480	1 680	**13.5**
	BB	1 400	1 510	**7.9**	1 430	1 570	**9.8**	1 390	1 600	**15.1**
	ZA	1 530	1 670	**9.2**	1 590	1 760	**10.7**	1 540	1 780	**15.6**
	PO	1 480	1 600	**8.1**	1 450	1 670	**15.2**	1 530	1 760	**15.0**
	KE	1 460	1 570	**7.5**	1 600	1 720	**7.5**	1 530	1 800	**17.6**
	SR	1 550	1 680	**8.4**	1 610	1 790	**11.2**	1 640	1 860	**13.4**
CL	SR	850	890	**4.7**	850	930	**9.4**	950	1 030	**8.4**

Source: NBS, author's own computation.

Note: **HL** = Housing Loans; **CL** = Consumer Loans; **BA** = Bratislava region; **TT** = Trnava region; **TN** = Trenčín region; **NR** = Nitra region; **BB** = Banská Bystrica region; **ZA** = Žilina region; **PO** = Poprad region; **KE** = Košice region; **SR** = Slovakia. The averages are calculated after trimming the lower and upper 0.5% of the values in respective year.

Table E.2 Average interest rate (% p.a.)

Loan	Region	2018	2019	Δ (p.p.)	2019	2020	Δ (p.p.)	2020	2021	Δ (p.p.)
HL	BA	3.11	1.31	**-1.80**	2.61	1.01	**-1.60**	2.34	0.89	**-1.45**
	TT	3.65	1.33	**-2.32**	3.08	1.09	**-1.99**	2.76	0.92	**-1.84**
	TN	3.79	1.34	**-2.45**	3.04	1.08	**-1.96**	2.72	0.93	**-1.79**
	NR	3.75	1.36	**-2.39**	3.30	1.09	**-2.21**	2.89	0.95	**-1.94**
	BB	3.97	1.35	**-2.62**	3.31	1.07	**-2.24**	3.01	0.91	**-2.10**
	ZA	3.58	1.34	**-2.24**	2.82	1.06	**-1.76**	2.76	0.93	**-1.83**
	PO	3.88	1.34	**-2.54**	3.22	1.06	**-2.16**	3.00	0.94	**-2.06**
	KE	3.60	1.35	**-2.25**	3.15	1.08	**-2.07**	2.83	0.96	**-1.87**
	SR	3.77	1.45	**-2.32**	3.06	1.07	**-1.99**	2.74	0.94	**-1.80**
CL	SR	9.92	7.75	**-2.17**	9.25	7.61	**-1.64**	9.16	7.37	**-1.79**

Source: NBS, author's own computation.

Note: **HL** = Housing Loans; **CL** = Consumer Loans; **BA** = Bratislava region; **TT** = Trnava region; **TN** = Trenčín region; **NR** = Nitra region; **BB** = Banská Bystrica region; **ZA** = Žilina region; **PO** = Poprad region; **KE** = Košice region; **SR** = Slovakia.

Table E.3 Average time to maturity (years)

Loan	Region	2018	2019	Δ (yrs)	2019	2020	Δ (yrs)	2020	2021	Δ (yrs)
HL	BA	19.2	24.5	**+5.3**	21.0	25.1	**+4.1**	21.2	25.3	**+4.1**
	TT	19.1	24.6	**+5.5**	20.2	24.9	**+4.7**	20.7	25.2	**+4.5**
	TN	17.7	24.1	**+6.4**	19.5	24.6	**+5.1**	20.0	24.9	**+4.9**
	NR	18.0	24.0	**+6.0**	19.3	24.9	**+5.6**	19.6	25.0	**+5.4**
	BB	17.3	23.5	**+6.2**	18.2	24.0	**+5.8**	19.1	24.6	**+5.5**
	ZA	18.0	24.0	**+6.0**	19.9	24.8	**+4.9**	19.7	25.3	**+5.6**
	PO	16.7	23.9	**+7.2**	18.7	24.9	**+6.2**	19.0	25.0	**+6.0**
	KE	18.4	24.2	**+5.8**	19.3	24.3	**+5.0**	19.6	24.9	**+5.3**
	SR	17.9	24.1	**+6.2**	19.6	24.8	**+5.2**	20.1	25.1	**+5.0**
CL	SR	5.5	7.1	**+1.6**	5.4	7.3	**+1.9**	5.7	7.3	**+1.6**

Source: NBS, author's own computation.

Note: **HL** = Housing Loans; **CL** = Consumer Loans; **BA** = Bratislava region; **TT** = Trnava region; **TN** = Trenčín region; **NR** = Nitra region; **BB** = Banská Bystrica region; **ZA** = Žilina region; **PO** = Poprad region; **KE** = Košice region; **SR** = Slovakia.

Table E.4 Average value of collateral (EUR)

Region	2018	2019	Δ (%)	2019	2020	Δ (%)	2020	2021	Δ (%)
BA	135 200	145 200	**7.4**	151 100	165 600	**9.6**	160 700	190 400	**18.5**
TT	96 500	107 000	**10.9**	102 200	118 900	**16.3**	103 900	132 300	**27.3**
TN	73 900	83 300	**12.7**	89 000	104 800	**17.8**	96 200	118 900	**23.6**
NR	79 600	85 400	**7.3**	84 300	99 200	**17.7**	82 600	110 300	**33.5**
BB	68 400	78 200	**14.3**	77 800	92 700	**19.2**	91 600	107 600	**17.5**
ZA	87 900	96 700	**10.0**	101 100	118 800	**17.5**	104 400	128 700	**23.3**
PO	69 600	82 800	**19.0**	82 500	100 400	**21.7**	90 700	117 400	**29.4**
KE	78 400	93 200	**18.9**	88 600	106 500	**20.2**	102 800	122 900	**19.6**
SR	86 800	97 100	**11.9**	101 300	118 200	**16.7**	109 400	134 400	**22.9**

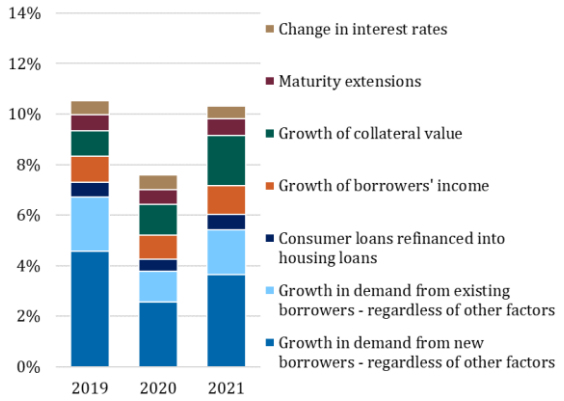
Source: NBS, author's own computation.

Note: **BA** = Bratislava region; **TT** = Trnava region; **TN** = Trenčín region; **NR** = Nitra region; **BB** = Banská Bystrica region; **ZA** = Žilina region; **PO** = Poprad region; **KE** = Košice region; **SR** = Slovakia. The averages are calculated after trimming the lower and upper 0.5% of the values in respective year.

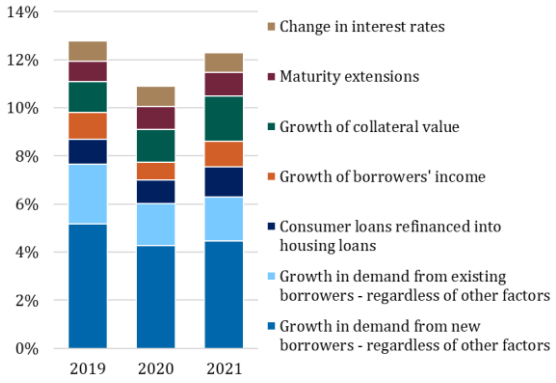
Appendix F Decomposition of an annual housing loan growth by region

Figure F.1 Decomposition of an annual housing loan growth by region

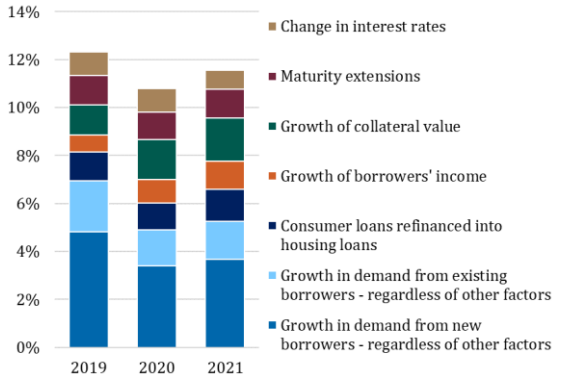
(a) Bratislava region



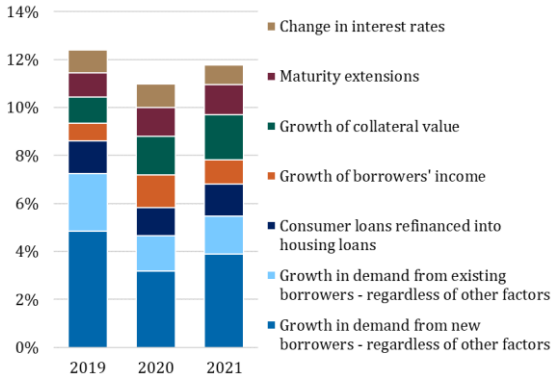
(b) Trnava region



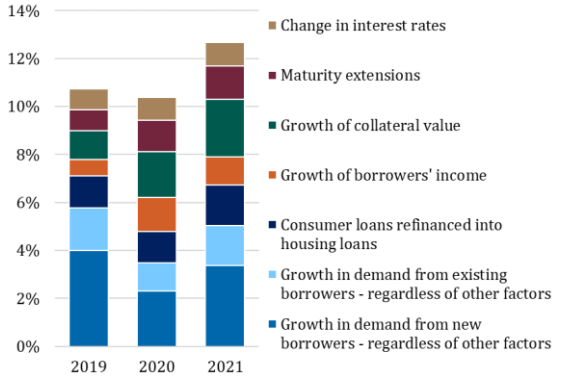
(c) Trenčín region



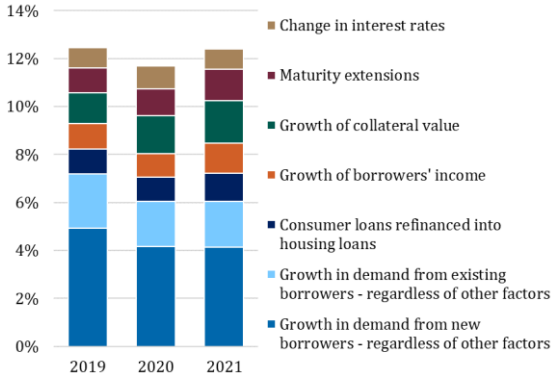
(d) Nitra region



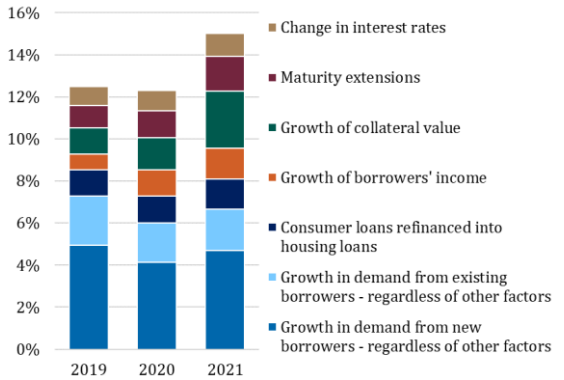
(e) Banská Bystrica region



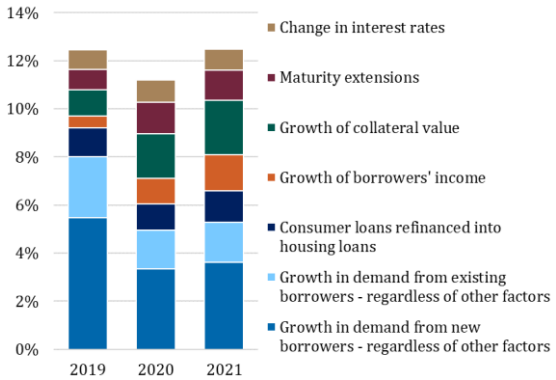
(f) Žilina region



(g) Prešov region



(h) Košice region



Source: NBS, author's own computation.