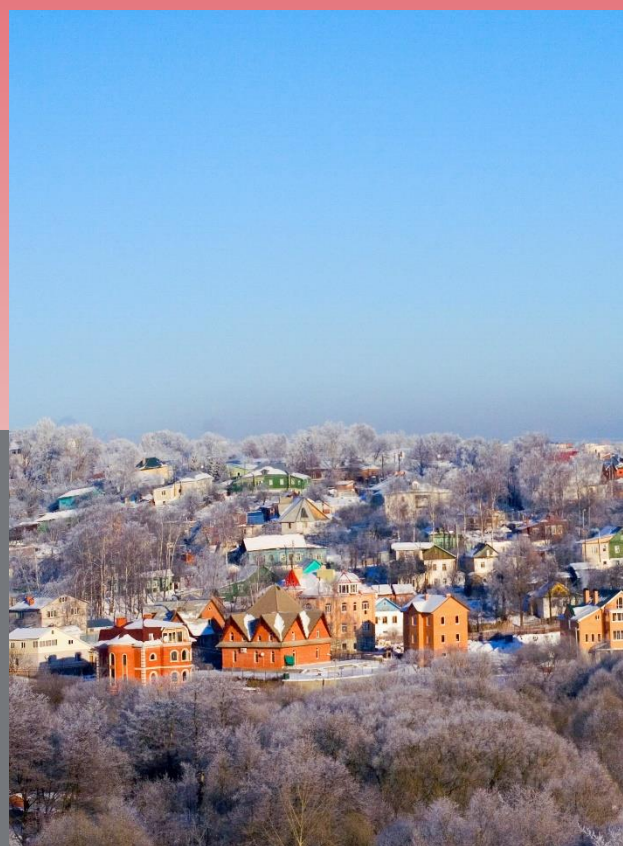**Bank of Russia**

Regional finance and fiscal regulation: estimating fiscal multiplier

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ABSTRACT

This paper estimates the response of gross regional product (GRP) in the constituent entities of the Russian Federation[1] (multipliers) to fiscal flow (revenue and expenditure) shocks both at the level of individual regions and across all levels of government budget, including federal and regional budgets, as well as extra-budgetary funds. The authors have compiled a database of fiscal flows of all levels for the constituent entities of the Russian Federation, incorporating proxy variables to capture all withdrawals and injections of financial resources from/into regional economies by government agencies. The study also provides an assessment of the impact of fiscal policy on regional economies in the regions grouped into clusters by the level of economic development and by the type of expenditure (social or economic expenditures).

The main finding of the study is the assessment of the combined impact of fiscal revenue and expenditure multipliers across the constituent entities of the Russian Federation. This assessment has revealed an overall negative effect on the economy from expanded fiscal flow (revenue and expenditure) shocks. The negative effect of withdrawing funds from the regional economy exceeds the positive effect of injecting funds into it. The GRP response is at its maximum at the time of both revenue and expenditure shocks.

A relatively positive impact on the economy is noted from the redistribution of income from regions with higher levels of economic development to those with lower levels. The accumulated effect on economic activity from increased budget expenditure in less developed regions is higher compared to more developed regions. Injecting budgetary funds into the economies of less developed regions has a greater multiplier effect than if those funds were returned to the economies of more developed regions.

During periods of economic stimulus and budget deficits, regions with lower levels of economic development experience a relatively greater impact from fiscal policy on economic activity. On the contrary, during periods of fiscal consolidation and budget surpluses, these regions incur relatively higher GRP losses compared to those with higher levels of economic development.

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[1] The study was conducted for 68 constituent entities of the Russian Federation within the confidence interval of distribution.

INTRODUCTION

In Russia, given its significant regional heterogeneity in social and economic development, a policy of smoothing regional disparities is traditionally pursued. One of the instruments for neutralising such disparities is the fiscal regulation of regional systems.

In recent years, the role of this instrument has increased even further. This is driven by the increasing importance of goal-oriented regulation, the large scale of national projects, and the redistribution of substantial financial resources between the federal government and the regions in the course of implementing such projects.

In this context, it seems expedient and relevant to conduct a comprehensive assessment of the impact of regional fiscal flows on economic growth. In this paper, the authors aim to qualitatively and quantitatively assess the effects of fiscal policy at the level of Russian regions. Currently, the degree of practical use of approaches to solving this problem at the regional level is insufficient. In fact, there are virtually no studies that address this problem in a comprehensive manner.

At the same time, the development of methodologies for such research at the macro level has a long historical trajectory. Undoubtedly, the results previously obtained by researchers need to be used as a theoretical basis when addressing the objectives of this study. These results should be further combined with the methods of regional structural analysis and the development of a comprehensive structural and dynamic assessment at the level of macroregions and constituent entities of the Russian Federation.

Many governments use fiscal stimulus to overcome economic crises. The 2008 crisis and the 2020 pandemic were no exceptions.

To provide anti-crisis support, many countries increased their government spending. For example, government spending in the US rose by 6.9 pp of GDP, and in the UK by 6.8 pp of GDP, both in 2009 compared to 2007. A number of countries implemented fiscal stimulus measures by reducing rates for certain types of taxes. In Russia, government spending was increased by 7.2 pp of GDP in 2009 compared to 2007, and a range of tax incentives were also implemented in 2009.

The increase in spending during this period was accompanied by a fall in revenues. This led to a deterioration in the fiscal balance and an increase in public debt. The average level of public debt in the Organisation for Economic Cooperation and Development (OECD) countries exceeded 90% of GDP over this period. As a result, at the G20 meeting in 2010, after the adoption of an agreement on gradual fiscal consolidation, the countries participating in the meeting envisaged a reduction in budget deficits by 2013. Russia did not have a similar debt problem. Although the consolidated budget was executed with a significant deficit in 2009–2010, the overall level of public debt was around 10% of GDP.

The accumulated negative trends of late 2014 and early 2015, including the decline in consumption and investment, rising inflationary threats, sanctions, the depreciation of the ruble, and negative trends in energy prices, served as factors triggering a new crisis in the country.

In 2020, the global pandemic simultaneously exposed the domestic economy to two powerful shocks: a deterioration in the terms of trade and a forced, sharp and extensive downturn. Overcoming the consequences of the shocks required substantial budgetary injections into the economy.

In 2020, an anti-crisis package was implemented with a value equivalent to more than 4.5% of GDP. Given regional and off-balance sheet support measures, together with a reduction in the revenues of the budgetary system, the total size of the fiscal impulse reached approximately 8% of GDP.

The issue of fiscal stimulus is widely discussed in Russia. There is an ongoing debate on the directions for the use of the National Wealth Fund and the feasibility of other measures to stimulate the economy through a large-scale increase in government spending.

Thus, the 2008, 2015 and 2020 crises demonstrated the expediency of implementing fiscal stimulus. To assess the relationship between fiscal policy measures and GDP growth, so-called fiscal multipliers are typically used. These multipliers show a change in business activity (GDP growth) caused by budgetary operations.

The need to study fiscal multipliers stems not only from macroeconomic forecasting, but also from the need to select optimal policies for adjusting government revenue and expenditure. Thus, the budget serves as an important prerequisite for enhancing the effectiveness of fiscal policy (fiscal space).

An assessment of the revenue and expenditure multipliers of the regions allows for evaluating the nature of the effect of the interregional redistribution of revenues in the budgetary system to smooth the provision of public goods.

This study estimates the value of fiscal multipliers as the strength of the response of aggregate supply (GDP) to changes in the aggregates of fiscal policy (fiscal revenue and expenditure).

1. LITERATURE REVIEW

Many domestic and foreign scholars have studied the issue of fiscal stimulus and fiscal multipliers. They have developed the conceptual framework of fiscal policy.

The fiscal multiplier is defined as the ratio of the change in national income to the exogenous change in budget revenues and expenditures. Multipliers are calculated to assess the macroeconomic impact of government stimulus or austerity plans [Di Serio M., Fragetta M. and Melina G. (2021). The impact of *r-g* on euro-area government spending multipliers. Journal of International Money and Finance, Elsevier, Vol. 119(C)].

In recent years, especially after the financial crisis, there has been a significant interest in the study of fiscal multipliers. The results of these studies show a wide range of estimates. Moreover, there are no benchmark values for fiscal multipliers. The estimated fiscal multipliers vary according to:

- The estimation methodology used, the assumptions employed in the models, and the length and frequency of the data series utilised in the calculation of the multipliers. We should note the review [Gechert and Will, 2012], which analysed 89 research papers on the estimation of fiscal multipliers and concluded that the results of calculations largely depend on the class of models employed, the method chosen to estimate multipliers, and the data series used;

- The economic characteristics of the countries under study, their economic policies, and the performance of their economies.

The magnitude of fiscal multipliers depends on the following factors reflecting the state of the economy:

- The rigidity of the labour market: the more rigid the contracts in the labour market and the lower the bargaining power of employers, the higher the output response to demand shocks, i.e. fiscal multipliers are higher [Gorodnichenko et al., 2012];

- The effectiveness of fiscal policy (government spending and tax administration): the higher the effectiveness and targeting of government spending and tax collection, the greater the impact of government spending on GDP;

- The sustainability of public finance: the lower the level of public debt, the higher, as a rule, the confidence of economic agents in the fiscal policy pursued and the lower the propensity to save when the fiscal stimulus is implemented; otherwise, the propensity to save may increase due to fears of subsequent mirror tightening of fiscal policy [Ilzetzki et al., 2013];

- The exchange rate regime: a fixed exchange rate regime in a country creates prerequisites for growth in imports amid strengthening of the real exchange rate, which, in turn, forms a channel for the leakage of part of the fiscal stimulus abroad [Corsetti et al., 2012];

- The maturity of financial markets: fiscal multipliers are higher in countries with relatively less developed financial markets and, as a consequence,

less opportunity for the intertemporal redistribution of consumption among economic agents [Batini et al., 2014];

- The phase of the economic cycle: studies show that multipliers are higher during economic downturns than during economic recoveries; this applies to both fiscal stimulus and fiscal consolidation episodes [Auerbach and Gorodnichenko, 2013]. Better-targeted spending, i.e. directing funds to households with a high propensity to consume, could be a possible explanation;

- The openness of the economy: multipliers are larger in countries with relatively closed economies and smaller in countries with more open economies [Sheremirov and Spirovska, 2019];

- The share of the shadow economy: a high share of the shadow economy reduces the effectiveness of government spending and, consequently, the magnitude of fiscal multipliers [Vlasov and Deryugina, 2018].

According to the literature, the magnitude of the fiscal multiplier may also depend on the type of government instrument used: taxes, transfers, expenditures, or investments. The multiplier for public investment tends to be larger than for other fiscal measures [Abiad et al., 2016].

Fiscal equalisation policies redistribute tax revenues from regions with a high fiscal capacity to poorer jurisdictions and thus, in effect, enable recipient regions to offer more public goods than they otherwise could in the absence of transfers. Many countries use fiscal equalisation programmes to address spatial economic disparities [Henkel et al., 2021].

Studies of local multipliers provide information on the relative impact of fiscal policy in different regions rather than the aggregate multiplier. Local multipliers are related to the aggregate multiplier indirectly due to spillover effects between regions. Sources of secondary effects may include, in particular, trade in goods, changes in production factors, general monetary policy, or general fiscal policy [Dupor, 2015].

Empirical studies by foreign authors are mainly devoted to the analysis of G20 countries with developed economies. The majority of these studies have been conducted for the United States. According to the studies, the estimation of the fiscal multiplier based on real data can be done using theoretical (general equilibrium) models or econometric methods. General equilibrium macroeconomic models better reflect the qualitative aspects of the main parameters and the nature of their influence on the magnitude of the multiplier.

Assessing the value of multipliers based on real data is complicated by the need to filter out outliers in the dynamics of expenditure, as well as to isolate changes in GDP from the impact of expenditure under the influence of other factors.

Vector autoregression (VAR) and dynamic stochastic general equilibrium (DSGE) models are used as the main research approaches when estimating fiscal multipliers.

In the case of a significant deviation of the economic situation from the normal level, estimates based on DSGE models are the most effective. New Keynesian macroeconomic models are commonly used to simulate growth

models [Coenen et al., 2012] and consider the fiscal multipliers generated by all DSGE models. One of their advantages is the description of the behaviour of the entire economy by analysing the interaction and combination of many microeconomic decisions.

However, the analysis of fiscal multipliers using DSGE models has some drawbacks. First, there is no consensus on the modelling of the fiscal multiplier. The variables emerging from DSGE models depend on particular assumptions, especially if the models are calibrated rather than estimated. If a single model for measuring multipliers is used for different countries, it tends to show smaller variances than if multipliers are estimated by empirical studies.

Estimates based on the VAR model are more widely used. This method relies on the fact that the variables of interest, such as revenue, expenditure, output, interest rates, and inflation, are interrelated and there are numerous causal relationships.

When applying the VAR model, the key task is to remove economic shocks from it. Starting with the pioneering work by Blanchar and Perotti (2002), the general approach to conducting VAR analysis is the method of structural identification (the development of a so-called SVAR model). This method uses various assumptions to identify structural shocks and assess their impact on GDP.

However, SVAR models have a number of shortcomings. First, the structural identification approach may fail to capture purely exogenous fiscal shocks, as it filters out changes in asset and commodity prices [IMF, 2010]. Second, SVARs (as well as simple VARs) based on past trends provide an averaged estimate of the outcome of external shocks. If the country under study has undergone significant structural changes, the fiscal multiplier will fail to accurately measure the impact of fiscal policy on output in the relevant period. Third, SVARs tend to be linear and do not capture cyclic behaviour. Several studies have addressed this concern by using non-linear SVARs and testing differences in variables across the business cycle [Auerbach and Gorodnichenko, 2012; Batini et al., 2012; Baum et al., 2012].

Among less common approaches to estimating fiscal multipliers are: New Keynesian models [Albertini et al., 2014; Sims and Wolff, 2017; Engler and Tervala, 2018], Markov-switching models [Arin et al., 2015; Papaioannou, 2018], quantile regressions [Linnemann et al., 2015], ARDL (autoregressive distributed lags) models [Romer and Romer, 2010; Cloyne, 2013], and various two-stage regression procedures [Corsetti et al., 2012; Forni and Gambetti, 2015; Pragidis et al., 2015].

As noted above, the empirical approaches used by foreign authors to evaluate fiscal multipliers demonstrate significant discrepancies in the resulting estimates. These discrepancies are far from definitive, given the diversity of specifications and methodologies applied. Table 1 summarises some of the available empirical data.

In normal times, the economic consensus regarding the fiscal multiplier is that it is generally small (typically less than 1). This can be explained by two reasons. First, the need to finance increased government spending leads to

a negative 'wealth effect', which crowds out consumption and reduces demand. Second, fiscal expansion, which raises inflation and output levels, triggers a response from central banks, which raise interest rates, partly offsetting the stimulatory effect of fiscal policy [Abiad et al., 2016].

For the US, the literature usually reports short-term (one-year) multipliers in the range of 0.4 to 1. Some studies report multipliers higher than 1. For European countries, aggregate multipliers over the same time horizon are usually above 1. In these studies, government spending multipliers range from 0 to 2.1 with an average value of 0.8 during the first year following the implementation of fiscal measures. Government revenue multipliers vary from approximately -1.5 to 1.4 with an average value of 0.3. A comprehensive review of the literature on fiscal multipliers is provided by Baunsgaard et al. (2012). The authors examine a total of 37 studies, including both DSGE- and VAR-based approaches. Similar to the case of government spending shocks, most of the available empirical data on fiscal multipliers pertain to the US. There are even differences in the sign of the multipliers, so the results are not conclusive.

Table 1. Characteristics of foreign studies on estimation of fiscal multipliers (VAR-based)

Authors	Country	Revenue multiplier (accumulated over 4 quarters)	Expenditure multiplier (accumulated over 4 quarters)
Blanchard and Perotti (2002)	US	-1.26	0.62
Perotti (2005)	US	0.26	0.94
	Germany	0.26	1.31
	UK	-0.23	0.09
	Canada	0.3	0.17
	Australia	-0.28	0.15
Giordano et al. (2007)	Italy	0.02	0.05
Mirdala (2009)	Czech Republic	0.42	0.02
	Hungary	0.44	0.09
	Poland	0.02	0.23
	Slovakia	0.14	0.55
	Bulgaria	0.39	0.02
	Romania	0.73	0.37
Burriel et al. (2010)	EU	-0.63	0.87
Mountford and Uhlig (2009)	US	-0.16	0.28
Benassy-Quere and Cimadomo (2006)	Germany	-1.17	0.23
Auerbach and Gorodnichenko (2012)	US	-0.82	0.31
Ilzetzki et al. (2013)	24 emerging economies	-0.01	-
Born et al. (2013)	OECD panel	0.32	-
Menchinger et al. (2017)	OECD panel	0.5	-
	EU	0.82	-

The key finding from most studies is that the fiscal multiplier depends on numerous factors, including the current state of a country's budgetary system, the exchange rate regime in place, and, most critically, the phase of the economic cycle. Moreover, at different points in time within the same country, an increase in government spending may have a significant stimulatory effect or may exert little to no impact on output.

The fact that there are many countries lacking sufficient data for a reliable analysis prompted the IMF to develop a simplified method for calculating the aggregate fiscal multiplier based on an estimated set of the determinants of its magnitude [Batini et al., 2014].

In Russia, the absence of long, comparable data series for many indicators is a significant issue. This stems from differences between Soviet and international statistical standards, as well as the ongoing transition of government agencies to new calculation approaches, often without appropriately revising previous values.

Among the key studies on the estimation of fiscal multipliers in Russia, we can highlight [Vlasov and Deryugina, 2018] and [Kudrin and Knobel, 2017]. Their most recent estimates of the fiscal multiplier are presented in Table 2.

Table 2. Estimates of fiscal multipliers in Russia

Authors	Model	Multiplier value
Kudrin and Knobel (2017)	SVAR with recursive identification	Aggregate expenditure multiplier (0.91)
Votinov and Stankevich (2017)	BVAR SVAR	Aggregate expenditure multiplier (0.27) Aggregate expenditure multiplier (0.56)
Vlasov and Deryugina (2018)	SBVAR with the identification of shocks using zero and sign restrictions	Aggregate revenue multiplier (-0.75) Aggregate expenditure multiplier (0.28)
Zyablitskiy (2020)	SVAR	Aggregate revenue multiplier (-0.38) Aggregate expenditure multiplier (0.42)

One of the latest estimates of fiscal multipliers in the Russian economy is found in the research of I. Zyablitskiy, who used SVAR models identified by sign and 'descriptive' restrictions. This approach allowed the author to narrow the range of models, eliminate outliers caused by random factors, and thereby obtain more accurate intervals of impulse responses and improve the robustness of estimates. For instance, the expenditure multiplier (0.42) was found to be higher

than the revenue multiplier (-0.38). The confidence intervals indicated the neutrality of fiscal policy conducted under the current fiscal rule.

An important aspect of assessing the fiscal multiplier is the concept of the fiscal impulse examined in detail in the context of Russia in [Myasnikov et al., 2023].

The fiscal impulse, as an indicator that reflects the dynamics of fiscal policy relative to the dynamics of a business cycle indicator (e.g. the GDP gap), is a critical measure for analysing the impact of the fiscal multiplier on the economy.

The fiscal impulse may be regarded as a factor of the initial effect on aggregate demand in the economy (see Figure 1). However, firms and households may change their investment and consumption behaviour in response to such government actions. Such effects may be accounted for using advanced structural macroeconomic models that simulate the behaviour of economic agents.

Figure 1. Role of fiscal multiplier in transmission of fiscal impulse to inflation
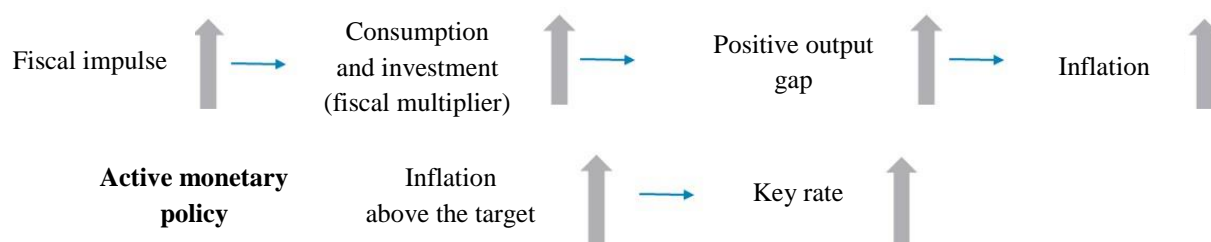
2. RESEARCH METHODOLOGY AND DATA SOURCES

To estimate the fiscal multipliers of government revenues and expenditures across Russian regions, the authors analysed fiscal flows at all levels of the budgetary system, including federal and regional budgets, as well as extra-budgetary funds. The analysis of fiscal flows across Russian regions and federal districts was conducted on a quarterly basis for the period from 2010 to 2023.

A database consisting of two major components (revenues and expenditures at all budgetary levels by region) was compiled for the study. Comprehensive statistical data of this kind are not fully available. The revenue indicators were drawn from the following data sources: the Federal Treasury (Roskazna), the Unified Interdepartmental Information and Statistical System (EMISS), and statistical reports from the Federal Tax Service Inspectorate (FTSI) of Russia. Proxy variables were required to estimate the expenditure indicators. The algorithm for determining fiscal revenue and expenditure indicators by region is presented in Table 3.

It is important to note that the risks associated with the use of proxy variables lie in the assumptions made about which variables can represent others. These assumptions may affect the robustness of the results to underlying hypotheses about the distribution of revenues and expenditures.

Table 3. Scheme for compiling statistical data on fiscal flows across regions to estimate fiscal impulse

No.	FI component	Fiscal revenues	Fiscal expenditures
1	Federal	FB revenue / external FB revenue	FB expenditure (including outgoing transfers to RB and GEBF) / external FB expenditure / FB expenditure to service external debt
2	Regional	RB revenue / incoming transfers to RB	RB expenditure (including outgoing transfers to TEBF) / incoming transfers to RB
3	Extra-budgetary	GEBF and TEBF revenue / incoming transfers to GEBF and TEBF	GEBF and TEBF expenditure / incoming transfers to GEBF and TEBF

Note: FI – the fiscal impulse, FB – the federal budget, RB – a regional budget, GEBF and TEBF – government and territorial extra-budgetary funds, respectively.

The data on federal budget revenues and expenditures were sourced from the Federal Treasury (www.roskazna.ru), FTSI, and EMISS (www.fedstat.ru). Most data on fiscal flows are presented at the aggregate level for Russia as a whole, without regional disaggregation.

A portion of federal budget revenues by region is presented in the FTSI statistics (approximately 60% of all budget receipts):

- Corporate income tax and revenue;
- Taxes on goods (services, works) sold within Russia;
- Taxes, fees, and regular payments for the use of natural resources.

We estimate the remaining major revenue items of the federal budget by region using proxy variables (see Figure 2).

To estimate federal budget expenditures by region, we also apply proxy variables on an annual basis as distribution weights for the indicators. Subsequently, fiscal flows at the federal level were adjusted for outgoing transfers to regional budgets and extra-budgetary funds. Additionally, the data were adjusted for major one-off factors that do not influence economic activity, such as the costs of bank recapitalisation in 2014 and income from the Sberbank deal in 2020–2021.
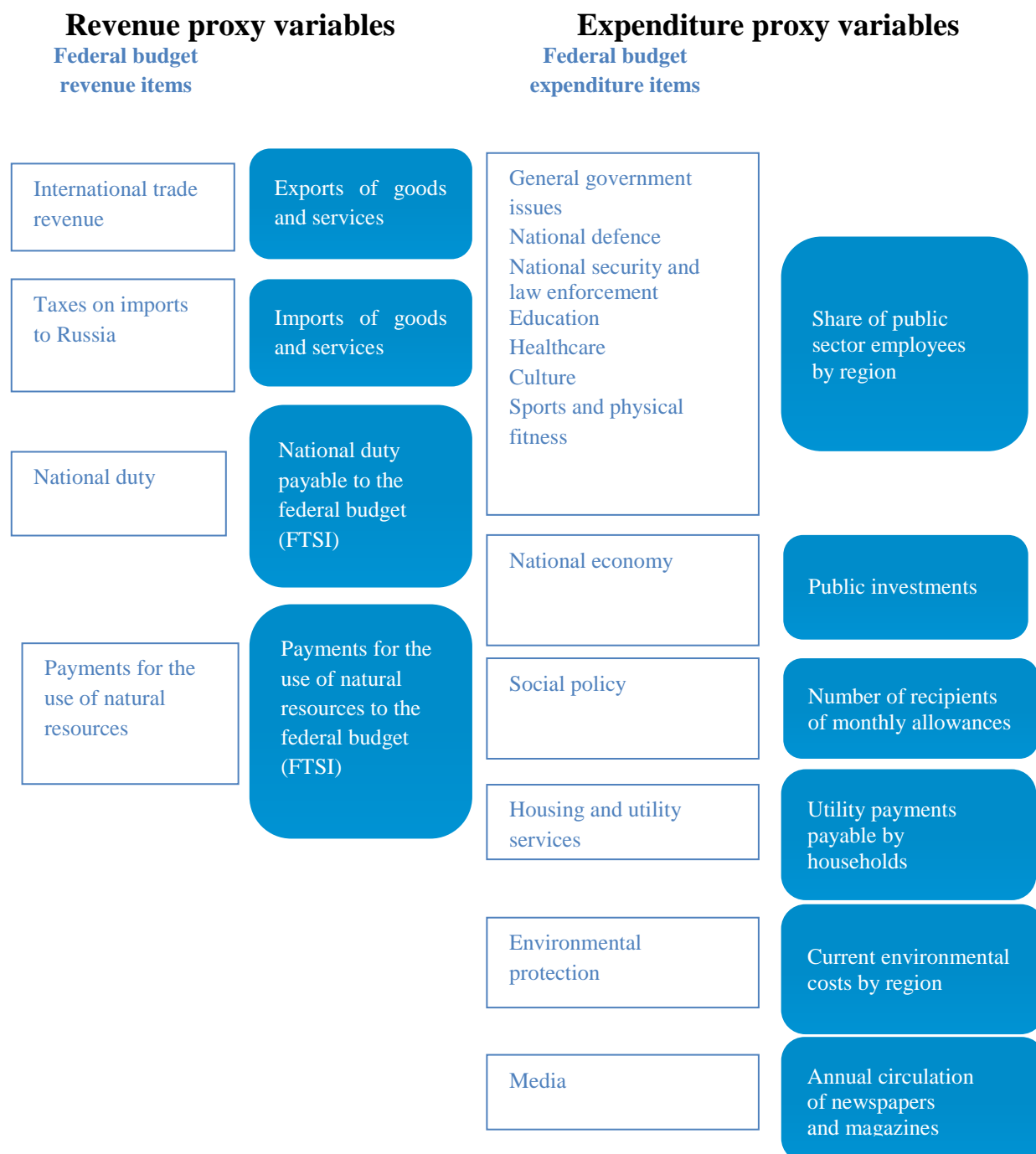
To compile the quarterly database on the general dynamics of fiscal flows, data from the Federal Treasury were used, both overall and broken down into items of the consolidated regional budgets. Revenues and expenditures of regional budgets were adjusted for incoming federal transfers (grants, subsidies, subventions, and other intergovernmental transfers) as well as for outgoing transfers to extra-budgetary funds and intergovernmental transfers.

We use the following indicators in the study:

1. Real seasonally adjusted quarterly values of the leading indicator of gross regional product (proxy GRP) by region and macroregion [Boyko et al., 2020].

2. Real seasonally adjusted expenditures of federal and regional budgets by region and macroregion.

3. Real seasonally adjusted revenues of federal and regional budgets by region and macroregion.

4. Moscow interbank actual credit rate (MIACR) for a period of 1 day (as a measure of monetary conditions).

5. Urals crude oil price in rubles (as a measure of the external sector).

Figure 2. Proxy variables used as weights for distributing federal budget fiscal flows across regions

Revenue proxy variables

Federal budget
revenue items

International trade revenue	Exports of goods and services
Taxes on imports to Russia	Imports of goods and services
National duty	National duty payable to the federal budget (FTSI)
Payments for the use of natural resources	Payments for the use of natural resources to the federal budget (FTSI)

Expenditure proxy variables

Federal budget
expenditure items

| General government issues
National defence
National security and law enforcement
Education
Healthcare
Culture
Sports and physical fitness | Share of public sector employees by region |
National economy	Public investments
Social policy	Number of recipients of monthly allowances
Housing and utility services	Utility payments payable by households
Environmental protection	Current environmental costs by region
Media	Annual circulation of newspapers and magazines

Additionally, the following indicators were used as a measure of the external sector (commodity cycle parameter) for certain groups of regions:

- Export price of iron ore concentrate (FE);

- Price of hot-rolled, hot-drawn, extruded and forged long and shaped products (Steel);

- Food price index that measures changes in international prices of a basket of food commodities (FAO);

- Exchange rate of the US dollar (USA).

Groups of regions sensitive to various external shocks were defined based on the following criteria (see Table 4):

1. Exporting regions (based on the share of foreign trade turnover relative to GRP exceeding 20%).

2. Commodity-producing regions with a high share (more than 20%) of commodity-related revenues from corporate income tax in the consolidated revenue of the regions. This includes sectors such as oil and gas, ore mining, metallurgy, agriculture, and food production (collectively).

Table 4. Regions categorised by key indicators

Indicator	Region
USA_EXP	Moscow, Novgorod Region, City of St Petersburg, Republic of Khakassia, Republic of Buryatia, Sakhalin Region, Jewish Autonomous Region
URALS	Leningrad Region, Republic of Tatarstan, Republic of Udmurtia, Orenburg Region, Perm Territory, Tyumen Region, Irkutsk Region, Republic of Sakha (Yakutia), Altai Territory, Arkhangelsk Region, Bryansk Region, Vladimir Region, Ivanovo Region, Kabardino-Balkarian Republic, Kaluga Region, Karachayevo-Circassian Republic, Kemerovo Region – Kuzbass, Kurgan Region, Moscow Region, Novosibirsk Region, Omsk Region, Orel Region, Penza Region, Pskov Region, Republic of Adygea, Republic of Altai, Republic of Bashkortostan, Republic of Mordovia, Republic of North Ossetia – Alania, Republic of Tyva, Ryazan Region, Samara Region, Saratov Region, Smolensk Region, Stavropol Territory, Tver Region, Tomsk Region, Ulyanovsk Region, Chuvash Republic, Yaroslavl Region, Astrakhan Region, Republic of Mari El
FAO	Kaliningrad Region, Murmansk Region, Krasnodar Territory, Rostov Region, Primorye Territory, Kamchatka Territory
FE	Belgorod Region, Kursk Region, Krasnoyarsk Territory, Khabarovsk Territory, Amur Region, Magadan Region, Chukotka Autonomous Area, Trans-Baikal Territory
STEEL	Kostroma Region, Lipetsk Region, Tula Region, Republic of Karelia, Komi Republic, Vologda Region, Volgograd Region, Nizhny Novgorod Region, Kirov Region, Sverdlovsk Region, Chelyabinsk Region, Kemerovo Region – Kuzbass

We estimate fiscal multipliers for the period from 2010 Q1 to 2023 Q4, expressed in prices of the base quarter 2009 Q4, using the Russian Federation GDP deflator. This study utilises the results of calculation of the leading GRP indicator using the temporal disaggregation method [Boyko et al., 2020], enabling us to compile quarterly data on GRP dynamics by region.

The paper evaluates a SVAR model with the identification of shocks using sign restrictions, such as a positive response of GRP to spending shocks and a negative response of GRP to revenue shocks. Sign and zero restrictions are imposed according to [Arias et al., 2014] (see Table 5).

Table 5. Zero and sign restrictions on impulse response functions for aggregate government revenue and expenditure shocks

	Revenues (R)	Expenditures (G)	GRP (Y)	MIACR (I)	Ruble oil price (P)
Revenue shock	+	+	-	0	0
Expenditure shock	+	+	+	0	0

Note: '+' indicates a positive response, '-' indicates a negative response, and MIACR is the weighted average actual interest rate on loans granted by Moscow banks in the money market.

Seasonal adjustments to the data are carried out done using the X13-ARIMA/SEATS method, except for nominal interest rates and commodity prices. The variables are converted to real terms using the Russian Federation GDP deflator (except for nominal interest rates, the ruble price of oil, currencies, and export prices for ore and metals) and presented as the difference in natural logarithms (except for nominal interest rates). Aggregate revenues and expenditures by region are expressed as percentages of the region's GRP. The lag length in the model is set to one quarter.

3. EMPIRICAL RESULTS

We define the value of the fiscal multiplier as the simultaneous response of GRP to the shock of the corresponding budget variable in the region.

The revenue and expenditure multipliers are estimated for 68 Russian regions, including by budget levels (federal and regional budgets, as well as extra-budgetary funds).

Based on the available data, median values of GRP responses to revenue and expenditure shocks are estimated. The analysis of the impulse response function shows that the median response of GRP across Russian regions to a government revenue shock is -0.84 pp, with an average value of -0.95 pp by GRP volume. At the same time, the simultaneous median response of GRP to a government expenditure shock is 0.67 pp and the average is 0.62 pp (see Table 6 and Figure 3).

Table 6. Estimates of fiscal multipliers at various time horizons for Russian regions (median and average by GRP volume), GRP response to variable shocks, cumulatively (pp)

	Number of quarters following the shock						
	0	**1**	**2**	**3**	**4**	**8**	**12**
Median							
Revenue shock	**-0.84**	-0.80	-0.83	-0.83	**-0.84**	-0.84	-0.84
Expenditure shock	**0.67**	0.57	0.62	0.61	**0.62**	0.62	0.62
Average							
Revenue shock	**-0.95**	-0.83	-0.87	-0.86	**-0.87**	-0.87	-0.87
Expenditure shock	**0.62**	0.47	0.51	0.51	**0.51**	0.52	0.52

Figure 3. Boxplot of regional GRP response to 1% revenue and expenditure shocks by budget levels (pp)

GRP response to revenue shock   GRP response to expenditure shock
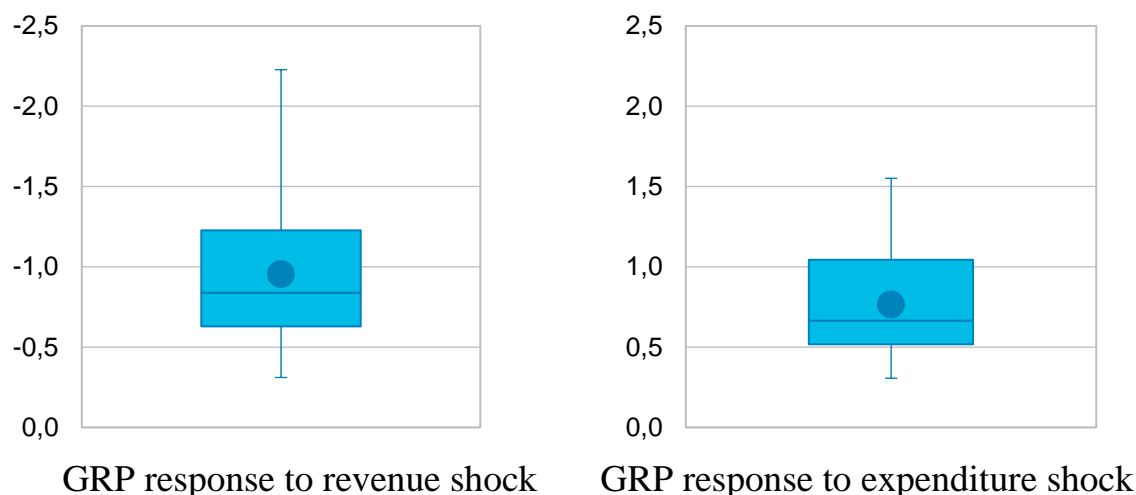
In line with the hypotheses derived from the literature review on factors influencing the magnitude of the fiscal multiplier, this study groups the regions using k-means cluster analysis. The parameters used for grouping are the following indicators averaged over 10 years, which characterise the state of the regional economy:

- Openness of the economy (measured by the ratio of imports to GRP);
- Economic development of the region (measured by GRP per capita);
- Labour market rigidity (measured by the unemployment rate);
- Financial stability of the region (measured by the ratio of government debt to GRP);
- Business cycle (measured by the output gap, which is estimated using the HP filter);
- Quality of life (measured by the regional quality of life index published by RIA Rating);

- Targeting of fiscal policy (measured by the expenditures of the consolidated regional budget aimed at supporting households, as a percentage of GRP);

- Effectiveness of regional authorities (measured by the regional government efficiency index published by the Agency for Political and Economic Communications).

Thus, using the k-means method, two clusters were formed (see Figure 4).

More developed regions are placed in Cluster 1, which is characterised by a lower fiscal expenditure multiplier compared to the other cluster. This cluster is also marked by a lower level of budget policy targeting and a slightly higher level of positive output gap on average over the 10-year period.

Less developed regions are characterised by higher values of fiscal expenditure multipliers. This may be due to a higher targeting of fiscal policy aimed at supporting the region's households, shorter periods of economic overperformance, and greater availability of labour resources, i.e. higher unemployment (see Table 7).

A common feature of the regions is budget consolidation between 2016 and 2019 and the lack of stimulation of regional economies by budget expenditures during the 2015 crisis. In 2020, most regions implemented fiscal stimulus in response to reduced economic activity, and the largest multiplier effect of fiscal policy was observed in less developed regions. The main stimulus for regional economies came from the federal budget.

The contribution of fiscal policy to economic activity varied in the groups of regions from 2011 to 2023. Given that the multiplier effects are higher in less developed regions, fiscal stimulus and consolidation have a greater impact on their economies (see Figures 5 and 6).

Figure 4. Clusters of regions based on indicators characterising fiscal multiplier magnitudes
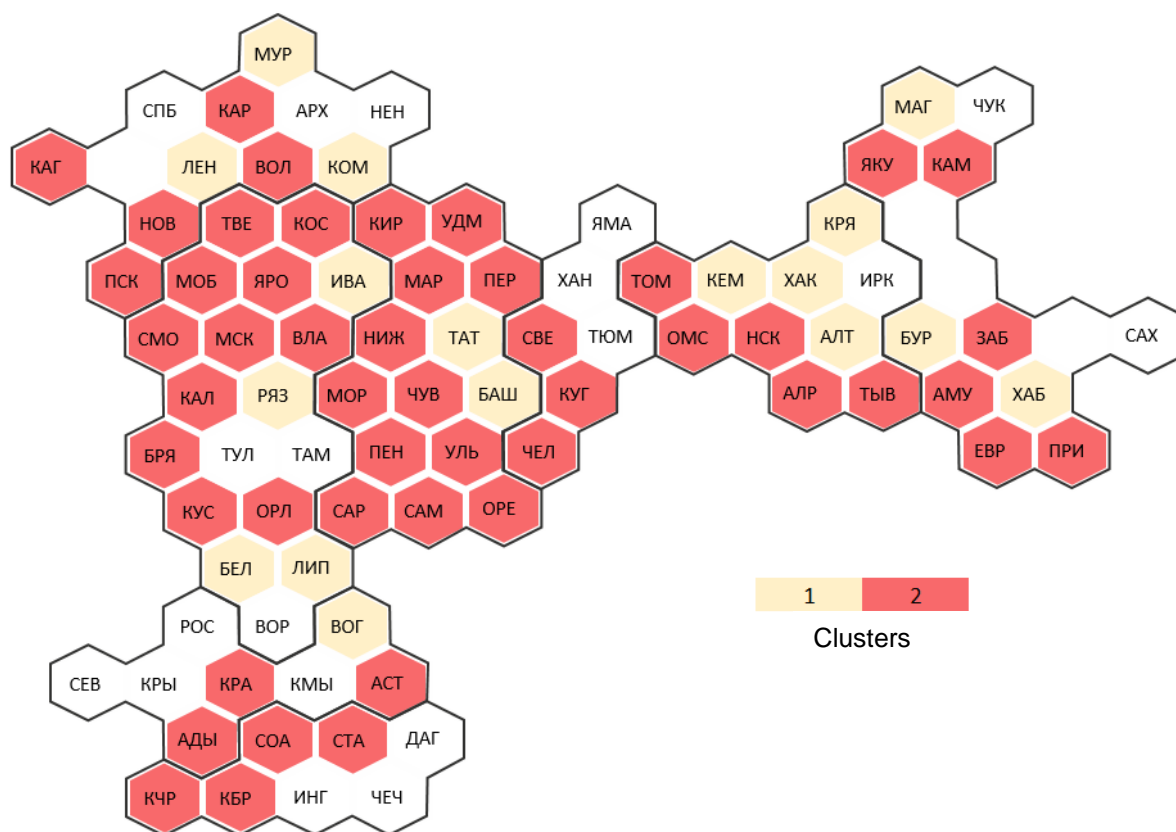
Note: Regions not highlighted in colour are not included in the clusters. Data are not yet calculated for the new Russian regions.

Ady	Republic of Adygea	Kos	Kostroma Region	Sam	Samara Region
Altt	Altai Territory	Krya	Krasnoyarsk Territory	Sar	Saratov Region
Altr	Republic of Altai	Kdt	Krasnodar Territory	Sakh	Sakhalin Region
Amur	Amur Region	Crm	Republic of Crimea	Svr	Sverdlovsk Region
Arkh	Arkhangelsk Region (excl. Autonomous Area)	Kur	Kursk Region	Sev	City of Sevastopol
Ast	Astrakhan Region	Krg	Kurgan Region	Smo	Smolensk Region
Bash	Republic of Bashkortostan	Kcr	Karachayevo-Circassian Republic	SPb	City of St Petersburg
Bel	Belgorod Region	Len	Leningrad Region	Stv	Stavropol Territory
Brya	Bryansk Region	Lip	Lipetsk Region	Tam	Tambov Region
Bur	Republic of Buryatia	Mag	Magadan Region	Tat	Republic of Tatarstan
Vla	Vladimir Region	Mri	Republic of Mari El	Tve	Tver Region
Vlg	Volgograd Region	Msr	Moscow Region	Tom	Tomsk Region
Vgd	Vologda Region	Mor	Republic of Mordovia	Tul	Tula Region
Vrzh	Voronezh Region	Msk	Moscow	Tyv	Republic of Tyva
Dag	Republic of Dagestan	Mur	Murmansk Region	Tyum	Tyumen Region (excl. Autonomous Areas)
Jew	Jewish Autonomous Region	Nen	Nenets Autonomous Area	Udm	Republic of Udmurtia
Tra	Trans-Baikal Territory	Nizh	Nizhny Novgorod Region	Uly	Ulyanovsk Region
Iva	Ivanovo Region	Nov	Novgorod Region	Khab	Khabarovsk Territory
Ing	Republic of Ingushetia	Nsk	Novosibirsk Region	Khak	Republic of Khakassia
Irk	Irkutsk Region	Oms	Omsk Region	KhtM	Khanty-Mansi Autonomous Area – Yugra
Klm	Republic of Kalmykia	Orb	Orenburg Region	Chel	Chelyabinsk Region
Klu	Kaluga Region	Orl	Orel Region	Chech	Chechen Republic
Kam	Kamchatka Territory	Ost	Republic of North Ossetia – Alania	Chuv	Chuvash Republic
Kar	Republic of Karelia	Pen	Penza Region	Chuk	Chukotka Autonomous Area
Kbr	Kabardino-Balkarian Republic	Per	Perm Territory	Yaku	Republic of Sakha (Yakutia)
Kem	Kemerovo Region – Kuzbass	Prm	Primorye Territory	Yaml	Yamal-Nenets Autonomous Area
Kir	Kirov Region	Psk	Pskov Region	Yar	Yaroslavl Region
Kgr	Kaliningrad Region	Ros	Rostov Region		
Kmi	Komi Republic	Ryaz	Ryazan Region		

Table 7. Median values of indicators for clusters

Indicator	Cluster	
	1	2
Imports (% of GRP)	9.90	5.50
GRP per capita (thousand rubles)	530.36	314.58
Unemployment rate (%)	4.45	5.79
State support of households (% of GRP)	0.93	1.17
Regional public debt (% of GRP)	3.25	5.46
Business cycle (pp)	0.12	0.05
Revenue multiplier (pp)	-0.62	-0.93
Expenditure multiplier (pp)	0.47	0.84
Quality of life index (pp)	0.55	0.45
Regional government efficiency index (pp)	0.66	0.58

Figure 5. Estimation of budget contribution to Russia's output dynamics (% of GRP)

Aggregate multiplicative contribution of revenues and expenditures

Aggregate multiplicative contribution of expenditures

Fiscal flows across regions (median)

Consolidated budget of the Russian Federation as a whole
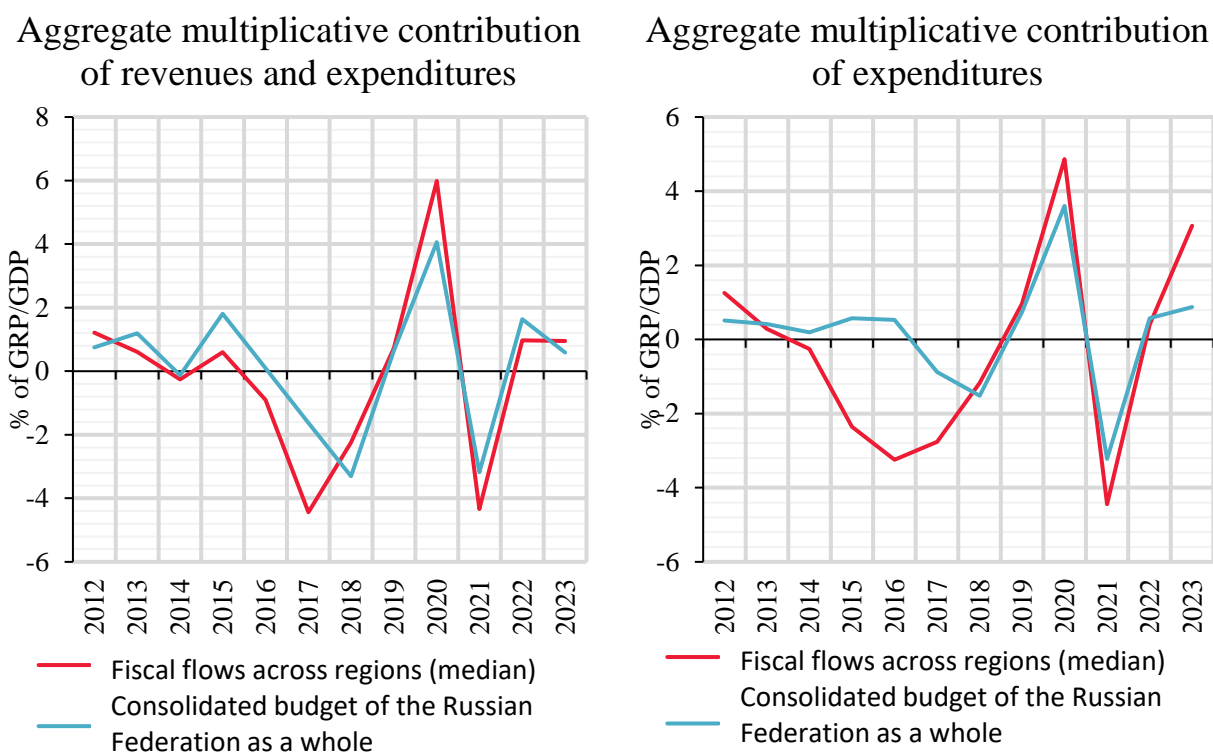
Figure 6. Contribution of fiscal policy to GRP dynamics in Russian constituent entities as a percentage of GRP (pp)

Cluster 1   Cluster 2

Aggregate multiplicative contribution of revenues and expenditures

Aggregate multiplicative contribution of expenditures
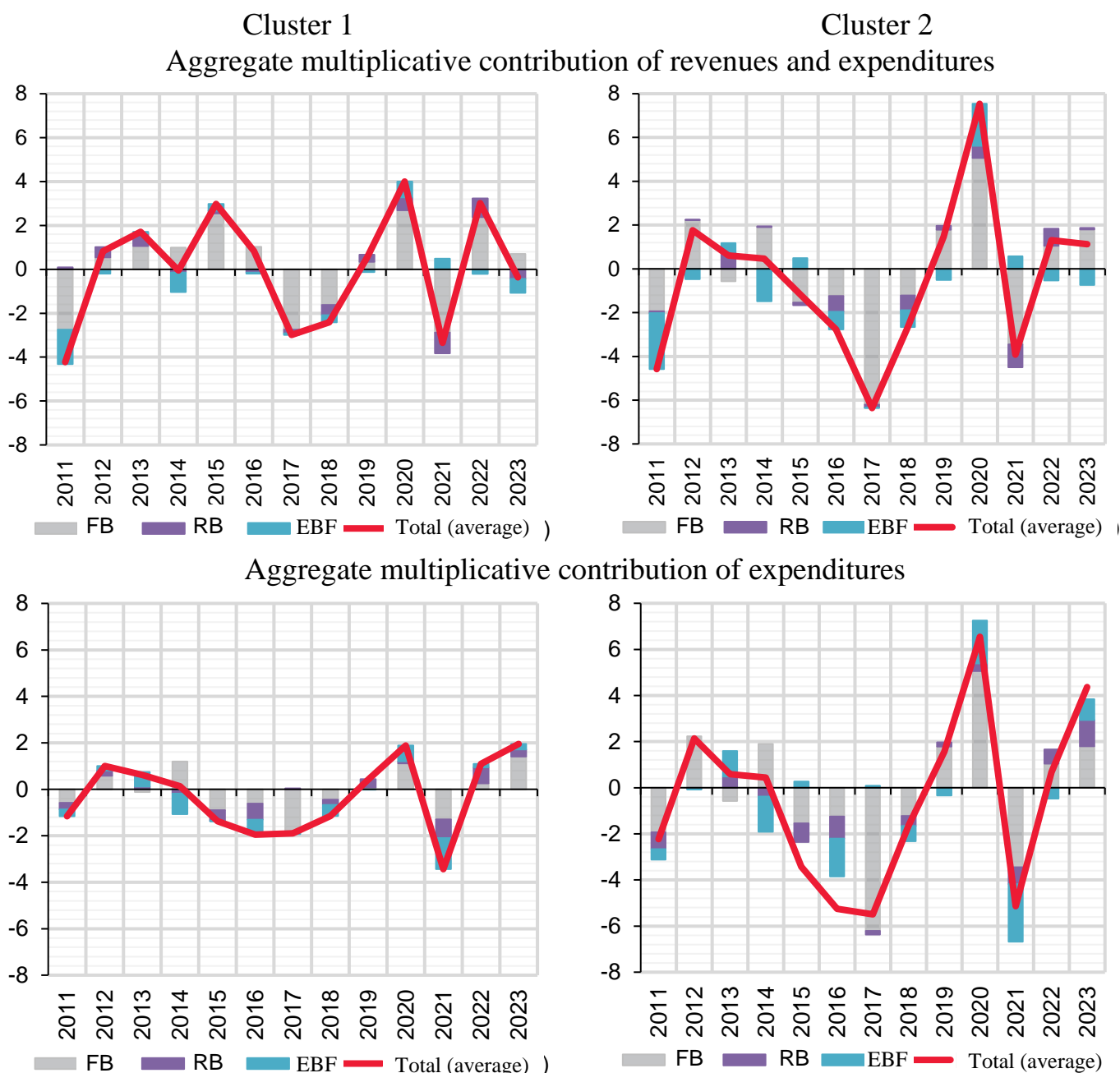
Note: FB – the federal budget, RB – a regional budget, EBF – extra-budgetary funds.

The procyclical fiscal policy implemented during crisis periods leads to greater losses in economic activity in less developed regions, which is evident for the period from 2015 to 2018. At the same time, the countercyclical fiscal policy implemented during a crisis, as was the case in 2020, results in a greater multiplier effect on GRP from budget-driven economic stimulus in less developed regions. Therefore, during this period, more developed regions experienced relatively smaller losses in GRP when consolidation was pursued. It is important to note that the approach to dividing regions into groups significantly affects the result. The differences in the budget contribution to GRP include a mixed effect of the multiplier size and the expenditures themselves.

In addition, we examine separately the impact of social and economic expenditures on GRP dynamics. To do this, major expenditure items were grouped. In this study, social expenditures included such items from the federal and regional budgets as social policy, education, healthcare, culture, sports and physical fitness, and media, while economic expenditures included national economy, housing and utility services, and environmental protection.

The evaluation was also carried out using the SVAR model outlined in Section 2. The median response of GRP to economic expenditure shocks was found to be higher than that from social expenditures (see Table 8).

Table 8. GRP response to social and economic expenditure shocks, cumulatively (pp of GRP)

	Number of quarters following the shock						
	0	1	2	3	4	8	12
Median							
Economic expenditure shock	**0.74**	0.65	0.68	0.68	**0.68**	0.68	0.68
Social expenditure shock	**0.62**	0.53	0.57	0.57	**0.57**	0.57	0.57
Average							
Economic expenditure shock	**0.78**	0.68	0.72	0.73	**0.73**	0.74	0.74
Social expenditure shock	**0.65**	0.57	0.62	0.62	**0.63**	0.63	0.63

In the period from 2017 to 2023, the contribution of economic expenditures to the GRP dynamics of Russian regions was +0.05 pp annually. The multiplier effect from social expenditures on the dynamics of regional output was +1.36 pp. If we consider the multiplier value by regional clusters (see Figure 7), the estimate for Cluster 1 averaged 0.43 pp for the social expenditure multiplier and 0.53 pp for the economic expenditure multiplier. For Cluster 2, the values were 0.73 pp and 0.86 pp, respectively. A possible reason for this difference in multiplier size across clusters could be less developed economy and financial markets, and also less ability to redistribute consumption over time.

In the period under consideration, i.e. from 2016 to 2019, the multiplier effect of economic expenditures was comparable to that of social expenditures. However, from 2022, the contribution of social expenditures to the economy has significantly exceeded the contribution from economic expenditures.

Figure 7. Weighted average contribution of budget expenditures by type to GRP dynamics (pp)
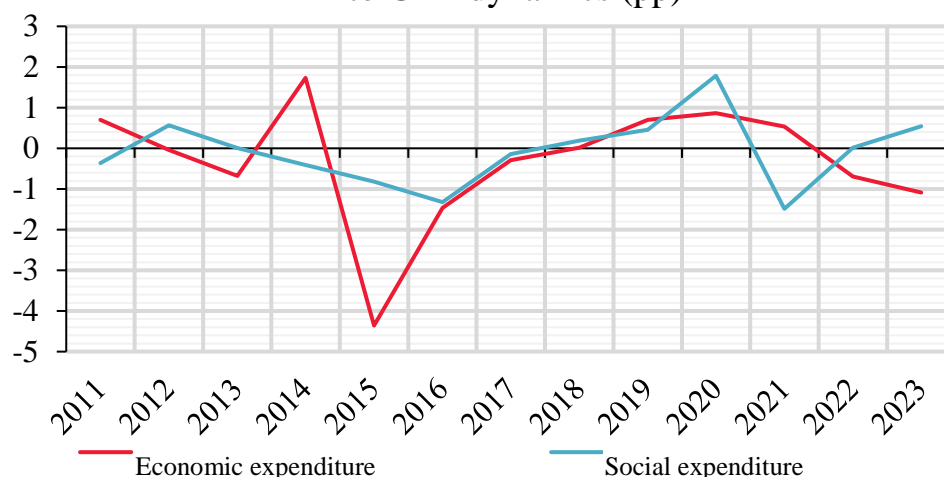
Thus, the negative accumulated effect of withdrawing funds from the economy of regions in the medium term exceeds the positive accumulated effect of injecting funds into the economy. The effects of budgetary influence on economic activity are higher in less developed regions. During the periods of economic stimulus by government agencies, a comparatively larger positive effect on economic activity is observed in less developed regions, whereas during the periods of fiscal policy consolidation, these regions experience comparatively larger losses in GRP.

CONCLUSION

Based on the estimation of fiscal multipliers across regions, we observe an overall negative effect on the economy from expanded fiscal flow (revenue and expenditure) shocks. The obtained estimates of fiscal multipliers are consistent with theoretical expectations regarding their size and the sign of GRP response to the shocks.

The negative effect of withdrawing funds from the regional economy exceeds the positive effect of injecting funds into it. The GRP response is at its maximum at the time of both revenue and expenditure shocks.

A relatively positive impact on the economy is noted due to the redistribution of income from regions with higher levels of economic development to those with lower levels. The accumulated effect on economic activity from increased budget expenditure in less developed regions is higher compared to more developed regions. This suggests that injecting funds withdrawn from the economies of more developed regions into the economies of less developed regions has a greater multiplier effect than if those funds were returned to the economies of more developed regions.

It is important to note that the estimates of revenue and expenditure multipliers may have changed in recent years. The factors potentially raising the expenditure multiplier include improved efficiency of the national security, defence and law enforcement sector, redistribution of funds in favour of households with a high propensity to consume, increased spending on subsidising preferential credit rates, and restrictions on the supply of imported products. The factors potentially reducing the revenue multiplier include increased withdrawals from households with a high propensity to save and from enterprises that are less inclined to reinvest profits into the economy.

The estimation of fiscal multipliers across regions allows for evaluating the heterogeneous impact on the economies of regions depending on their level of economic development. During periods of economic stimulus and budget deficits, regions with lower levels of economic development experience a relatively greater impact from fiscal policy on economic activity. On the contrary, during periods of fiscal consolidation and budget surpluses, these regions incur relatively large GRP losses compared to those with higher levels of economic development. The response of regional GRP to an increase in economic expenditures is higher than to an increase in social expenditures.

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APPENDIX

Impulse responses of variables (Table 6) in the SVAR model to 1% revenue and expenditure shocks, median value (pp)

R->Y

R->R

R->G

R->I

R->P
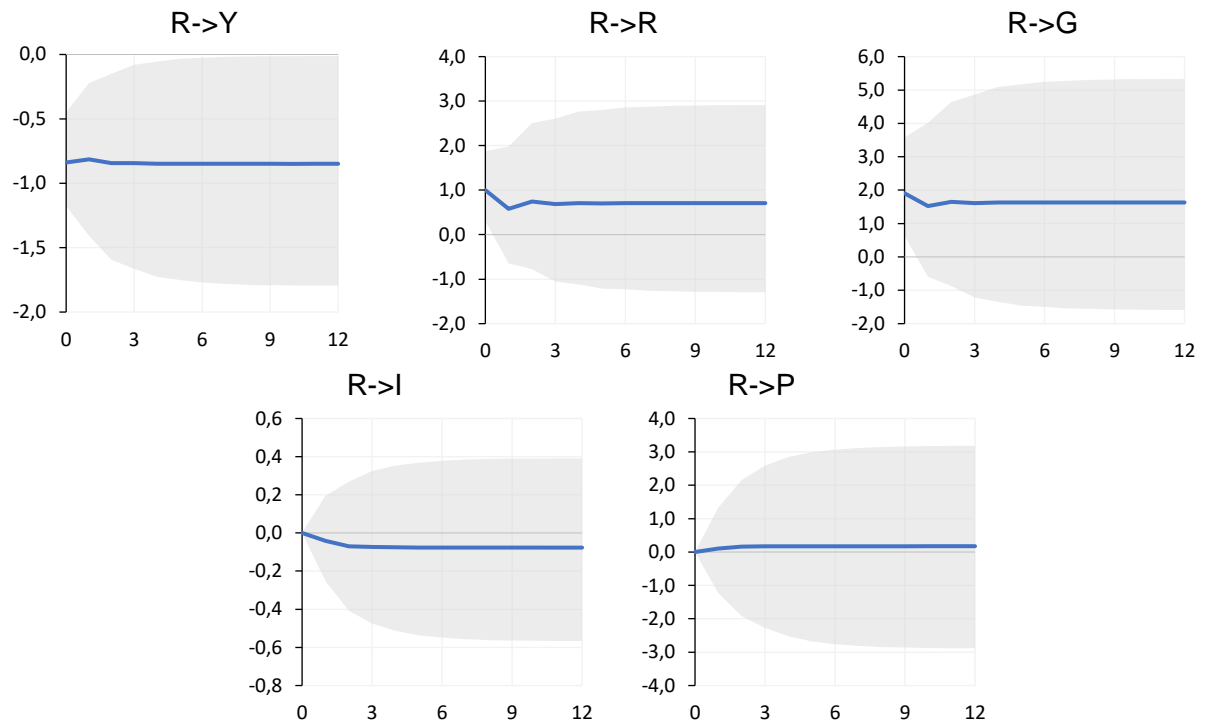
Impulse responses of variables in the SVAR model to 1% revenue shock, cumulatively (pp)

G->Y

G->R

G->G

G->I

G->P
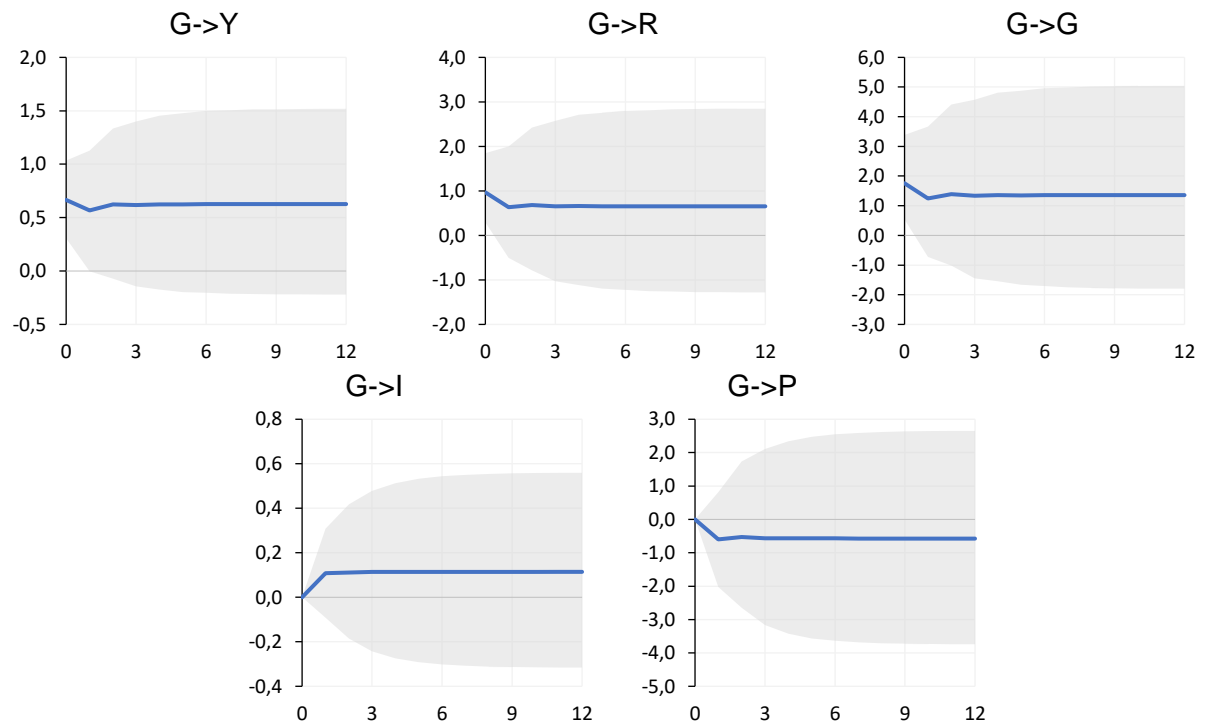
Impulse responses of variables in the SVAR model to 1% expenditure shock, cumulatively (pp)

Growth in shares of budget revenues and expenditures of regions, grouped by level of economic development, in monetary value of GRP (pp)

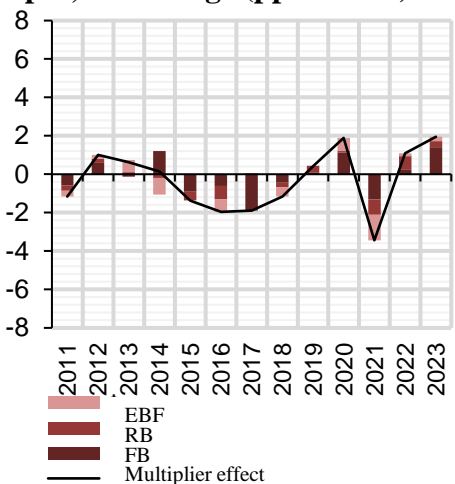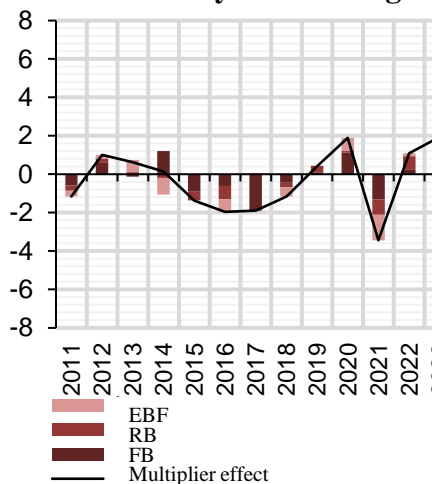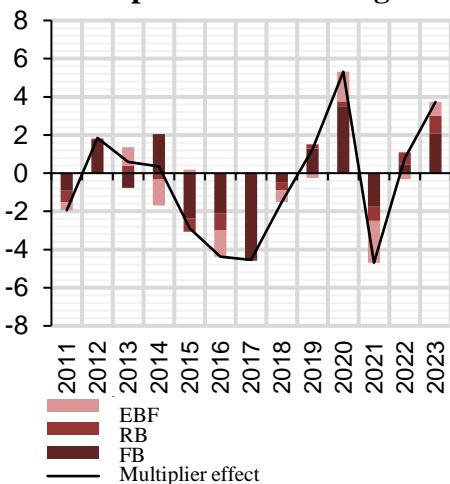*68 Russian regions* *Cluster 1* *Cluster 2*

Multiplier effect of budget revenues and expenditures on the dynamic of regional output, on average (pp of GRP)
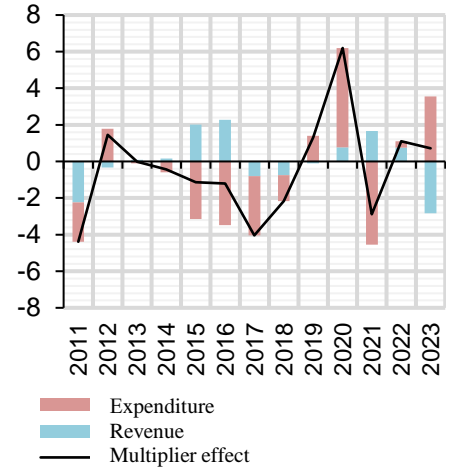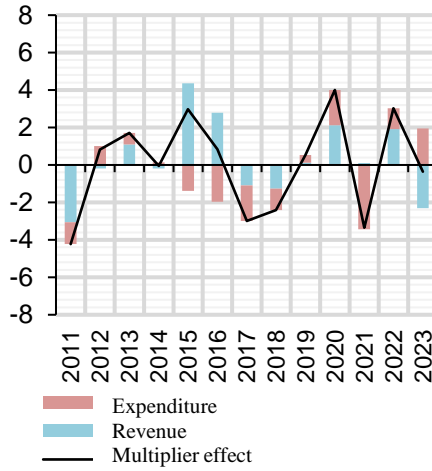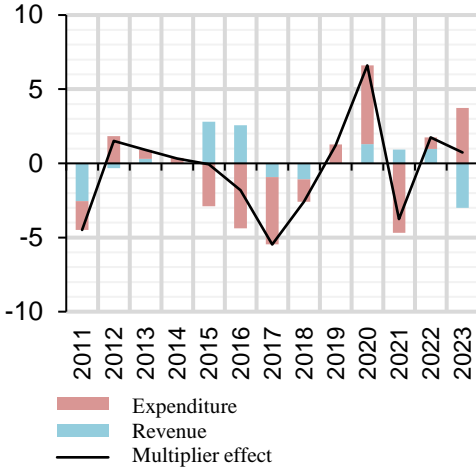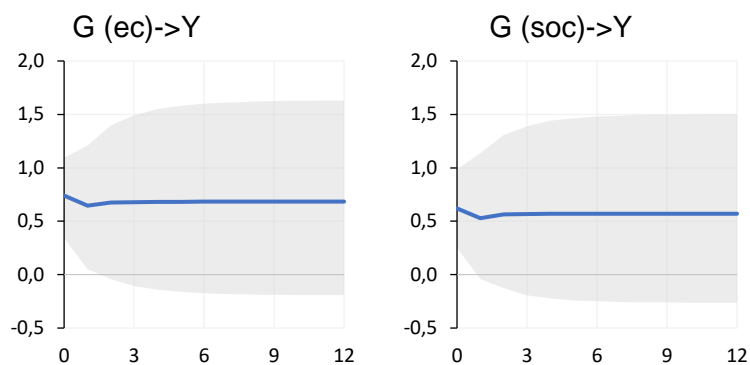

Multiplier effect of budget revenues on the dynamic of regional output, on average (pp of GRP)
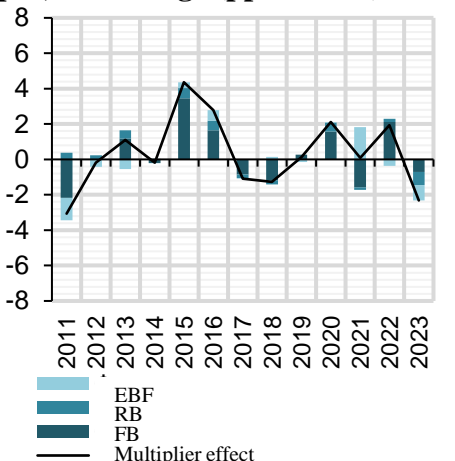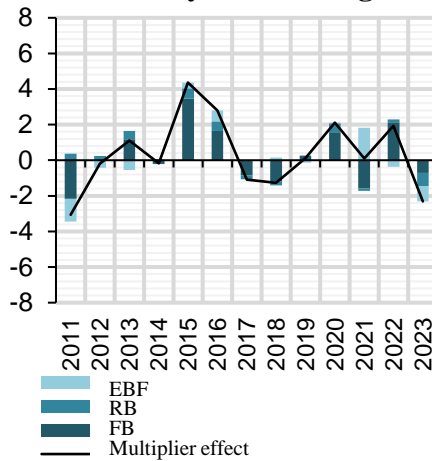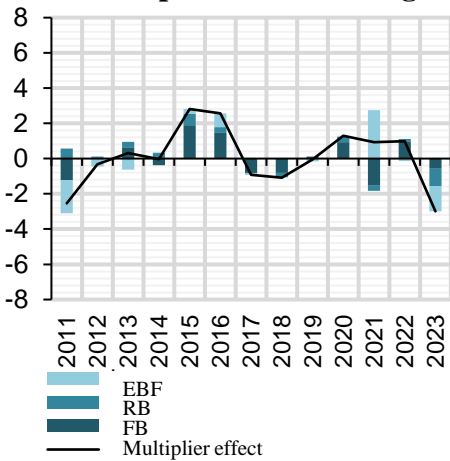
Multiplier effect of budget expenditures on the dynamic of regional output, on average (pp of GRP)

Impulse responses of variables (Table 8) in the SVAR model to 1% shock by type, median value (pp)

G (ec)->Y

G (soc)->Y

Selection of optimal number of clusters

Optimal number of clusters

Optimal number of clusters