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# Heterogeneity of Mortgage Refinancing Channel in Russian Regions

**E.A. Gafarova**
Bank of Russia, Ufa, Russia

ABSTRACT*

During the period of monetary policy easing in Russia, mortgage refinancing became popular, which involves the issuance of a new mortgage housing loan to repay an earlier loan on more favorable terms. There is a regionally heterogeneous refinancing of mortgages at lower mortgage rates. The **purpose** of this paper is to quantify the impact of monetary easing on mortgage refinancing and household consumption for groups of Russian regions. Econometric methods (vector autoregression models on panel data, estimated by Bayesian methods) and multivariate clustering (hierarchical analysis, k-means method) were used in the paper. Based on the impulse response functions, it is shown that during the period of monetary policy easing, the greatest effect of lowering mortgage interest rates on refinancing is typical for groups of regions with high- and middle-income levels, a liquid housing market, and a developed mortgage market. It is proven that refinancing is involved in the transfer of the effects of monetary policy to consumer spending and consumer lending, and this transfer is heterogeneously. Refinancing in low-income regions stimulates consumption and consumer borrowing. In regions with an average and high level of per capita cash income, after refinancing, consumer spending and consumer loans are temporarily reduced. The obtained **results** can be explained by the different types of financial behavior of borrowers in the use of top-up mortgage refinancing, depending on the level of their cash income. Based on the results of the study, the hypothesis about the heterogeneity of the refinancing channel in the Russian regions was confirmed. The **scientific novelty** of the study consists in the development of a methodological approach to the study of the refinancing channel and its approbation on Russian regional data.

***Keywords:*** mortgage refinancing; mortgage; mortgage refinancing channel; monetary policy; consumption; regional heterogeneity; Bayesian vector autoregression; panel data

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## INTRODUCTION

In the market of Russian bank lending during the period of monetary policy (hereinafter — MP) popularity has gained mortgage refinancing, which involves the issuance of final borrowers a new loan on more favorable conditions to repay previously granted. Most favorable conditions for mortgage refinancing were 2020 (*Fig. 1*). Since the second half of 2021, the change in mortgage interest rates following the increase in the key interest rate of the Bank of Russia has limited the growth of refinancing.

MP tightening in 2022 against the background of increased geopolitical risks has made mortgage refinancing economically unprofitable for most borrowers. As a result, the volume of mortgage refinancing in the country in 2022 decreased by 78.8% compared to the previous year. Following the decline of interest rates to the "pandemic" level in the third quarter of 2022, there was a slight revival in demand for refinancing, primarily among borrowers who signed contracts under market programs at ultra-high interest rates, as well as for borrower under "Family Mortgage".[1]

Mortgage refinancing is also limited in the period 2020–2022 due to the introduction of preferential federal programmes without further interest rate change (with the exception of "Family Mortgages"). As a result of their active implementation, the structure of mortgage liabilities has changed,[2] the average rate on the Mortgage portfolio has formed significantly below the rate on refinancing of the mortgages, which deprives some borrowers of the feasibility of refinancing the mortgage. However, given the high debt of the population, which is usually long-term, it is reasonable to expect a resumption of the demand for refinancing during the further MP mitigation cycle.

Analysis of mortgage in the regional segment revealed the heterogeneity of the refinancing response to the decline in mortgages during the MP mitigation period. The high share of mortgage refinancing in the volume of Mortgage is observed in the Moscow region (17.1% in 2020), Moscow (17.3%), St. Petersburg (16.5%), Leningrad (14.7%) and Kaliningrad district (14.7%), low — in Republic of Chechen (2.3%), Republic of Ingushetia (2.4%), Republic of Karachay-Cherkessia (4.0%)), Republic of Kalmykia (4.2%) etc.

The analysis of foreign papers on the subject of the study shows an extensive evidence base, first, the effects of mortgage refinancing on consumption in response to monetary incentives within the so-called MP transmission mechanism refinancing channel and, second, the spatial heterogeneity of these effects. In view of the high heterogeneity of regional development, there is a hypothesis that the transmission in the refinancing channel among the regions of the Russian Federation is heterogenic.

As far as we know, there is no Russian study of the refinancing channel, which can be explained by the later formation of the Russian mortgage market and it's lagging behind in development compared to the countries of Europe and the USA. This paper seeks to fill the gap in scientific literature.

Thus, the purpose of this study is to quantify the impact of the MP mitigation on mortgage refinancing and further on population consumption for regions of the Russian Federation. To this goal, the following objectives have been set and resolved:

- distribution of homogeneous groups of regions of the Russian Federation by the level of average cash income of the population, taking into account the average prices on the secondary housing market;

[1] According to the Dom.rf service, more than 10.2 thous. mortgage housing loans amounting to 32.2 bln rubles were refinanced under this programme in 2022, which is about a third of all loans refinanced during this period. URL: https://дом.рф (accessed on 06.02.2023).

[2] According to Frank RG, the share of subsidized mortgage housing loans in total in cash amounted to 28% in 2020–2021 and 48% in 2022 (less than 2% in 2019). As of 1 January 2023, the portfolio of mortgage housing loans has a government-supported program debt of approximately 29%. URL: https://frankrg.com (accessed on 06.02.2023).

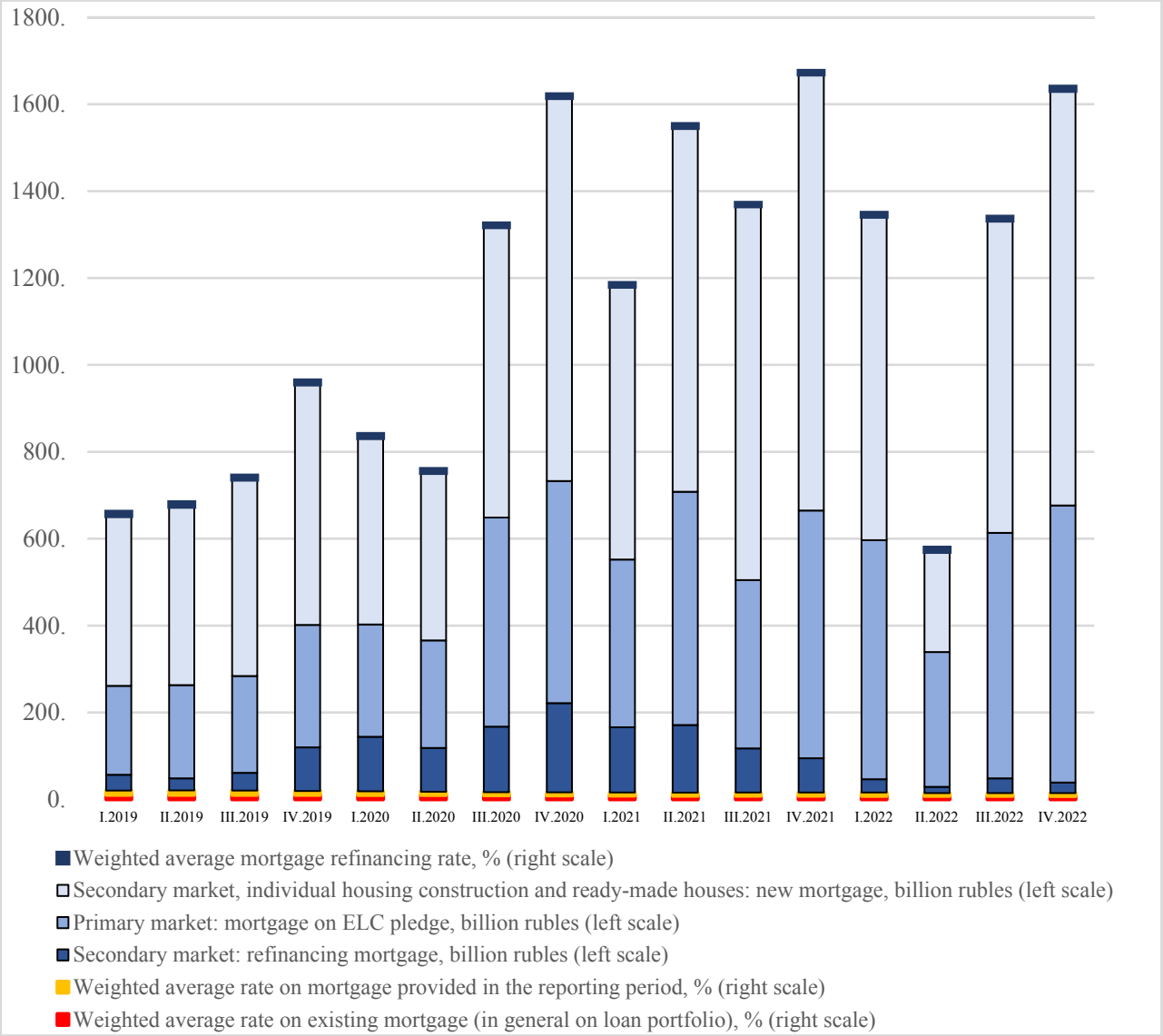


*Fig. 1.* **Dynamics of Issued Mortgage Housing Loans in Rubles to Resident Individuals (Billion Rubles) and Average Mortgage Rates for Existing Loans and Extended Loans (% Per Annum) in 2019–2022**

*Source:* Author' calculations based on data from the Bank of Russia.

- development of econometric models for groups of regions, allowing to obtain estimates of the growth of refinancing volumes in regions of the Russian Federation in response to the decrease of average mortgage interest rates;
- establishment of the heterogeneity of the change in mortgage refinancing in the conditions of MP mitigation and further transfer of it to consumer expenses and consumer credit in regions of the Russian Federation.

The achievement of the objective required the use of methods of econometrics and multidimensional clustering.

## THE CHANNEL OF MORTGAGE REFINANCING AND ITS RESEARCH

In order to target inflation, the central bank affects market interest rates, including mortgage rates, by modifying the base interest rate. In the framework of the interest channel of the MP transmission mechanism, which has been studied to the greatest extent,

the reduction in the interest rate of the national bank is transmitted to a decrease in mortgage rates to the final borrowers.[3] Mitigation of credit conditions encourages borrowers to refinance existing mortgages at a fixed interest rate, while improving the terms of the contract and possibly increasing the size of the mortgage debt[4] ("top up"). After refinancing a mortgage, the borrower's consumption or investment increases. The study of this impact has been developed in foreign studies within the refinancing channel [8–11], which assumes the impact of mortgage refinancing on consumption in two ways.

Firstly, additional mortgage refinancing loans, which can be viewed as an alternative to consumer credit, but on more favorable terms, are mainly spent to finance temporarily increased consumption, to cover more expensive consumer loans or savings. According to H. Y. Andersen et al. [12], additional borrowed funds for refinancing account for about 55% of the available annual income of borrowers, which are spent on consumption (including home improvement and repair, long-term goods), deposits, investment in shares and bonds, as well as bank debt repayment (55, 22 and 18% of the "top up" amount, respectively). Earlier estimates of G.B. Canner et al. [13] find a generally similar distribution of the use of additional credit.

Secondly, changing the terms of the mortgage contract in the context of refinancing usually reduces monthly payments and thus increases the borrower's monthly disposable income, which in turn also stimulates consumption.

It should be understood that the transfer of mortgage refinancing incentives to borrowers' consumption will not be carried out immediately and in full due to the tendency of some borrower to postpone decisions on refinance, as well as the uncertainty of the choice of the option of using additional funds. This makes it difficult to assess the causal effects of refinancing on consumption.

In applied research [8–11, 14, 15] provide evidence based on unique microdata sets of increased consumer costs for long-term goods, most commonly measured by debt on car loans, after refinancing. It was found that less creditworthy borrowers with high debt burden significantly increased consumer expenses and car loans [8, 10, 14]. The spatial heterogeneity of mortgage refinancing is promoted by the positive relationship between refinancing and housing prices [8–10], financial literacy [16] and credit ratings [17] of borrowers, and a negative relationship — with the number of unemployed [18]. These proven facts led to the conclusion that MP incentives did not have any effect in the depressed regions that needed them most.

The above-mentioned analysis of the papers on the study of effects within the refinancing channel indicated the need to include in the model to study the heterogeneity of mortgage refinance indicators characterizing the development of the credit market, housing market, well-being of the population, etc.

## ORIGINAL DATA

The analysis of the survey was based on the official annual data of Rosstat and the Bank of Russia for the period 2008–2019 in the region of the Russian Federation. The choice of the temporary period is due, firstly, to the relative stability of the MP mitigation and, secondly, the low mortgage ratio of state-supported programmes. The choice of periodicity is due

[3] Issues of the influence of interest rate on the money market on interest rates for final borrowers are well studied in foreign literature. For example, this papers that quantifies the extent and speed of the reaction of mortgage interest rates to changes in US federal fund rates [1], the Bank of England rates [2], the official monetary rate of New Zealand [3]. In Russian literature, the transmission from the key rate to the interest rate under the mortgage housing loans remains insufficiently studied, but the effect of transferring interest rates from the interbank credit market, for example MIACR or RUONIA, to bank interest rates on loans [4–6], is well studied. Evidence of regional heterogeneity of the impact of the key rate on bank interest rates on loans is presented in the paper [7].

[4] In Russia, in 2020, mortgage debt after its refinancing increased on average by 4–6%, in 2019 — by 4–10%. URL: http://www.cbr.ru/collection/collection/file/31945/review_03022021.pdf (accessed on 06.02.2023).

to the fact that information on population expenditure in the regions of the Russian Federation is published only once a year. Thus a panel data set is collected. The following indicators were considered as endogenous variables: 1) deposits of individuals in rubles; 2) mortgage liability granted to resident individuals in rubles; 3) consumer credit liability in rubles; 4) the amount of early repayment of newly issued mortgages in rubles; 5) average interest rate on mortgage granted to resident individuals in rubles[5]; 6) average income of the population; 7) average consumer expenditure per capita; 8) average prices on the primary housing market (rubles per square meter); 9) average prices in the secondary houses market (rubles per square meter); 10) consumer price indices (%, December to December of the previous year). For the correctness of interregional comparisons in dynamics, the source data in the region of the Russian Federation are converted: 1) corrected for consumer price indices and the value of a fixed set of consumer goods and services in regions of the Russian Federation; 2) reduced to average values (if necessary). Socio-demographic and economic indicators were used as exogenous.

## METHODOLOGY OF RESEARCH

A panel vector auto-regression model[6] is chosen, in which the value of each endogenous variable for the region is described by the previous all endogenic variable values[7]:

$$y_{it} = A_0 + A_1 y_{it-1} + A_2 y_{it-2} + Bx_{it} + u_{it},$$

where $y_{it}$ — endogenous variable vector; $A_0$, $A_1$, $A_2$, $B$ — coefficient matrices; $x_{it}$ — exogenous variable vector; $u_{it}$ — residuals; $i$ — region index; $t$ — time index.

In the preliminary phase, the source panel data was collected and converted. The first phase involved the methods of multidimensional clustering of homogeneous regions of the Russian Federation, since the description of the dynamics under investigation for all regions of the Russian Federation in one equation did not bring satisfactory results.

In the second phase, a panel vector autoregression model [PBVAR(2)] for each group of regions was evaluated by Bayesian methods. In the third phase, a substantive analysis of models based on pulse response functions is carried out.

## RESULTS AND DISCUSSION

In accordance with the logic of the study, in the first phase, the *k*-average method was divided into five[8] groups of average income of the population. The second group was further divided into subgroups, taking into account the average prices on the secondary housing market due to the high heteroscedasticity of balances in further simulation. In addition, the Kaliningrad and Leningrad regions were expertly classified in the higher group given the high demand for residential real estate. On the contrary, Republic of Chechen, Republic of North Ossetia — Alania, and Adygea were placed in the lower income group in the simulation. The Republic of Dagestan was excluded from the analysis because of a significant decline in the quality of the model. The subgroups presented in the table of the regions of the Russian Federation are ordered according to the growth of average per capita monetary income of the population, subgroup (IIa, IIb, IIc) — in the order of the increase of average prices of housing.

[5] When modeling on panel data, the inclusion of a key rate, the same for all regions of the Russian Federation, is impossible. We assume the transfer from the key rate to the mortgage interest rate as a proven fact and we analyze the effects of the change in the interest rate on mortgages and their refinancing.

[6] Analysis of foreign and domestic literature devoted to the study of the transmission mechanism monetary policy [19–21], as well as the influence of monetary policies on the prices of residential real estate [22] based on vector auto-regression models was carried out for the selection of econometric tools.

[7] In the course of modeling based on econometric tests (to determine the order of lag, as well as the exclusion of logs for each equation separately and all equations in aggregate) the second order of the model was established.

[8] Number of clusters determined by hierarchical (tree) analysis.

*Table*

**Groups of Regions of the Russian Federation**

| Group number | Regions group |
|---|---|
| I | Republic of Adygea, Republic of Kalmykia, Republic of Ingushetia, Republic of Kabardian-Balkar, Republic of Karachaevo-Cherkesskaya, North Ossetia — Alania, Republic of Chechen, Republic of. Mari El, Republic of Mordovia, Republic of Chuvash, Kurgan region, Republic of Altai, Republic of Tuva, Republic of Khakassia, Jewish Autonomous District |
| IIa | Bryansk region, Vladimir region, Ivanovo region, Smolensk region, Vologda region, Pskov region, Stavropol region, Orenburg region, Saratov region, Ulyanovsk region, Chelyabinsk region |
| IIb | Kostroma region, Orel region, Ryazan region, Tver region, Novgorod region, Volgograd region, Kirov region, Altai region, Kemerovo region, Republic of Korea, Republic of Buryatia |
| IIc | Tula region, Yaroslavl region, Republic of Karelia, Astrakhan region, Republic of Udmurt, Penza region, Irkutsk region, Tomsk region, Trans-Baikal region |
| III | Kaluga region, Tambov region, Arkhangelsk region, Rostov region, Samara region, Krasnoyarsk region, Novosibirsk region, Omsk region, Kamchatka, Primorsky Territory, Amur region |
| IV | Belgorod region, Voronezh region, Kursk region, Lipetsk region, Republic of Komi, Murmansk region, Krasnodar region, Republic of Bashkortostan, Perm region, Nizhny Novgorod region, Republic of Sakha (Yakutia), Khabarovsk region |
| V | Moscow region, Moscow, Kaliningrad region, Leningrad region, St. Petersburg, Republic of Tatarstan, Sverdlovsk region. Tyumen region, Magadan region, Sakhalin region, Chukotka |

*Source:* Compiled by the author.

In the second phase for each group regions of the Russian Federation evaluated PBVAR(2). As endogenous variables in all models were the first differences of the variables described above.

The model for each group of regions represents a system of ten interrelated equations.[9] The list of exogenous variables models varies for different groups of regions and includes: the share of the population with monetary incomes below the subsistence minimum in the total population, the coefficients of demographic burden, the level of unemployment in the working age, the rates of migration growth, the share of the urban population in the overall population, housing operation, the total area of housing per inhabitant, etc.

In the third phase, the response of the mortgage refinancing to the shock of interest rate growth on the basis of the analysis of the impulse response functions was assessed for each model. To make it possible to compare estimates for different groups of regions, a single scenario of reducing mortgage interest rate by 0.5 p.p. was considered.

The low-impulsive response of per capita refinancing to the lower mortgage rate is characteristic of the regions of Group I (*Fig. 2*), dominated by the Southern and Northern Caucasus regions. The greatest impulsive response of refinancing to the reduction in mortgage rates is characteristic of regions with medium and high average per capita cash income combined with affordable liquid

[9] The developed models have passed all essential diagnostic tests, indicating their stability, lack of auto-correlation and heteroscedasticity in residues, the significance of each lag in each model, the correctness of selecting variables as endogenous. Vector autoregression coefficients do not allow usual interpretation, pulse response functions are used to assess impact.

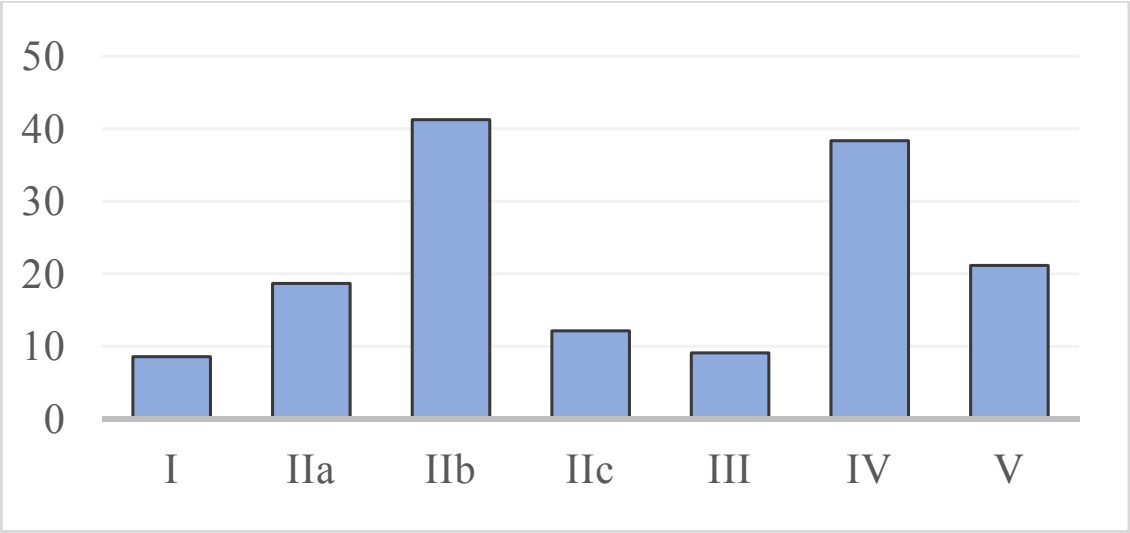


*Fig. 2.* **Impulse Responses of Changes in Mortgage Refinancing (Rubles Per Capita, in 2018 Prices) to a Decrease in the Mortgage Interest Rate 0.5 p.p.**

*Source:* Compiled by the author.

housing. A substantial increase in average mortgage refinancing gains per capita with a decrease in the interest rate on mortgages has been observed for two groups: IIb and IV. The composition of these groups includes the subjects primarily of the Central Federal District, North-Western Federal District and the Volga Federal District which are characterized by a high and medium level of socio-economic situation and the availability of liquid housing, as well as the development of the banking sector.

After applying the positive shock of mortgage refinancing, which corresponds to a reduction of the mortgages rate by 0.5 p.p., for each group of regions, an estimate of the momentum responses of consumer expenditure and consumer credit per capita for the first year is given, as well as the cumulative result for two years (*Fig. 3*).

For all regions, a decrease in consumer costs is characteristic in response to a one-minute reduction in the mortgage rate by 0.5 p.p. (*Fig. 3a*). For the first year, there has been an increase in consumer expenditure in response to a given positive shock of mortgage refinancing for low-income groups of regions. Over the two-year period, the effect of increased refinancing under the conditions of MP mitigation on consumer expenditure is becoming more significant and its heterogeneous nature is clearly manifested (*Fig. 3b*).

This may mean that low-income regions are characterized by the use of refinanced mortgages to finance current consumer expenses. For the population of high-income regions, there is a decrease in average cash costs per person, presumably due to lower mortgage payments after refinancing. For other regions, the response of consumer costs to the increase in average mortgage refinancing per capita could be considered insignificant.

Consumer lending is more responsive to the reduction in mortgage rates compared to consumer expenses (*Fig. 3*), but there is also a heterogeneity of reaction for different groups of regions. For example, in low-income regions there is a positive short-term increase in consumer credit after mortgage refinancing.

Regions with high average monetary income are characterized by a decline in consumer credit in response to the MP incentives. This can be explained by the fact that borrowers in these regions are using additional refinancing mortgages to repay less favorable consumer loans. Furthermore, the overall decline in population interest in consumer credit in prosperous regions (*Fig. 3b*) in the context of

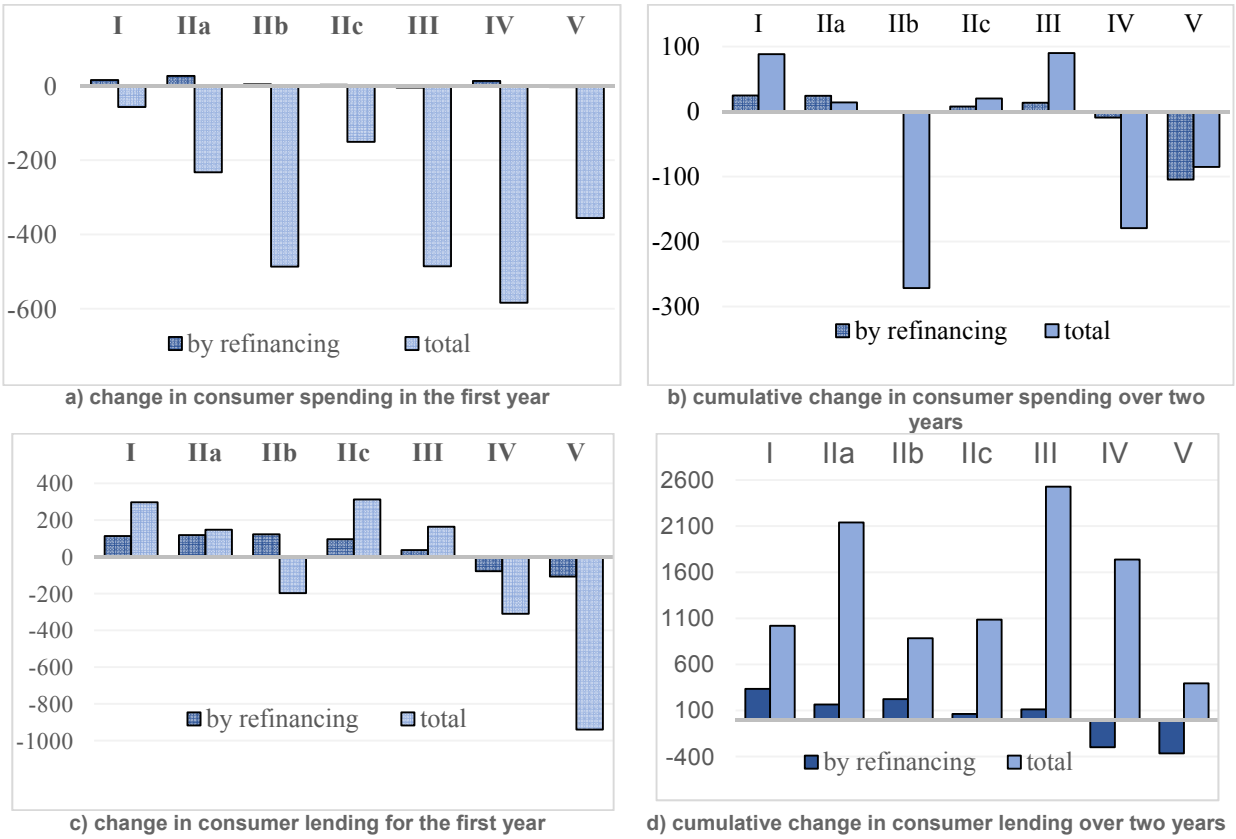


*Fig. 3.* **Impulse Responses of Changes in Consumer Spending of the Population and Consumer Lending (Rubles Per Capita, in 2018 Prices) to a Decrease in the Mortgage Interest Rate by 0.5 p.p. (by Refinancing and Everything)**

*Source:* Compiled by the author.

MP easing and rising housing market prices may be due to increased demand for real estate mortgages for investment purposes. The empirical results obtained are consistent with foreign empiric studies, in which the heterogeneous nature of refinancing is noted [8–11, 14, 16, 18].

Interregional differences in the impact of the refinancing channel on consumer consumption, in our view, can be explained by different financial behaviors on the use of additional mortgage loans after refinance for different income groups of the population.

## CONCLUSION

The empirical results obtained indicate that the average per capita increase in mortgage refinancing at a decrease in the average mortgages rate varies for groups of regions in terms of the level of average per capita monetary income of the population, as well as the cost of residential real estate.

At the same time, the greatest effect of MP easing on refinancing operations was obtained for groups of regions of the Russian Federation with high and medium levels of cash income and liquid housing market. Low-income regions most in need of MP incentives have been found to benefit less from refinancing. These regions are characterized by a low level of socio-economic development and a weak level of development of mortgage services and housing real estate markets, and the population has low levels of financial literacy and credit rating.

It was also shown that the heterogeneous impact of mitigation of mortgage lending conditions on refinancing operations was then transmitted to population consumption. In low-income regions, mortgage refinancing stimulates both consumer spending and per

capita consumer lending. For the population of high- and middle-income regions, the incentives for mortgage refinancing are reflected in lower consumer spending and consumer lending. The result can be explained by different types of behavior of borrowers to use additional funds of the refinanced mortgage depending on the level of their monetary income.

The research conducted confirmed the hypothesis of the heterogeneous nature of the operation of the refinancing channel in regions of the Russian Federation. A more in-depth study of the impact of mortgage refinancing on the financial behavior of the population may be a new study that, as a review of foreign sources has shown, is more appropriate to conduct on the basis of micro-data borrowers obtained from the credit history bureau.

The results of the research indicate how important it is for the regulator to do a regional analysis before settling on the key rate level.

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## ABOUT THE AUTHOR

***Elena A. Gafarova*** — Cand. Sci. (Econ.), Assoc. Prof., Chief Economist, Division – National Bank of the Republic of Bashkortostan of the Ural Main Branch of the Central Bank of the Russian Federation (Bank of Russia), Ufa, Russia
https://orcid.org/0000-0003-0798-7111
gafarovaea@mail.ru

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