

For citation: Kovtun, Z. (2017). Heterogeneous Bank Lending Responses to Monetary Policy: Empirical Evidence from Russia. *Ekonomika regiona [Economy of Region]*, 13(2), pp. 616-627

doi 10.17059/2017-2-25

UDC 338.1; 338.2; 332.1

JEL Classification: E44, E50

Z. Kovtun

Mendel University in Brno (Brno, Czech Republic; e-mail: zlata183@email.cz)

HETEROGENEOUS BANK LENDING RESPONSES TO MONETARY POLICY: EMPIRICAL EVIDENCE FROM RUSSIA¹

The monetary policy affects the regional economy through interest rates and its main parameter the Bank of Russia key rate. But do all the banks in the regions respond uniformly to monetary policy changes? The effects of monetary policy actions can vary across the regions within an economic entity, depending on the regional industrial output, the financial structure, household incomes, lending activity, etc. The analysis of the article aims to determine the monetary policy instruments that influence the development or degradation of the regional banking sector in Russia. This helps to identify the heterogeneous commercial bank responses to changes in conducted monetary policy. In order to assess the effects of macroeconomic shocks and instruments of banking supervision on lending activity, the Ordinary Least Squares estimator and Generalized Least Squares technique were applied. The Taylor rule was used to calculate the desired level of interest rate for the each region and, then, to compare the results with the Central Bank interest rate. The empirical results, described in the context of the regional analysis, demonstrate that Central Bank's interest rate does not affect the lending activity in most of the regions. Finally, the author summarizes conclusions one can draw from the results and provides recommendations for economic policy makers, based on the results of empirical analysis.

Keywords: monetary policy, interest rate, lending channel, commercial banks, heterogeneity, monetary transmission, inflation, bank supervision, regional development, Taylor rule

Introduction

Monetary policy, acting through different channels, has significant macroeconomic implications. Major instruments of monetary policy are credit channel, interest rate channel, and exchange rate channel. Interest rate channel is closely connected with credit channel, as the commercial banks' loans play an important role in the interest rate transmission mechanism.

In spite of integrity, common standards, tools, and mechanisms for the implementation of monetary—credit instruments, monetary policy has national and regional aspects. According to the CBR, the monetary policy affects the regional economy through interest rates. But do all the banks in the regions respond uniformly to monetary policy

changes? The effects of monetary policy actions can vary across the regions within an economic entity, depending on the regional industrial output, the financial structure, household incomes, lending activity, etc. Taking into consideration the territorial sizes of Russian Federation and different economic development within the regions, the problem of conducting a single monetary policy is especially relevant nowadays.

In recent European studies, many authors have already discussed the problem of the common monetary policy of the European Central Bank, which is transmitted asymmetrically within the Euro area [1–2]. The authors suggest that the asymmetry of the credit channel causes the heterogeneous reaction of European countries on conducted policy. Some articles devoted to this subject explains the cross-country heterogeneity of the effects of monetary policy shocks by a lack

¹ © Kovtun Z. Text. 2017.

of convergence in fiscal, financial or production structures, that affect the interest rate elasticity and the functioning of transmission mechanisms [3].

Commercial banks' lending activity is a significant determinant of the overall rate of economic growth, as they influence the investment decisions and consumption sphere. Exploring the response of commercial banks to changes in conducted monetary policy is necessary for creating favorable conditions for economic growth within Russian regions. Loans are important financing sources, which are helping banks to be the primary mobilizers of financial resources and distributors of these resources to investments [4].

The importance of the action of a bank loan on the transmission of monetary policy highly depends on whether bank loans and deposits are special, or in other words, how difficult it is to do the substitution [5]. Thus, some authors [6–7] mention that the credit channel depends, primarily, on the degree to which the banks can easily substitute other sources of financing for deposits and on the degree to which borrowers are able to find alternative sources of funding.

The analysis aims to determine the monetary policy instruments that influence the development or degradation of Russian regional banking sector. This helps to identify the heterogeneous commercial bank responses to changes in conducted monetary policy.

In order to assess the effects of macroeconomic shocks and instruments of banking supervision on the lending channel, I apply an OLS estimator and GLS-technique and use the Taylor rule to calculate the desired level of interest rate for the each region and compare the results with the Central Bank interest rate.

Following the works of Kashyap [8], Juurikkala [9], Ehrmann [10], I explore the cross-regional differences in micro-level data on the Russian banking sector to find out whether the bank loan supply is affected by changes in monetary policy. The results of the empirical analysis are subsequently discussed in the context of the regional analysis. Finally, I summarize conclusions one can draw from the results and provide recommendations for economic policy makers, based on the results of empirical analysis.

The analysis demonstrates that Central Bank's interest rate does not affect the lending activity in most of the regions. Even if interest rates are seen to be common across the regions, it does not mean that the power of monetary policy transmission is the same across the regions. When lenders make lending decisions based on a local collateral

value, heterogeneity in these values results in heterogeneous effects of monetary policy across the regions [11].

Literature Review

In recent years, research on the regional impact of the monetary policy on commercial banks' lending activity has been intensified and these studies show that the movement and redistribution of credit resources are important in regional economic development. The regional aspect of monetary policy in Russia includes the various tools, such as refinancing, reserve standard changes, interest rates on operations of the Central Bank, etc. The hallmark of these tools is the presence of the potential to vary the degree and direction of their impact on the economy of the region, depending on its specific features.

Danilova [12, pp. 69–78] suggests that the traditional direction of stabilization policy, aimed at cushioning the adverse macroeconomic shocks at the level of the Russian territories, could lead to unplanned changes, such as the decrease in the multiplier impact of regulatory instruments and increase in regional differentiation. By the negative effects of stabilization policy in some regions the author explains the poor performance of regulatory measures. The author supposes that regional component of stabilization policy should include those channels of transmission mechanisms that can define the different susceptibility of the regulatory impact of the federal center.

The action of monetary instruments primarily reflects on credit institutions by changing their financial capacity, affecting the costs of funds. Volkov [13] claims that the significant influence of monetary policy on the real economy depends much on the active use of banking products by real sector and financial services provided by credit institutions. The author finds that the impact of monetary policy measures on the region's economic development would be stronger in regions with high investment potential, developed credit system, largely satisfying requirements of companies in financial resources.

Krasilnikov [14] notes the existence of the heterogeneous monetary system in Russia, as well as the presence of many cash holdings and quasi-monetary assets, which may fully or partly replace the money in their functions. Due to them, there is the correction of an excessive rigidity of monetary policy. They provide the endogeneity of monetary systems, reducing the effectiveness of the exogenous control of the money supply by the monetary authorities. Under such conditions, the flexible device is not possible, or it takes a long

time. Excessively tight monetary policy causes a liquidity crisis¹.

Kuzin [15] observes the presence of the heterogeneous policy in Russia, which provides a combination of monetary levers and direct government regulation. The author notes that the government regulation is directed primarily to the correction and stabilization of inter-branch relations prices, promotion, and safeguarding of investments in priority sectors of production, improving the predictability of the economic situation.

High regional segmentation of the Russia's economic space has been stressed in the contribution by Popova [16]. The author takes into consideration the important role of regional heterogeneity in Russia and analyzes the factors that explain inequality in transition economies. Finally, the author concludes that regional structural peculiarities play a greater role in inequality in Russia than in any other transition economy.

Juurikkala et al. [9, pp. 109–121] analyze the role of banks in monetary policy transmission in Russia and find that better-capitalized banks are less likely to adjust their lending practices after a change in the monetary policy.

Vladimirova et al. [17] affirm a low efficiency of the applied market regulation and recommend the Central Bank of Russia to create a system of incentives interests of commercial banks for lending to the real sector of the economy, including the priority areas of the economy. The authors also offer to take into account the experience of China and other countries, where there are available facilities in the interest rate policy or taxation.

Heterogeneity of Monetary Policy Transmission Mechanism

Differences between Russian regions are determined by economic conditions: the level of inflation, GDP, the structure of the regional industry, the concentration of financial institutions in the region and their capabilities, the development of agricultural and commodity sector, the level of transport costs, etc. All this suggests a difference in levels of market interest rates [13]. This leads to the need to develop a set of measures concerning not only the unification of instruments of monetary control for different regions, as the definition of its position, aimed at achieving the same outcome indicators of economic development for the

¹ Such situation was in the Russian economy in 1992, when Yegor Gaidar was the Prime Minister. One of the main reasons for the significant production decrease in Russian economy at the beginning of the 1990s was the tight monetary policy. A number of economists (R. Portes, G. Calvo, F. Coricelli, B. Ickes, R. Reiterman, V. M. Polterovich) have proved this fact.

economically diversified area. For example, in regions with high rates of inflation, monetary policy has a much smaller effect on aggregate demand, compared with regions with low inflation. Economic growth in Russian regions, measured with different indicators, continues to develop very unevenly.

Historically, Central Banks have set monetary policy by raising or lowering its target for the federal funds rate, the interest rate at which depository institutions (banks and credit unions) lend reserve balances to other depository institutions overnight, on an uncollateralized basis. The Taylor rule² is a numerical formula that relates the Central Bank's target for the federal funds rate to the current state of the economy. The Taylor rule (1) is one of the best known and simple rules, where the nominal short-term interest rate (instrument) responds only to inflation and to the output gap. The classic Taylor rule equation is the following:

$$i = \pi + 0.5gap + 0.5(\pi - 2) + 2, \quad (1)$$

where i represents the federal fund rate, π is the inflation rate, gap is the deviation of the real GDP from potential GDP, expressed in percentage points. Taylor suggests that the target inflation rate and the equilibrium real interest rate are equal to 2, and the estimated parameters are equal to 0.5.

Taking into account the peculiarities of the Russian economy, I have modified Taylor's equation as follows:

$$i = 0.5\pi + 0.5gap, \quad (2)$$

where i represents the refinance rate (nominal short-term interest rate), π is the inflation rate and gap is the deviation of the real GDP from potential GDP, expressed in percentage points. The estimated response of policy rates to inflation and output gap is 0.5.

The Central Bank refinance rate is used in the analysis as a nominal short-term interest rate because it is an important instrument of monetary policy in Russia. The refinance rate was introduced in 1992 as a single interest rate, which has been applied by the Central Bank of Russia and all its institutions in the provision of loans to commercial banks.

The Taylor rule (1, 2) says that an increase in inflation by 1 percentage point in comparison with the target inflation level and an increase in the de-

² Taylor rule was invented by the famous economist John Taylor in 1992 and outlined in his study "Discretion versus policy rules in practice" (1993).

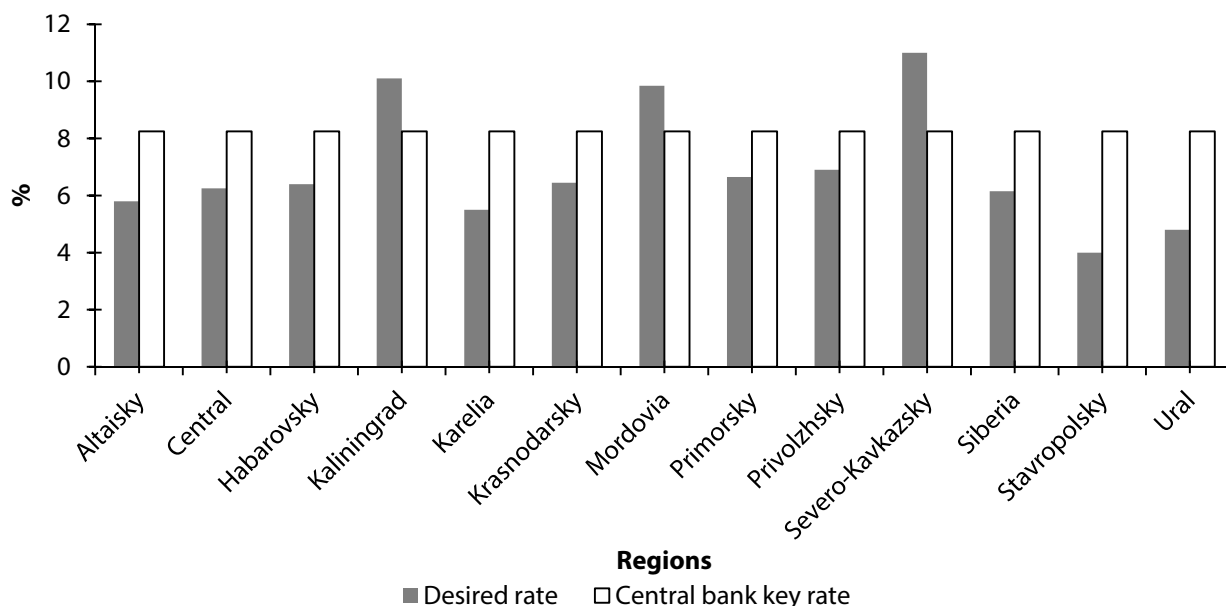


Fig. 1. Central Bank refinance rate vs. desired rates, calculated by Taylor rule (2014).

Data source: The Central Bank refinance rate was taken from the CBR official statistics and the desired refinance rates were calculated by the author with the help of Taylor rule

viation of the real GDP from potential GDP by 1 percentage point should prompt the Central Bank to raise the interest rate by 0.5 percentage point.

By using the Taylor rule (2) I have calculated the desired (optimal) level of the refinance rate for the each region. After that, I compared it with the actual Central Bank refinance rate (8.25 % in 2014, CBR Statistics). The results are provided in Figure 1.

The Taylor rule implies that Central Banks aim at stabilizing inflation around its target level and output around its potential. Positive (negative) deviations of the two variables from their target or potential level would be associated with a tighten-

ing (loosening) of monetary policy. According to Figure 1, the optimal interest rates in most of the regions are lower than the actual value of the refinance rate. It means that Central Bank is keeping the refinancing rate higher than necessary, thereby significantly reducing the inflation rate. Other words, Central Bank adheres to strict monetary policy, which is not appropriate in the circumstances. In 3 regions (Kaliningrad, Mordovia and Severo-Kavkazsky), the optimal interest rates are higher than the level of the refinance rate. In this case, the refinance rate is well below the desired rates because monetary policy can not define the dynamics of changes in the price level;

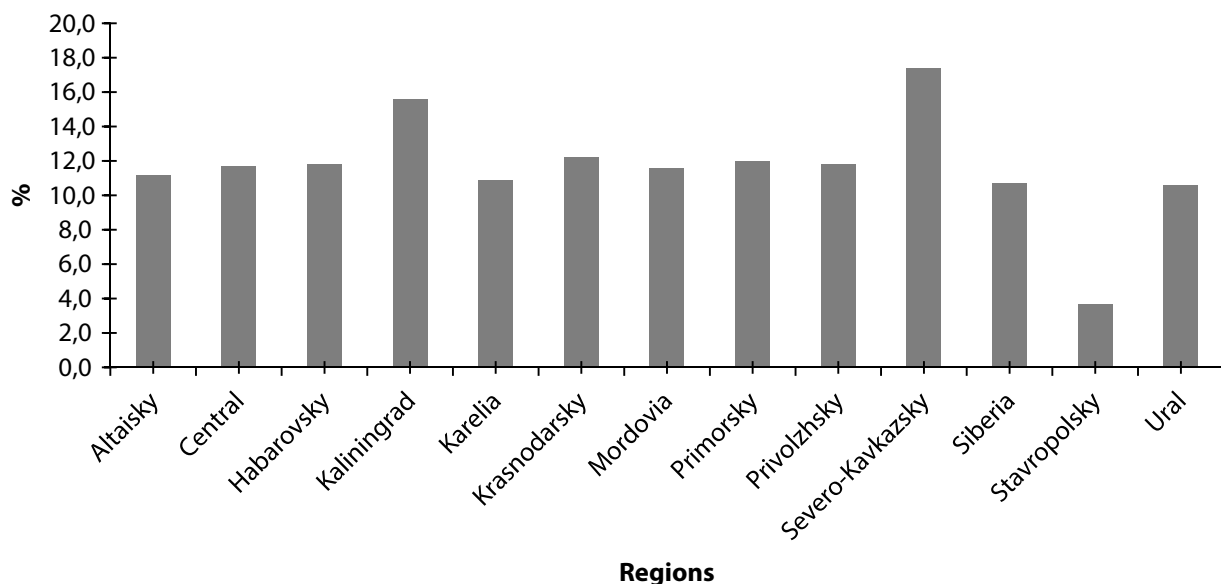


Fig. 2. The level of Inflation in Russian regions (2014).

Data source: The data was collected by author with the help of examining the regional statistics (2014)

monetary policy is only able to adjust to inflation. Inflation in these regions is considerably higher than in other analyzed regions (fig. 2). In other words, monetary policy has an adaptive character within these regions.

Active interest rate policy encourages economic growth by reducing interest rates amidst recession and retaining the same through their increase during overheating. The dependence of monetary easing on a cycle stage is critical—as the economy regains its potential, monetary easing is discontinued and gives way to tightening when output exceeds the potential level (Gorunov, Trunin, 2013).

According to the results demonstrated in Figure 1, the desired refinance rate in regions varies considerably. It indicates the heterogeneity of economic development within the regions. Thus, it can be judged that the monetary policy is distributed unevenly.

In this case, Ball [18, pp. 63–83] recommends the monetary policy to “minimize a weighted sum of output variance and inflation variance.” This minimization procedure should provide efficient rules expressing the Taylor rule.

Since different regions vary greatly in levels of development of the banking sectors, the impact of the regional aspect will not also be the same for these components of the banking system. In the process of implementation of the regional aspect, the Central Bank needs to use the resources of its territorial divisions, in contradistinction to the implementation of the federal aspect of monetary policy. In this case, it is enough to use the tools at the disposal of the federal government.

The regional aspect of the implementation of monetary policy in addition to traditional tools includes a relatively young branch of the Bank of Russia—information management tools of monetary policy, known as monitoring companies. Currently, monitoring of enterprises at the regional level consists of two blocks and conducting a study of economic processes in five areas. “Classic” unit analyzes the state of the economic situation on the regional market, the investment component in the enterprise development strategy and the financial situation of enterprises. Block “The demand for banking services,” respectively examines the state of the market of banking products in two areas—the study of the demand for banking services, and the study of banking services offers.

Considering that in my analysis I include only regional commercial banks (not affiliates), I can conclude that by using the diversification of interest rates it is possible to adjust the effect of mone-

tary policy on different regions. For the maximum effect from the realized monetary policy, there is a need in reliable and operational information about the state of real and financial sectors and the monetary sphere.

Methodology

The analysis aims to determine the indicators that influence the development or the degradation of the regional banking sector in Russia. In order to assess the effects of macroeconomic shocks, instruments of banking supervision and regional indicators on banking activity, I apply an OLS estimator and GLS-technique.

The vast body of studies is aimed at examining the impact of monetary policy on the economic development via its impact on the banking activity, by using an OLS estimation and GLS-technique. For example, Ekpung et al. [19, pp. 1015–1029] uses OLS to analyze the monetary policy impact on the banking sector in Nigeria. The authors find the significant impact of monetary policy on banks deposit liabilities and recommended to monetary authorities to conduct the flexible monetary policy to enable the commercial banks to discharge their duties effectively to the public. In addition to flexible monetary policy, the authors also recommend the higher interest on deposits in order to encourage and mobilize more funds from the public.

Gianni De Nicolo et al. [20] use an OLS regression with bank fixed effects and find that the impact of monetary policy on bank risks is different in most of the countries in the sample and depends on the local banking market conditions (bank leverage and charter values and the contestability of banking markets) and factors that affect these conditions (business cycles).

Pandit [21] analyses the effectiveness of monetary policy during the global financial crisis, in influencing the economic activity (demand for bank credit) in countries with emerging market economies. The monetary policy instrument, used in the empirical analysis is the overnight or short-duration interest rate. The author uses the panel data technique for obtaining the generalized least squares (GLS) estimation. Finally, the author finds that the demand for bank credit reflecting the pace of economic activity increases when policy rates are reduced.

Pestova and Mamonov [22] identify the influence of macroeconomic and bank-specific factors that lead to the increase in the nonperforming loans of Russian banks. The authors estimate panel data econometric models with a wide range of independent macroeconomic variables and spe-

cific banks' variables. The findings suggest that most of the negative influence on the loan quality of Russian banks come from the deterioration of macroeconomic conditions. Following Pestova and Mamonov [22], I consider several bank specific variables which describe liquidity quality.

Following Kučerová and Kapounek [23], I employ robust OLS estimator to identify the link between the bank lending activities and main macroeconomic shocks and institutional variables in Russia. The specific of the model in my analysis is similar in nature to the model used in the work of these authors.

Ajayi and Atanda [24, pp. 462–476] identify the impact of monetary policy instruments on bank performance in Nigeria using time series data. They found that interest rate and inflation had a positive effect on a bank loan, while liquidity ratio and cash reserve ratio had a negative effect on lending. They concluded that monetary policy instruments are not effective stimulants for bank lending in Nigeria.

Aymen Ben Moussa and Chedia [25, pp. 27–36] analyze the internal and external factors of commercial banks' lending activity in Tunisia using a panel data. The authors find that among the internal factors, only the return on assets, net interest margin, liquidity has a significant impact on bank loans, and among the external factors, only the inflation rate has a significant impact on bank loans.

Ujuju and Etale [26, pp. 29–37] employ the Ordinary Least Squares technique to analyze the relationship between interest rate, gross domestic product and bank lending in Nigeria. The authors found that interest rate had a negative relationship with bank lending, while economic growth had a positive correlation with bank lending in Nigeria.

Following these works I apply both macroeconomic and bank-level data to identify the main factors having an impact on bank lending in Russia.

Commercial banks' lending activity is a significant determinant of the overall rate of economic growth, as it influences the investment decisions and consumption sphere. Exploring the response of commercial banks to changes in conducted monetary policy is necessary for creating favorable conditions for economic growth within Russian regions.

The regression in the present research includes time and bank fixed effects, which can cover a large part of the endogeneity bias, which is time or bank invariant. The fixed effects μ are used in regression because of the difference between the banks. The dependent variable loans represent the

share of gross loans provided by bank i in time t to their total assets (3):

$$\text{loans}_{it} = \sum_{s=1}^S \beta_s \text{shocks}_{rt}^s + \sum_{l=1}^L \beta_l \text{bcontr}_{it}^l + \mu_i + \varepsilon_{it}, \quad (3)$$

where variable shocks represents selected macroeconomic shocks s within the selected region (shocks_{rt}^s). Variable bcontr represents selected instrument of bank controls b for bank i in time t . The difference between the sizes of banks is solved by assets.

Macroeconomic shocks include several economic activity indicators: unemployment, inflation rate measured by the Consumer Price Index (CPI), and policy rate using the refinance rate (CB rate). Instruments of bank controls include each bank's total assets and total liabilities (Deposits) in national currency (RUB), and net interest income, which is the difference between the revenue that is generated from a bank's assets and the expenses associated with paying out its liabilities. Instruments of bank controls were chosen as independent variables because they reflect the liquidity of commercial banks.

I applied an OLS robust estimator to estimate robust standard errors ε that are adjusted for non-constant error variance. The OLS makes the assumption (4) that:

$$V(a_i) = u^2 I, \quad (4)$$

for all banks i . Variable I is the identity matrix and variable a^2 is a parameter which determines the variance of each observation.

With the robust option, the point estimates of the coefficients are the same as in ordinary OLS, but the standard errors take into account issues concerning heterogeneity and lack of normality.

After the OLS estimation, I have included the GLS technique in my analysis (without constant). The GLS (generalized least squares) makes the assumption (5) that:

$$V(a_i) = u^2 \Sigma, \quad (5)$$

where, Σ is the variance-covariance matrix and variable a^2 is a parameter which determines the variance of each observation.

The method of GLS is introduced to improve the estimation efficiency when $\text{Var}(y)$ is not a scalar variance-covariance matrix (Heteroskedasticity). The difference between OLS and GLS is the variance of the estimates. GLS technique takes advantage of the field equations, boundary conditions, and material interface conditions. GLS also deals with discontinuity of the derivative quantities along material interfaces correctly, using the original finite element grid [27]. Economic intuition.

I expect that bank controls will represent a positive and significant relationship with loans, because the increase in assets, deposits, and interest income means the liquidity surplus and might tend to higher lending activity.

Inflation erodes the value of the depositor's savings as well as that of the bank's loans. The uncertainty caused by inflation increases the risks associated with the investment and production activity. I expect that increase in inflation rate will cause the significant fall of the lending activity.

With regard to Central Bank rate, I suggest a hypothesis: the most important characteristic of the Classical quantity theory of money is the belief that the interest rate does not bear any impact on the demand for money [28]. Therefore, I suppose, the variable Central Bank rate will not be significant at all.

Unemployment negatively affects the cash flows and increases the debt burden. Regarding enterprises, an increase in unemployment could lead to a decline in production due to the decline in effective demand. This can also lead to a decline in revenue and a fragile state debt. An increase in unemployment limits the current and future purchasing power of households and is generally associated with a decrease in the production of goods and services. Finally, unemployed customers will be less able to meet their commitments and repay the loans. I suggest that unemployment will have a negative and significant impact on lending.

The regional variable is Industrial Production Index (IPI)¹. A high industrial production index indicates economic growth and is favorable for stockholders, especially in industrial sectors. A low industrial production index is favorable for bondholders, as the Federal Agency for State Reserves may use IPI as a reason to cut interest rates.

According to Keynesian transactions and precautionary demand for money, demand would increase proportionally with an increase in income. As the increase in industrial production means economic growth and growth of GDP, therefore, I expect the positive and significant relationship between IPI and lending.

Data

The dataset covers quarterly data from 2005–2015 and includes 32 commercial banks in 8 Russian Federal Districts. Each Federal District in the sample includes 4 regional commercial banks whose financial statements were freely available.

¹ American studies usually employ State personal income; European studies employ GDP or IPI. I employ GDP growth for the whole Russia and regional IPI as independent variables.

This unique dataset was collected from different sources (CBR statistics, banks' financial reports, regional statistics, and reports). The problem is that many Russian banks do not provide their reports to the public. The dataset for each bank was taken from the financial statements, which are provided on the official websites of these banks. Thereby, collecting of the data took about three years. The data does not include statistics for Crimea and Sevastopol, due to the fact that Crimea became the part of Russian Federation in 2014.

Macroeconomic shocks include several economic activity indicators (Interest rate of Central Bank, inflation rate, unemployment). The macroeconomic shocks were obtained from the online database (CBR, 2015). Commercial banks' assets, deposits, and income were taken from the each bank's official report. Regional industrial production index was taken from the Federal State Statistics Service (2015). The variables of bank controls are taken in national Russian currency (RUB) and macroeconomic shocks are taken in percentage. The data (except interest rates) were transformed using logs.

Empirical Results

In order to investigate the existence of considerable heterogeneity across the regional banking sector, I estimate the impact of different macroeconomic shocks and instruments of bank control on lending activity in Federal Districts. The results are displayed in the following tables (see Tables 1–8).

Conclusion

The objective of the research was to analyze the effectiveness and uniformity of distribution of monetary policy transmission mechanisms in Russian regions. Thereby, I identify the link between the Russian bank lending activities and main macroeconomic shocks and banking controls in Russian Federal Districts within the period 2005–2015. The dataset includes 32 commercial banks in 8 Federal Districts. Each Federal District in the sample includes 4 regional commercial banks.

The task to check the heterogeneous reaction of commercial banks on Monetary Policy conducted by the Central Bank was set up. Even if interest rates are common across the regions, it does not mean that the strength of monetary policy transmission mechanism is the same across the regions. When lenders make lending decisions based on a local collateral value, heterogeneity in these values results in heterogeneous effects of monetary policy across the regions.

Table 1

Results of panel regression for the Volga (Privolzhsky) Federal District

	Dependent variable: the share of gross loans provided by banks to their total assets (2005–2015)				
	(1)	(2)	(3)	(4)	(5)
Assets	0.186 [*] (2.02)	0.442 ^{***} (6.41)			
Deposits	0.638 ^{***} (9.22)	0.527 ^{***} (7.76)			
Interest income	0.106 ^{***} (4.33)	0.0310 [*] (2.39)			
CB rate	-0.00162 (-0.07)				
Unemployment	0.232 (0.79)		-1.330 ^{***} (-4.32)		
Inflation	-0.0611 (-1.88)			-8.762 ^{***} (-5.02)	
IPI	-2.234 (-1.83)				3.522 ^{***} (172.43)
Constant	YES	NO	YES	NO	NO
Observations	155	180	180	170	180

Source: Calculated by the author in Stata.

Notes: Absolute robust t-statistics in parentheses. Asterisks indicate statistical significance: ^{*} significant at the 10 % level; ^{**} significant at the 5 % level; ^{***} significant at the 1 % level.

Table 2

Results of panel regression for the Siberia Federal District

	Dependent variable: the share of gross loans provided by banks to their total assets (2005–2015)			
	(1)	(2)	(3)	(4)
Interest income	0.0998 ^{**} (2.96)	0.273 ^{***} (6.20)		
Assets	0.879 ^{***} (10.88)			
Deposits	-0.0140 (-0.17)	0.686 ^{***} (15.91)		
CB rate	0.0185 (1.30)			
Unemployment	-0.263 [*] (-2.05)		-2.214 ^{***} (-5.88)	
Inflation			-0.296 ^{***} (-3.58)	
IPI				2.721 ^{**} (-3.35)
Constant	YES	YES	YES	YES
Observations	108	108	102	108

Source: Calculated by the author in Stata.

Notes: Absolute robust t-statistics in parentheses. Asterisks indicate statistical significance: ^{*} significant at the 10 % level; ^{**} significant at the 5 % level; ^{***} significant at the 1 % level.

Table 3

Results of panel regression for the Ural Federal District

	Dependent variable: the share of gross loans provided by banks to their total assets (2005–2015)			
	(1)	(2)	(3)	(4)
Assets	0.215 [*] 0.215	0.817 ^{***} (21.57)		
Deposits	0.631 ^{***} (6.74)			
Interest income	0.0159 (0.56)	0.0984 ^{**} (2.81)		
CB rate	0.0157 (1.58)			
Unemployment	-0.384 ^{***} (-3.93)			
Inflation	-0.00970 (-0.49)		-9.088 ^{***} (-3.92)	
IPI				3.662 ^{***} (246.65)
Constant	YES	YES	NO	NO
Observations	102	108	102	108

Source: Calculated by the author in Stata.

Notes: Absolute robust t-statistics in parentheses. Asterisks indicate statistical significance: ^{*} significant at the 10 % level; ^{**} significant at the 5 % level; ^{***} significant at the 1 % level.

Table 4

Results of panel regression for the Central Federal District

	Dependent variable: the share of gross loans provided by banks to their total assets (2005–2015)			
	(1)	(2)	(3)	(4)
Assets	0.640*** (6.93)			
Deposits	0.184* (2.51)			
Interest income		0.258*** (5.48)		
Inflation			-0.162*** (-3.51)	
Unemployment			-1.828*** (-8.68)	
CB rate				-0.154*** (-5.73)
IPI				3.489*** (60.96)
Constant	YES	YES	YES	NO
Observations	144	144	136	144

Source: Calculated by the author in Stata.

Notes: Absolute robust t -statistics in parentheses. Asterisks indicate statistical significance: * significant at the 10 % level; ** significant at the 5 % level; *** significant at the 1 % level.

Table 5

Results of panel regression for the Far Eastern Federal District

	Dependent variable: the share of gross loans provided by banks to their total assets (2005–2015)				
	(1)	(2)	(3)	(4)	(5)
Assets	0.0337 (1.72)	0.441*** (20.52)			
Deposits	0.957*** (19.47)				
Interest income	-0.0153 (-0.27)	0.273* (2.31)			
CB rate	0.0339 (1.94)				
Unemployment			-1.646*** (-4.97)		
Inflation	-0.0155 (-0.64)			-0.193* (-2.31)	
IPI	0.0195 (0.09)				2.114*** (3.94)
Constant	YES	YES	YES	YES	YES
Observations	102	108	108	102	108

Source: Calculated by the author in Stata.

Notes: Absolute robust t -statistics in parentheses. Asterisks indicate statistical significance: * significant at the 10 % level; ** significant at the 5 % level; *** significant at the 1 % level.

Table 6

Results of panel regression for the Southern Federal District

	Dependent variable: the share of gross loans provided by banks to their total assets (2005–2015)		
	(1)	(2)	(3)
Assets		0.991*** (71.04)	
Deposits	0.611*** (7.71)		
Interest income	0.222** (3.23)		
CB rate	0.00723 (0.18)	-0.0129 (-0.63)	
Inflation	-0.231* (-2.54)	-0.108* (-2.22)	-0.414*** (-3.75)
Unemployment	-1.251** (-2.66)	-0.150 (-2.45)	-4.157*** (-7.82)
IPI	0.0274 (0.04)		-3.540*** (-4.06)
Constant	YES	NO	YES
Observations	99	99	99

Source: Calculated by the author in Stata.

Notes: Absolute robust t -statistics in parentheses. Asterisks indicate statistical significance: * significant at the 10 % level; ** significant at the 5 % level; *** significant at the 1 % level.

Table 7

Results of panel regression for the North Caucasus Federal District

	Dependent variable: the share of gross loans provided by banks to their total assets (2005–2015)				
	(1)	(2)	(3)	(4)	(5)
Deposits	1.005*** (62.09)				
Assets		0.960*** (34.59)			
Interest income		0.114** (2.68)			
Inflation			-0.231** (-3.06)		
Unemployment			-2.103*** (-6.12)		
CB rate				-0.102 (-1.81)	
IPI					-3.501*** (-3.42)
Constant	YES	YES	YES	NO	YES
Observations	108	108	102	108	108

Source: Calculated by the author in Stata.

Notes: Absolute robust t-statistics in parentheses. Asterisks indicate statistical significance: * significant at the 10 % level; ** significant at the 5 % level; *** significant at the 1 % level.

Table 8

Results of panel regression for the Northwestern Federal District

	Dependent variable: the share of gross loans provided by banks to their total assets (2005–2015)			
	(1)	(2)	(3)	(4)
Assets	0.0492 (0.41)	0.302** (2.85)		
Deposits	0.801*** (7.58)	0.597*** (6.29)		
Interest income	0.0832*** (3.68)	0.0567* (2.41)		
Inflation	-0.0879*** (-4.86)			
CB rate	0.00333 (0.43)			
Unemployment	-0.149 (-1.57)		-2.194*** (-5.42)	
IPI	-0.255 (-1.24)			2.916*** (89.37)
Constant	YES	YES	YES	NO
Observations	102	108	108	108

Source: Calculated by the author in Stata.

Notes: Absolute robust t-statistics in parentheses. Asterisks indicate statistical significance: * significant at the 10 % level; ** significant at the 5 % level; *** significant at the 1 % level.

With the help of Taylor rule, I found that monetary policy is distributed unevenly, as the desired rates vary significantly among the regions. Moreover, the desired interest rates for regions differ significantly from the Central Bank refinance rate. Since the commercial banks are playing a crucial role in the development of the regional economy, regional banks and Central Bank of Russia should work in close cooperation with each other and changes in monetary policy should be taken into account by regional banks in their loan pricing decision. Russian Central Bank, in its turn, needs to use the resources of its territorial divisions, in contradistinction to the implementation of the federal aspect of monetary policy. In this case, it is enough to use the tools at the disposal of the federal government.

The Taylor rule implies that Central Banks aim at stabilizing inflation around its target level and output around its potential. Positive (negative) deviations of the two variables from their target or potential level would be associated with a tighten-

ing (loosening) of monetary policy. According to Figure 1, the optimal interest rates in most of the regions are lower than the actual value of the refinancing rate. It means that Central Bank is keeping the refinancing rate higher than necessary, thereby significantly reducing the inflation rate. Other words, Central Bank adheres to strict monetary policy, which is not appropriate in the circumstances. In 3 regions (Kaliningrad, Mordovia and Severo-Kavkazsky), the optimal interest rates are higher than the level of the refinance rate. In this case, the refinance rate is well below the desired rates because monetary policy can not define the dynamics of changes in the price level; monetary policy is only able to adjust to inflation. Inflation in these regions is considerably higher than in other analyzed regions (fig. 2). In other words, monetary policy has an adaptive character within these regions.

In this case, increasing the refinance rate to the level recommended by the Taylor rule, would correspond to the declared priorities—reducing in-

flation to a value that does not hinder sustainable economic growth. The higher rate would serve as a limitation on the capacity of the banking system and credit expansion would prevent the growth of money supply. On the other hand, increasing the refinance rate may enhance the liquidity deficit, which has a negative impact not only on credit institutions, but also on the real economy due to the increased cost of credit. Thus, another recommendation to the Central Bank is to control inflation and continue to reduce it, by conducting the persistent moderately tight monetary policy.

In order to analyze the heterogeneity in the response of commercial banks to changes in conducted monetary policy, I applied the OLS robust estimator and the GLS-technique. Thus, I have analyzed the commercial banks' reaction to macroeconomic shocks and bank controls.

I found that macroeconomic variables expressing the economic activity, such as unemployment rate and inflation level, had a significant impact on bank lending activities in Russian Federal District within the analyzed time period. The variables of bank controls (assets, deposits, interest income) represent the liquidity surplus and depend positively on lending activity.

In seven Federal Districts from eight analyzed, the Central Bank refinance rate does not have any impact on lending. It means that the refinance rate in Russia doesn't reflect the real value of lending resources. Thus, I can conclude that the traditional instrument of monetary policy (main policy interest rate) does not play an important role in the process of monetary policy implementation in Russia. It confirms the hypothesis of the Classical quantity theory of money, which states that the interest rate does not bear any impact on the demand for money. The only exception is the Central Federal District, where an increase in the Central Bank rate is followed by the decrease in lending activity.

As expected, unemployment rate and inflation level affect negatively lending in all of the analysed regions. Inflation erodes the value of the depositor's savings as well as that of the bank's loans. The uncertainty caused by inflation increases the risks associated with the investment and production activity. Another recommendation to the Central Bank is to control inflation and continue to reduce it, by conducting the persistent moderately tight monetary policy.

According to Keynesian transactions and precautionary demand for money, demand would increase proportionally with an increase in income. Therefore, I expected the positive and significant relationship between the regional variable IPI and lending. In 6 Federal Districts from 8 analyzed the relationship is significant and positive, but in 2 Districts the industrial production index has a negative impact on credit risk at 1 % significance level. As with all empirical research, the priors are not always confirmed by the data. I assume the existence of some reasons why it could go in either direction. Economic freedom in a country is associated with higher levels of income and I predicted positive changes in economic freedom to be associated with positive changes in income in a society (or industrial sector). But it might be the case that societies with high levels of economic freedom are already among the highest levels of income and thus not necessarily growing at higher rates.

I suggest two more theoretical possibilities: what if expansion in industrial output in a particular region tends to be done by large multinational companies who are allocating resources from elsewhere to this region? Or large industrial companies are more likely to rely on equity finance over debt finance. In each case, these companies are able to finance their activities or expansion in other ways and that option could explain why they need to rely less on lending.

Bank of Russia implements monetary policy in the framework of inflation targeting regime, and changes its short-term interest rates (CBR, 2015). Different parameters of the economic sphere (GRP, regional prices, unemployment, IPI) depend greatly on the efficiency of the transmission mechanism. From my point of view, the regional component of stabilization policy should include the tools of transmission mechanisms that can identify the different exposure of the regulatory impact of the policymakers. Therefore, the Central Bank should conduct the interest rate channel of monetary policy transmission, taking into account the development of regional financial systems. Monetary Policy tools and instruments should be aimed instantly at supporting the priority lending areas and maintaining the stability of the regional banking sector. I recommend additional capitalization of banks, targeted subsidy programs for individual credit directions, saving the individual macroprudential indulgences.

References

1. Hendricks, W. T. & Kempa, B. (2008). Asymmetric Transmission of Monetary Policy in Europe: a Markov-switching Approach. *Journal of Economic Integration*. Sejong University papers, 23, 873–895. DOI: <https://doi.org/10.11130/jei.2008.23.4.873>.

2. Ciccarelli, M. & Rebucci, A. (2002). The Transmission Mechanism of European Monetary Policy: Is there heterogeneity? Is it changing over time? *International Monetary Fund Working Paper*, WP 02/54.
3. Cadoret, I., Payelle, N. & Durand, J. J. (2006). The asymmetric effects of monetary policy: a sectoral approach. *Cahiers Economiques de Bruxelles*, 51(1).
4. Freixas, X. & Rochet, J. C. (2008). *Microeconomics of banking*. 2nd Edition. London: The MIT Press, 392.
5. Salmanov, O. N., Zayernyuk, V. M. & Lopatina, O. A. (2014). An Analysis of the Impact of Monetary Policy on Bank Lending in Russia. *Asian Social Science*, 11(6). DOI:10.5539/ass.v11n6p221.
6. Bernanke, B. S. & Blinder, A. (1988). Credit, money, and aggregate demand. *American economic review*, 78(2), 901–921.
7. Bernanke, B. S. & Gertler, M. (1995). Inside the black box: The credit channel of monetary policy transmission. *Journal of Economic Perspectives*, 9(4), 27–48.
8. Kashyap, A. K. & Stein, J. C. (2000). Will a Common European Monetary Policy Have Asymmetric Effects? *Papers* 384, *Banca Italia*, 56–75.
9. Juurikkala, T., Karas, A. & Solanko, L. (2011). The Role of Monetary Policy Transmission: Empirical Evidence from Russia. *Review of International Economics*, 19(1), 109–121.
10. Ehrmann, M. (2003). *Financial Systems and the Role of Banks in Monetary Policy Transmission in the Euro Area*. In: Ignazio Angeloni, Anil K. Kashyap, and Benoit Mojon (Eds). *Monetary Policy in Euro Area*. Cambridge: Cambridge University Press, 235–69.
11. Beraja, M., Fuster, A., Hurst, E. & Vavra, J. (2015, June). Regional Heterogeneity and Monetary Policy. *Federal Reserve Bank of New York, Staff Report*, 731.
12. Danilova, I. V. & Rezepin, A. V. (2014). *Coordination of Federal and Regional Actions of Stabilization Policy for Heterogeneous Economic Area*. *Ekonomika Regiona [Economy of Region]*, 2(38), 69–78.
13. Volkov, M. U. (2015). *Denezhno-kreditnaya politika i eyo realizatsiya na regionalnom urovne*. *Dissertatsiya na sosiskanie uchenoy stepeni kandidata nauk [Monetary policy and its implementation on the regional level. Dissertation thesis by M. U. Volkov]*. Saratov, 24. (In Russ.)
14. Krasilnikov, A. A. (2015). Osobennosti sovremennykh institutov denezhno-kreditnoy politiki v Rossii [Modern Institutions of Monetary Policy in Russia]. *Vestnik Saratovskogo gosudarstvennogo sotsialno-ekonomicheskogo universiteta [Journal of Saratov State Socio-Economic University "Vestnik"]*, 5(59), 20–24. (In Russ.)
15. Kuzin, V. (2006). The Inflation Aversion of the Bundesbank: a State Space Approach. *Journal of Economic Dynamics and Control*, 30, 1671–1686.
16. Popova, D. (2002). Level and factors of inequality in transition economies: a comparison across Russia and Eastern Europe. *RECEP Working Paper*. Moscow, 186.
17. Vladimirova, O. N., Petrova, A. T. & Gavrilchenko, G. S. (2015, November). About Problems of Interrelation of Regional, Economic and Bank Policy. *Mediterranean Journal of Social Sciences* MCSER Publishing, Rome-Italy, 6(6), 91–100. DOI:10.5901/mjss.2015.v6n6p91.
18. Ball, L. (1999). Efficient Rules for Monetary Policy. *International Finance*, 2(1), 63–83.
19. Ekpung G. E., Udude, C. C. & Uwalaka, H. I. (2015, May). The Impact of Monetary Policy on the Banking Sector in Nigeria. United Kingdom: *International Journal of Economics, Commerce and Management*, 3(5), 1015–1031.
20. De Nicolo, G., Dell Ariccia, G., Laeven, L. & Valencia, F. (2010, July). Monetary Policy and Bank Risk Taking. *IMF Staff Position Note*, 10/09.
21. Pandit, B. L. (2015). *The Global Financial Crisis and the Indian Economy*. Springer India, 144.
22. Pestova, A. & Mamonov, M. (2013). Macroeconomic and Bank-Specific Determinants of Credit Risk: Evidence from Russia. *Economic Education and Research Consortium. Working Paper No. 13/10E*. ISSN: 1561–2422.
23. Kučerová, Z. & Kapounek, S. (2015). Determinants of Bank Lending Activities in the European Union Countries: Is There Any Difference Between Bank-based and Market-based Systems? *13th International Scientific Conference "Economic Policy in the European Union Member Countries"*, September 2–4, 2015, Czech Republic. ISBN: 978–80–248–3796–3.
24. Ajayi, F. O. & Atanda, A. A. (2012). Monetary policy and bank performance in Nigeria: A two-step co-integration approach. *African Journal of Scientific Research*, 9(1), 462–476.
25. Aymen Ben Moussa, M. & Chedia, H. (2016). Determinants of Bank Lending: Case of Tunisia. *International Journal of Finance and Accounting*, 5(1), 27–36. p-ISSN: 2168–4812. e-ISSN: 2168–4820.
26. Ujuju, L. E. & Etale, L. M. (2016, June). Macroeconomic Analysis of the Relationship Between Interest Rate, Economic Growth and Bank Lending in Nigeria. *European Journal of Business and Innovation Research*, 4(3), 29–37.
27. Aalto, J. (1995). GLS-smoothing with boundary conditions and material interface conditions. *Eight Nordic Seminar on Computational Mechanics: Short papers*. Gothenburg.
28. Fisher, I. & Brown H. G. (1911). *The Purchasing Power of Money: Its Determination and Relation to Credit, Interest and Crises*. New York: Macmillan, (2nd edition, 1913), 515.

Author

Zlata Kovtun — Master of Economics, PhD Student, Teacher, Mendel University in Brno (3, Zemedelska, Brno, Moravia, 61300, Czech Republic; e-mail: zlata183@email.cz).