

Fiscal federalism and regional performance in Russia[☆]

Gabriel Di Bella^{*}, Oksana Dynnikova, Francesco Grigoli

International Monetary Fund, Washington, DC, United States

Abstract

Sound regional policies are essential for balanced and sustained economic growth. The interaction of federal and regional policies with cross-regional structural differences affects human and physical capital formation, the business climate, private investment, market depth, and competition. This paper summarizes the main elements of Russia's fiscal federalism, describes the channels through which it operates, and assesses the effectiveness of regional transfers in reducing regional disparities. The results suggest that federal transfers to regions contributed to reducing disparities arising from heterogeneous regional tax bases and fiscal revenues. This allowed regions with initially lower per capita income to increase human and physical capital at higher rates. There is little evidence for transfers contributing to increased cross-regional growth synchronization. The results also suggest that federal transfers did not significantly improve regional fiscal sustainability, a conclusion that is supported by the lack of convergence in per capita real income across Russian regions in the last 15 years.

Keywords: convergence, federalism, regional policies, Russia, transfers.

JEL classification: H70, H71, H77.

1. Introduction

Sound regional policies are essential for balanced and sustained economic growth. The interaction of federal and regional policies with cross-regional structural differences (e.g., natural resources, market size, distance to markets, historical events) affects human and physical capital formation, the business climate, private investment, market depth, and competition. Policy pitfalls can be costly as they can result in persistent differences in regional per capita income, depen-

[☆] The views expressed in this paper are those of the authors and do not necessarily represent those of the IMF or IMF policy.

^{*} Corresponding author, E-mail address: gdibella@imf.org

dence on federal transfers, and excessive geographic concentration. Balanced regional development is a challenge that is particularly important in geographically large and heterogeneous countries (for a discussion of factors leading to uneven regional development, see Krugman, 1991).

Russia is a federal state in which regions have the legal responsibility—either exclusively or shared with the federal government—for education, health, and infrastructure spending. At the same time, Russia's fiscal constitution is more centralized than that in other federal countries. Its main building blocks are a relatively centralized tax authority and a complex system of federal transfers. Thus, the federal government plays a significant role in shaping regional outcomes. Federal transfers represented the economic lifeline of lower per capita income regions, which unsurprisingly have the weakest tax bases, for the last 15 years. Consolidated federal transfers, either from the federal budget or from federal extra budgetary funds (EBFs) to the regions (including territorial medical EBFs) amounted to 3.5 percent of GDP in 2016, or about 65 percent of federal oil and gas revenues. These transfers financed a large share of regional fiscal spending (e.g. almost 70 percent in the North Caucasus Federal Region, or about 40 percent in the Far Eastern Federal Region).

From a policy perspective, the large sub-federal share in general government spending—about 40 percent if territorial medical EBFs are considered—suggests that the fiscal stance is determined simultaneously by policies at the regional and federal level.¹ Federal transfers may affect the degree of synchronization of regional growth, creating challenges (or improving) the effectiveness of stabilization policies, including monetary policy (Siluanov and Nazarov, 2009). Moreover, a large volume of transfers reduces the downward flexibility of federal spending, which can create challenges (including for a fiscal rule targeting a constant structural balance) as oil revenues gradually decrease. In this regard, federal transfers to regions add to other (earmarked) transfers, including those to the pension system and other EBFs, some of which will likely mount as population ages.

There is a large Russia-focused literature analyzing fiscal federalism and regional development. Some authors discuss the appropriate institutional design of fiscal federalism in Russia: Lavrov et al. (2001), Khristenko (2002), Kadochnikov et al. (2002), Klimanov and Lavrov (2004), Shvetsov (2005), Yakobson (2006), Nazarov (2006), Grigoriev et al. (2008), Bukhval'd (2008), Zubarevich (2014), and Alexeev (2016). Other authors focus on the challenges and outcomes of regional development in Russia, including Mau and Yanovskiy (2001), Granberg (2002), Pelyasov (2003), Alexandrova and Grishina (2005), Zubarevich (2009), Yushkov (2016), and Yushkov et al. (2017b).

This paper attempts to empirically evaluate the relation between fiscal federalism and regional development in Russia. To that end, it compares Russia's fiscal federalism to that of other federal countries (Section 2), describes the channels through which fiscal federalism operates in Russia, assesses the effectiveness of regional transfers in reducing regional disparities in the provision of public services, analyzes the impact of transfers in synchronizing cross-regional growth,

¹ The share of regional spending to general government spending in Russia is lower than in Canada, the United States, and Mexico, but similar to that in a number of other OECD countries including Belgium, Germany, and Spain (OECD, 2016).

and evaluates the extent to which they have contributed to strengthen the regions' fiscal sustainability (Section 3). The paper concludes with a discussion of the results, some policy implications and issues for further analysis (Section 4). The results suggest that federal transfers to regions contributed to reducing disparities arising from heterogeneous regional tax bases and fiscal revenues. This allowed regions with initially lower per capita income to increase human and physical capital at higher rates. There is little evidence for transfers contributing to increased cross-regional growth synchronization. The results also suggest that federal transfers did not significantly improve regional fiscal sustainability, a conclusion that is supported by the lack of convergence in per capita real income across Russian regions in the last two decades.²

2. Russia's fiscal federalism in the international context

Fiscal federalism arrangements in Russia are involved. There are three levels of government in Russia—federal, regional, and local—with the local level further subdivided into a hierarchy of municipalities, which in total count more than 22,000. The Budget Code states that each of the three levels is autonomous and should be financially self-sustained. However, a complex system of intra-government transfers (mostly flowing from the federal government) ensures that spending of most regions, territorial EBFs, and federal EBFs remain broadly financed. A large network (counting more than 65,000) of budgetary, extra-budgetary, unitary enterprises, and joint stock companies (most of which operating at the regional level) adds to complexity.

Russia's legal framework is consistent with an integrated fiscal constitution. The main conclusion in Blöchliger and Kantorowicz (2016) is that through clustering of fiscal constitutions characterized by similar features it is possible to classify countries in either those having integrated fiscal constitutions or those having decentralized ones. Decentralized fiscal constitutions (e.g., Canada and the United States) are consistent with sub-national governments (SNG) having more autonomy and responsibility, lower co-determination of policies, and relatively weaker numerical budget rules and frameworks. Integrated or centralized, fiscal frameworks are characterized by lower autonomy and responsibility of SNGs and, at least *de jure*, stronger fiscal rules and frameworks.

In what follows, we rely on the data from Blöchliger and Kantorowicz (2016) to look into Russia's fiscal federalism and compare it with that of other federal countries. Their analysis together with a reading of Russia's legal framework, allows to understand the relative weight of the federal and regional governments in shaping cross-regional socio-economic outcomes.³ In particular, the framework for intergovernmental fiscal relations is assessed and quantified along five categories: the autonomy of SNGs, the responsibility for their own fiscal policies, their power to shape federal policy, the strength of budget frameworks, and the overall system's stability. Each of these categories (as well as sub-categories) is evaluated by looking at several sub-indicators whose performance is assessed with

² Appendix A provides further details about the distribution of revenue authority, sharing arrangements, intra-governmental transfers, spending jurisdictions among levels of government, and the limits imposed by the federal government on the regions' budgets.

³ See Appendix A for further details.

an index ranging from zero (low) to one (high). As this analysis is for some of the indicators mainly *de jure*, the description below notes, when appropriate, any differences with *de facto* realities in Russia.⁴

Russia’s SNGs have weaker tax autonomy than spending autonomy relative to other federal countries. The autonomy of SNGs (Fig. 1a) is analyzed looking at both tax and spending autonomy. Tax autonomy is assessed by looking at each tax category and evaluating whether the federal government, SNGs, or both, can affect tax rates, as well as with respect to the clarity with which the law assigns power between different levels of governments. Likewise, spending autonomy is evaluated at each policy area and assessing the respective responsibilities of SNGs and the federal government. In other sub-categories (namely, borrowing and budgetary autonomy), Russia ranks below the average of advanced economies and similar to the average of other emerging markets.

A look at Russia’s SNGs responsibility (Fig. 1b) suggests that the federal government plays a relatively more important role in regional fiscal policy in Russia than in both advanced and other emerging market economies. In terms of the sub-categories, fiscal equalization policy in Russia is more the responsibility of the federal government than that of SNGs, and stabilization policy is fully in the hands of the federal government. The intensity of federal grants (which may be underestimated in Blöchliger and Kantorowicz (2016) as they measure it in

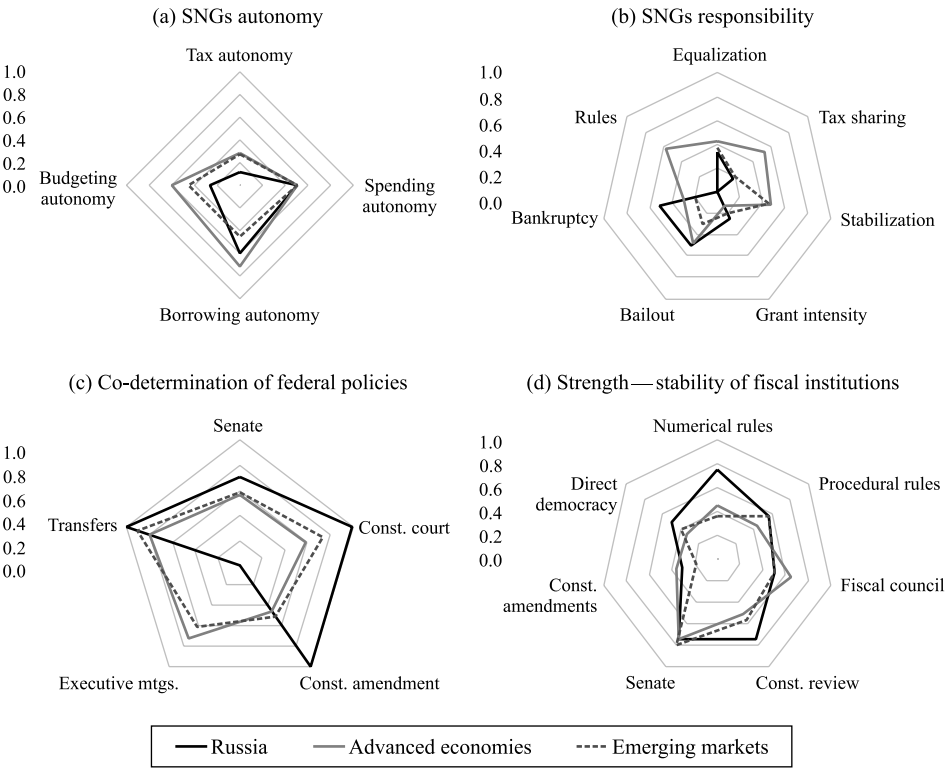


Fig. 1. Features of Russia’s fiscal federalism.

Source: Authors’ calculations and OECD (2016).

⁴ For a more comprehensive discussion see Blöchliger and Kantorowicz (2016).

terms of aggregate GDP rather than in terms of the gross regional product, GRP, of recipient regions) also suggests an important role for the federal government in shaping regional outcomes. A *de jure* evaluation of the possibility of regional bailouts or bankruptcies situates Russia in a better position than the average of advanced and other emerging market economies, although *de facto* the federal government as recently as in 2015–2016 resorted to transfers to ease the burden of public debt in some regions.⁵

Finally, Russia's legal framework obtains higher marks than the average of advanced and other emerging market economies in co-determination of federal policies (Fig. 1c) and the stability of its fiscal constitution (Fig. 1d). However, *de jure* versus *de facto* considerations play a role in this assessment. For instance, although Russia's budget code included some form of a fiscal rule since 2008, its parameters changed, and its implementation was suspended a few times. Regarding the stability of the legal framework, Russia suffered numerous modifications of the operational framework establishing the relation between the federal and regional governments, including on tax sharing and transfers.

3. Federal transfers to regions: Achievements and challenges

This section begins with some background information about Russia's tax sharing arrangements, the types of federal transfers, and the fiscal situation of Russian regions. It then presents an empirical analysis of the effectiveness of federal transfers in equalizing the provision of public services, in increasing the correlation of cross-regional growth rates, and in delivering sustainable regional budgets.

The econometric analysis uses panel data for 79 regions covering a large variety of regional socio-economic variables, including economic activity, labor, fiscal, financial, and structural indicators. The data spans the period 2000–2016, although some variables are available for shorter time periods (i.e., regional fiscal data for 2005–2016, GRP for 2000–2015, and GRP composition for 2004–2015). A cross-sectional dataset is then constructed in which each observation represents some bilateral interaction between two regions (e.g., difference in growth rates, level differences, or correlation) for a given variable.

3.1. Background

Regional revenues include own revenues and federal transfers. The share of federal transfers in regional revenue varies widely across regions, ranging from about 10 percent to 90 percent. Federal taxes (most importantly personal and corporate income tax) are the largest source of regional revenue, representing on average about 70 percent of own revenues. Tax sharing, or primary distribution, allocates tax revenues among different levels of government. Ideally, it should result in vertical fairness, i.e., in a balanced distribution of revenues among federal, regional, and local governments. It is performed directly in the regions where taxes are collected on a tax-by-tax basis at predetermined rates. Sharing arrangements and rates are governed by the Budget Code, and in the case of the corpo-

⁵ Tabakh and Andreeva (2015) analyze the debt strategies of Russian regions, and Blagoveschensky (2014) the solvency of Russian regions.

rate income tax by the Tax Code. Regional excises' shares are determined by the Budget Code with horizontal (i.e., cross-regional) re-distribution. Rates tend to be adjusted frequently (see Appendix A for more details).

The primary distribution of taxes results in a large cross-regional dispersion of fiscal revenues (or horizontal disparity, i.e., differences in the revenues within a level of government), however some relationships hold steady. Specifically, regions with lower per capita real GRP have lower per capita real own revenues (Fig. 2a). In regions in which the public sector's share in GRP is high, per capita real fiscal revenues tend to be lower (Fig. 2b). Also, and in line with the literature (Leuthold, 1991; Sen Gupta, 2007), per capita fiscal revenues are positively associated with the share of mining in GRP and negatively associated with the share of agriculture (Figs. 2c–2d). In other words, regional tax bases are positively associated with per-capita GRP, with the share of mining in GRP, and negatively associated with the share of agriculture, and that of the public sector.

In broad terms, inter-governmental federal transfers aim at reducing horizontal fiscal inequality.⁶ These include (i) non-earmarked and non-matching

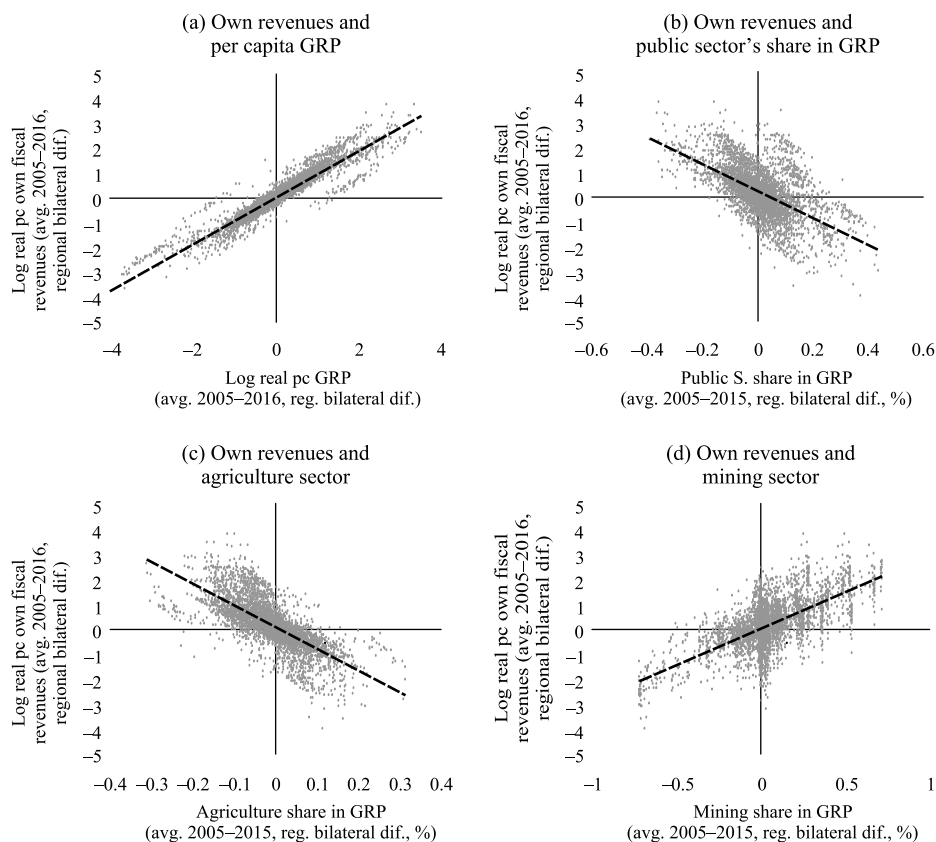


Fig. 2. Own fiscal revenues, per capita income, and GRP composition.

Note: The black dashed lines represent the linear regression lines.

Source: Authors' calculations.

⁶ We use the prefix “inter” to denote transfers between different levels of government (e.g., from the federal government to the regional governments or vice-versa).

transfers (of which equalization grants are the most important); (ii) subsidies (earmarked matching transfers to finance spending priorities); (iii) subventions (earmarked non-matching transfers to finance devolved spending responsibilities); and (iv) other transfers.⁷ In addition, there are transfers from the Federal Medical Insurance Fund (a federal EBF), to Territorial Medical Insurance Funds (regional EBFs), which represented 1.7 percent of GDP in 2016.⁸ Equalization grants constitute about 50 percent of federal government transfers (see Appendix A for more details). In per capita real terms equalization grants flow mostly to regions with both lower per capita income and lower own fiscal revenues. In contrast, subsidies and subventions in per capita real terms are allocated to regions with higher per capita income (Fig. 3).⁹

Regions and municipalities are largely responsible for social policies as well as for some regional infrastructure. In 2016, regional spending represented 95 percent of general government expenditure for housing and utilities, 80 percent for education and cultural activities, and around 85 percent for health including spending by territorial extra-budgetary medical funds.

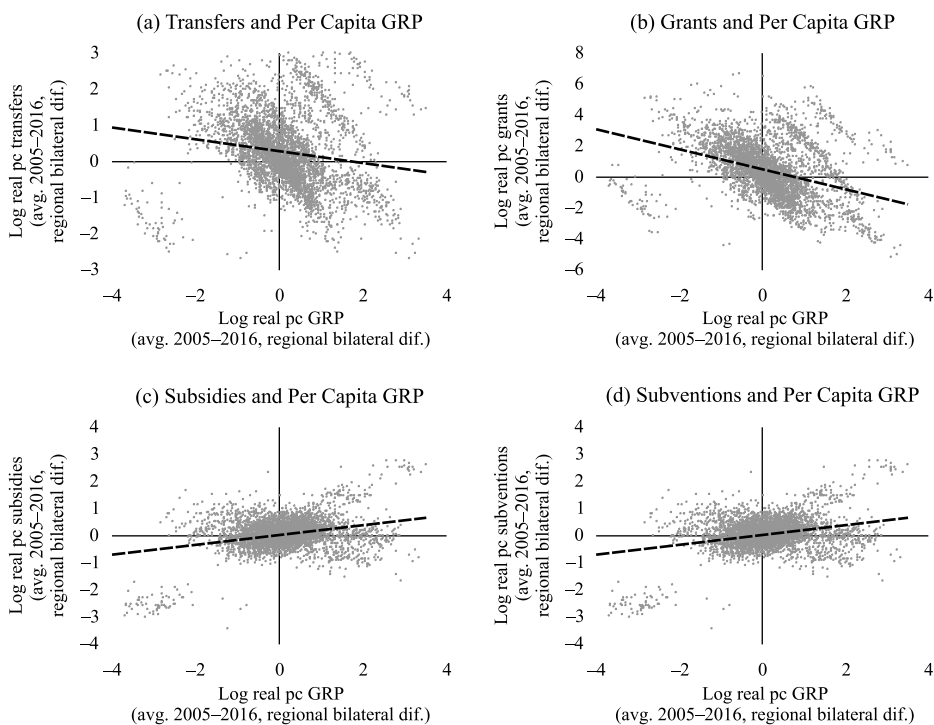


Fig. 3. Federal transfers and per capita income.

Note: The black dashed lines represent the linear regression lines.

Source: Authors' calculations.

⁷ In the econometric analysis that follows we consider formula-based and discretionary equalization grants together. Discretionary equalization grants are important for some regions.

⁸ About 40 percent of these transfers are financed by contributions to the Federal Medical Fund from regional budgets on behalf of the non-working population.

⁹ Federal budget spending for national economy includes transfers and subsidies to support economic activity, which can benefit both private and state-owned firms. Although this category of spending has a regional dimension, this dimension is not legally codified.

3.2. Federal transfers and public goods' supply disparities

In principle, a large portion of federal transfers to regions aim at reducing disparities arising from heterogeneous regional tax bases and unequal own revenues. A look at the data shows that indeed the distribution of cross-regional per capita real expenditure is situated to the right of the distribution of per capita real own revenues. This implies that lower income regions can afford higher public real per capita spending than warranted by their own regional revenues.

Moreover, higher average federal transfers to regions in 2005–2016 (in per capita real terms) are positively associated with larger increases in per capita real annual spending in health and education, helping lower income regions to partially close the gap with richer regions in per capita social spending (Figs. 4a–4b). Larger federal transfers are also positively associated with stronger human capital accumulation. Educational attainment together with employment data allows constructing regional measures of human capital using a methodology similar to that in Hall and Jones (1999), which assumes diminishing returns for additional years of education.¹⁰ The resulting human capital measures show that it grows at higher rates in re-

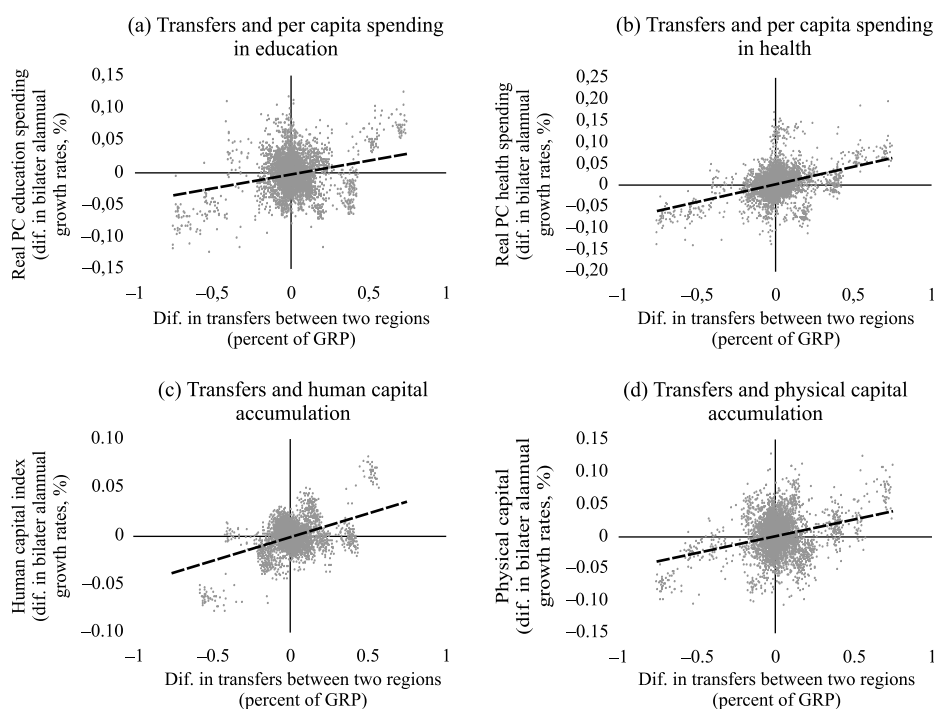


Fig. 4. Federal transfers and accumulation of factors of production.

Note: The black dashed lines represent the linear regression lines.

Source: Authors' calculations.

¹⁰ Human capital indices are constructed assuming decreasing returns of additional years of education. In other words, the increase in human capital of finishing primary school (with respect to having no schooling at all) is higher than the increase in finishing secondary education (with respect to having finalized basic education only). We assign decreasing returns to the five different categories of education that are reported by the national statistics agency (Rosstat), namely basic, secondary, secondary technical, university, and post-graduate. These calculations are available upon request.

regions that receive higher average transfers (in GRP terms) (Fig. 4c). This result, however, is partially driven by cross-regional differences in labor supply.

In addition, investment-to-GRP ratios and physical capital accumulation are generally higher in regions receiving larger federal transfers. The construction of regional capital stocks by means of the perpetual inventory method shows that physical capital accumulation in regions with initially lower per capita income and that receive larger transfers is faster than in other regions (Fig. 4d). The very high investment ratios (in some cases as high as 50 percent of GRP) highlight, however, that initial capital stocks in lower income per capita regions were likely very low when compared with richer regions.¹¹

3.3. Federal transfers and cross-regional growth correlation

Given the central role that the federal government plays in economic stabilization, a federal policy that smooths out aggregate economic cycles and strengthens cross-regional growth correlations should have positive spillovers for the effectiveness of monetary policy.¹² To test whether federal transfers contribute to increasing the synchronization of real GRP growth rates, we estimate the following equation:

$$\rho_{i,j}(y_i, y_j) = \alpha + \beta \theta_{i,j}(ft_i, ft_j) + \gamma X_{i,j} + \epsilon_{i,j} \quad (1)$$

where $\rho_{i,j}(y_i, y_j)$ is the correlation coefficient between the per capita real GRP growth rate, denoted by y , of region i and region j ; $\theta_{i,j}(ft_i, ft_j)$ is the correlation coefficient between the growth rate of per capita real federal transfers (on aggregate and by type of transfer), denoted by ft , of region i and region j ; $X_{i,j}$ is a set of control variables (including proxies for distance, GRP structure, footprint of the state, and international trade) calculated as the pairwise difference between two regions of the variable being considered;¹³ α is a constant; β and γ are the coefficients of the correlation coefficient and the control variables, respectively; and $\epsilon_{i,j}$ is the error term (see Appendix B for the definition of the variables used in the specifications).¹⁴

Table 1 presents the results for eleven alternative specifications. We find evidence that aggregate transfers do not have a strong or robust association with bilateral cross-regional growth correlation. Among transfer types, the same applies for per capita real grant growth rates (whose purpose is to reduce cross-regional spending disparities) and per capita real subsidies growth rates. The coefficient for per capita real subventions growth rates are somewhat significant in some

¹¹ The link between regional investment and transfers is straightforward. The budget finances a relatively large share of regional investment in regions receiving larger transfers, in particular lower-income regions. A similar pattern is observed when looking at gross investment by ownership (private, public, and mixed): public sector investment is larger in regions receiving larger transfers.

¹² This is a similar argument to that made in the optimal currency area literature (Mundell, 1961).

¹³ The footprint of the state is defined as the number of per capita regional budget and non-budgetary entities, including state unitary enterprises and joint-stock companies.

¹⁴ Since bilateral observations for region pair (i, j) are not independent from the bilateral observations for the region pair, say, (i, k) , the actual degrees of freedom are $n - k - 1$, where n is the number of the regions rather than the number of observations, and k is the number of the independent variables. Standard errors are corrected accordingly.

Table 1
Estimation results for bilateral per capita GRP growth correlations.

Variable	1	2	3	4	5	6	7	8	9	10	11
Constant	0.514***	0.530***	0.524***	0.561***	0.566***	0.562***	0.559***	0.566***	0.374*	0.149	0.149
Per capita real federal transfers growth corr.	0.065	0.051	0.047	0.034	0.021	0.023	0.025	0.013	0.005	0.002	0.002
Per capita real grant growth corr.									0.264	0.209	0.209
Per capita real subsidies growth corr.										0.356*	0.356*
Per capita real subventions growth corr.											0.209
Initial per capita real GRP		−0.071	−0.069	−0.142***	−0.124**	−0.104	−0.101	−0.102	−0.096	−0.085	−0.085
Common border			0.126	0.086	0.088	0.096	0.097	0.098	0.088	0.070	0.070
Share of public sector in GRP				−1.218***	−0.784	−0.814	−0.853	−0.854	−0.807	−0.813	−0.812
Footprint of state					−0.090	−0.097	−0.095	−0.096	−0.096	−0.083	−0.083
Urbanization rates						−0.155	−0.132	−0.132	−0.148	−0.189	−0.189
Foreign trade							−0.043	−0.043	−0.041	−0.054	−0.054
R^2	0.003	0.030	0.038	0.136	0.160	0.164	0.166	0.166	0.177	0.209	0.209
Adj. R^2	0.003	0.029	0.037	0.135	0.159	0.163	0.164	0.164	0.175	0.207	0.207
Observations	3023	3023	3023	3023	3023	3023	3023	3023	3023	3023	3023

Note: Robust standard errors, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Source: Authors' calculations.

specifications, though this should be taken with caution due to potential endogeneity.¹⁵ The positive association between per capita real GRP growth correlations and that of per capita real subventions growth rates can be either desirable or not, depending on whether federal fiscal policy amplifies or lessens the severity of overall economic cycles. The evidence for Russia in the last two decades suggests that federal fiscal policy has been somewhat pro-cyclical (Erbil, 2011).

3.4. Federal transfers and the sustainability of regional budgets

Federal transfers affect regional fiscal sustainability through different channels. To assess the effect of federal transfers on the regions' fiscal sustainability, we estimate a system of equations allowing for feedback effects among endogenous variables:

$$Y_{i,t}^m = \alpha + \beta Y_{i,t}^{-m} + \gamma Z_{i,t} + \epsilon_{i,t} \quad (2)$$

where $Y_{i,t}$ is a matrix of endogenous variables including the long-term change in the revenue-to-expenditure ratio (our proxy for fiscal sustainability), the cumulated per capita real GRP growth, the long-term percentage change in the share of public sector in GRP, and the long-term average of federal transfers in percent of GRP;¹⁶ $Z_{i,t}$ is a matrix of exogenous variables including the level of initial per capita real GRP, the share of mining in GRP, population size, population density, common border (as a proxy for geographic distance), and the footprint of state;¹⁷ m is the equation index; α is a vector of constant terms; β is the matrix of coefficients of the endogenous variables; γ is the matrix of coefficients of the exogenous variables; and $\epsilon_{i,t}$ is a vector of the error terms. Table 2 shows the identifying restrictions to estimate the system.

The identification of the model assumes that federal transfers affect fiscal sustainability through their impact on regional tax bases, which should expand faster in regions in which cumulated GRP growth is higher. Differences in GRP growth rates are assumed to be endogenously determined by differences in economic structure (i.e., whether the private or the public sector is expanding more rapidly), by differences in federal transfers (regions receiving larger transfers could accumulate factors of production faster), and to depend on a number of predetermined and exogenous variables (the level of initial real per capita GRP, population density, and geographic distance). Regional economic structure is assumed to depend endogenously on federal transfers and per capita real GRP growth, while federal transfers are assumed to be explained by exogenous and predetermined variables (including bilateral differences in the initial level of real per capita GRP).

¹⁵ Imbs (2004) estimates a cross-regional growth correlation equation within a system to allow for endogeneity of some of the right-hand side variables. However, to our knowledge, there is no inter-regional trade data available for Russia, preventing this sort of analysis. Also, as noted by Imbs (2004) differentiating between cyclical and structural effects can be revealing, but we refrain from doing this due to the reduced time series length. Yushkov (2016) analyzes the role of subventions in Russia's fiscal federalism.

¹⁶ The public sector is defined as the sum of the share of public administration; military security; social insurance; education; health care and social services; and other communal, social, and personal services. Note that the private sector is defined as sum of the rest of economic activities, despite the fact that it comprises the operations of SOEs in these activities.

¹⁷ The common border dummy variable is time invariant.

Table 2
Specifications for federal transfers in a simultaneous equations system.

Endogenous Vector				Exogenous Vector					Stoch. terms		
Rev. to exp. ratio	Per capita real GRP growth	Change in share of public sector in GRP	Federal transfers as a share of GRP	Const.	Initial per capita real GRP	Share of mining	Pop. density	Common border		Footprint of state	
$\begin{bmatrix} 1 \\ \beta_{21} = 0 \\ \beta_{31} = 0 \\ \beta_{41} = 0 \end{bmatrix}$	$\begin{bmatrix} -\beta_{12} \\ 1 \\ -\beta_{32} \\ \beta_{42} = 0 \end{bmatrix}$	$\begin{bmatrix} \beta_{13} = 0 \\ -\beta_{23} \\ 1 \\ \beta_{43} = 0 \end{bmatrix}$	$\begin{bmatrix} \beta_{14} = 0 \\ -\beta_{24} \\ -\beta_{34} \\ 1 \end{bmatrix}$	$= \begin{bmatrix} \alpha_1 \\ \alpha_2 \\ \alpha_3 \\ \alpha_4 \end{bmatrix}$	$\begin{bmatrix} \gamma_{12} = 0 \\ \gamma_{22} \\ \gamma_{32} = 0 \\ \gamma_{42} \end{bmatrix}$	$\begin{bmatrix} \gamma_{13} = 0 \\ \gamma_{23} = 0 \\ \gamma_{33} \\ \gamma_{43} = 0 \end{bmatrix}$	$\begin{bmatrix} \gamma_{14} = 0 \\ \gamma_{24} = 0 \\ \gamma_{34} = 0 \\ \gamma_{44} \end{bmatrix}$	$\begin{bmatrix} \gamma_{15} = 0 \\ \gamma_{25} \\ \gamma_{35} = 0 \\ \gamma_{45} = 0 \end{bmatrix}$	$\begin{bmatrix} \gamma_{16} = 0 \\ \gamma_{26} \\ \gamma_{36} = 0 \\ \gamma_{46} \end{bmatrix}$	$\begin{bmatrix} \gamma_{17} = 0 \\ \gamma_{27} = 0 \\ \gamma_{37} = 0 \\ \gamma_{47} \end{bmatrix}$	$\begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \varepsilon_3 \\ \varepsilon_4 \end{bmatrix}$
+											

Note: Coefficients equal to zero represent the exclusion identification restrictions.
Source: Authors' calculations.

The results in Table 3 suggest that federal transfers did not significantly contribute to improve regional fiscal sustainability. This is visible by analyzing the channels through which federal transfers led to changes in per capita real GRP growth rates. On the one hand, comparing pairs of regions, those that received larger federal transfers grew faster (direct effect), possibly due to a more rapid accumulation of factors of production, as described above; on the other hand, the share of the public sector expanded comparatively more (10-year cumulative increase) in regions receiving larger federal transfers, which subtracted from per capita real GRP growth dynamism (indirect effect), with the negative (indirect) impact more than offsetting the positive (direct) one. Given the positive association between own revenue-to-expenditure ratio and per capita real GRP growth, which takes place through the positive effect of per capita real GRP growth on tax bases, it can be inferred that federal transfers did not result in an improvement of regional fiscal sustainability. For instance, our estimates suggest that a one-standard deviation difference in the level of federal transfers (about 17 percent of regional GRP) is associated with a negative cumulative bilateral difference in per capita real GRP growth (over 2005–2015) of around 1.2 percentage points, an increase in the bilateral share of public sector in GRP of around 1.5 percentage points, and with no improvement in the (own) revenue-to-expenditure ratio. These results are particularly relevant for around one third of Russia's regions (28 out of 79 in the sample), which receive federal transfers that are higher than the average by between one and three standard deviations.

Accordingly, regions receiving larger federal transfers did not close (even partially) the gap between their expenditures and own revenues. This is the case as economic growth based on the expansion of government services did not result in an improvement in its own revenue-to-GRP ratios, which (in levels) are positively correlated with the size of the private sector (see Fig. 2). Thus, the financial dependence of many of these regions on federal transfers remained broadly unchanged. This dependence is summarized by the fact that for many of them their own revenues continue to be barely sufficient to finance health and education spending.¹⁸

An alternative way to interpret the results is that, at least during the period analyzed, federal transfers were insufficient to jump-start self-sustaining, private-sector led growth in regions receiving relatively more transfers. Federal transfers should, in the short term, increase the size of the public sector as transfers push social and infrastructure spending upwards; however, they should not necessarily result, *a priori*, in a long-term increase in the share of the public sector in GRP. Indeed, it can be expected that the increased supply of public goods (e.g., in the form of higher human and physical capital) would result in positive spillovers for the private sector, but this is not observed. A possibility is that a by-product of federal transfers is to support a larger state footprint in regions; there is some evidence for this, as federal transfers flowed to regions not only with lower initial per capita real GRP, but also with a relatively larger footprint of the state (equation 4 in Table 3).

We indirectly test the robustness of these results by means of complementary analysis. First, we find that for pairs of regions, total factor productivity (TFP) expanded at lower annual rates in regions receiving relatively higher levels of

¹⁸ Beginning in 2012, the continuing gap is also explained by wage increases for the education, health and social sectors that was decreed by the federal government.

Table 3
Estimations for federal transfers in a simultaneous equations system.

Equation	Variable	Coefficient	SUR	2SLS	3SLS	FIML	GMM
<i>Endogenous</i>							
1	Per capita real GRP growth	β_{12}	0.280***	0.743***	0.717***	1.095***	0.754***
2	Chg. in share of public sector in GRP	β_{23}	-0.320***	-0.504	-0.431	-0.236	-0.373
2	Federal transfers as a share of GRP	β_{24}	0.011	0.051	0.034	0.023	0.025
3	Per capita real GRP growth	β_{32}	-1.360***	-0.628	-0.573	-0.502	-0.683
4	Federal transfers as a share of GRP	β_{34}	0.083**	0.104**	0.090*	0.087	0.099*
<i>Exogenous</i>							
1	Constant	α_1	0.002	0.004*	0.004*	0.005*	0.004*
2	Constant	α_2	0.001	0.001	0.001	-0.001	0.000
2	Initial per capita real GRP	γ_{22}	-0.010***	-0.007	-0.010***	-0.009**	-0.011***
2	Population density	γ_{25}	0.001	0.002	0.001	0.000	0.001
2	Common border	γ_{26}	0.000	0.003	-0.002	-0.002	-0.002
3	Constant	α_3	0.002	0.004	0.004	0.004	0.003
3	Share of mining	γ_{33}	-0.053**	-0.046	-0.041	-0.042	-0.042*
4	Constant	α_4	0.022*	0.024*	0.023*	0.024*	0.021
4	Initial per capita real GRP	γ_{42}	-0.058***	-0.068***	-0.062***	-0.067***	-0.049***
4	Population	γ_{44}	-0.046***	-0.048***	-0.043***	-0.043***	-0.039***
4	Common border	γ_{46}	-0.025	-0.032	-0.024	-0.025	-0.024
4	Footprint of state	γ_{47}	0.033	0.031	0.034	0.034	0.037*

Note: Robust standard errors, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Source: Authors' calculations.

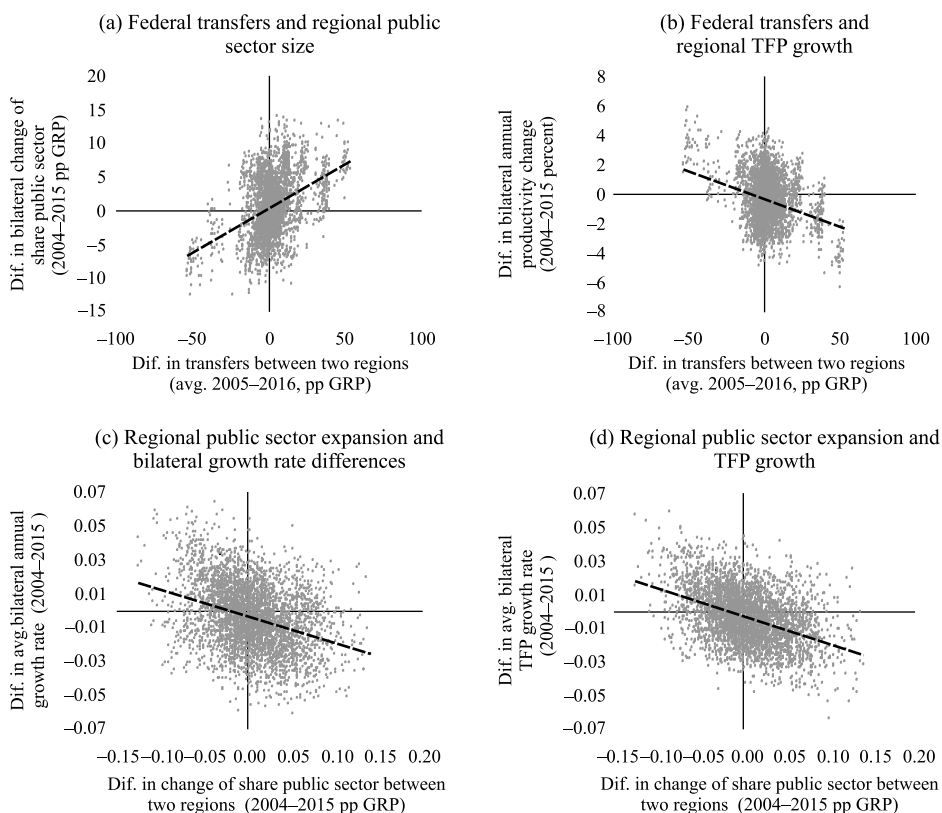


Fig. 5. Federal transfers, public sector expansion, and TFP increases.

Note: The black dashed lines represent the linear regression lines.

Source: Authors' calculations.

federal transfers. This means that the distance in productivity levels between low- and high-income regions increased in the last 15 years (Fig. 5). We come to these results by recovering neutral TFP levels for the period 2000–2015 using a production function approach based on an identical Cobb–Douglas production function for all regions. We construct regional capital stocks using the perpetual inventory method and regional investment, and we calculate effective human capital (i.e., corrected for labor utilization) using educational attainment of the employed working-age population.

Second, we find no evidence of convergence in real per capita income across Russian federal regions in the period 1998–2015 (Table 4). Following Pedroni and Yao (2006), we test for convergence across federal regions in the sample and across regions in different geographical areas with the panel unit root tests of Im et al. (2003) and Maddala and Wu (1999). Apart from the Far-Eastern Federal District that shows some convergence at the 10 percent significance level, there is no convergence across the identified clubs.

Third, population concentration in higher-income geographical areas increased in the last 15 years. For instance, the population of the city of Moscow increased by more than 30 percent since the year 2000, and by 10 percent in Saint Petersburg, against the backdrop of a broadly constant total population. This implies that other less densely populated (and generally lower-income) regions experienced popu-

Table 4
GRP convergence across regions.

	Countries	Im, Pesaran, and Shin (2003)	Maddala and Wu (1999)
Full sample $(y_{it} - \bar{y}_t) \forall i$	84	0.105	195.050
Districts			
$(y_{it} - \bar{y}_t) \forall i \in$ Central Federal District	19	4.075	15.456
$(y_{it} - \bar{y}_t) \forall i \in$ Northwestern Federal District	11	−0.049	21.417
$(y_{it} - \bar{y}_t) \forall i \in$ Southern Federal District	6	0.145	9.938
$(y_{it} - \bar{y}_t) \forall i \in$ North-Caucasus Federal District	6	−1.274	18.264
$(y_{it} - \bar{y}_t) \forall i \in$ Volga Federal District	15	0.032	29.083
$(y_{it} - \bar{y}_t) \forall i \in$ Ural Federal District	5	−0.536	16.871
$(y_{it} - \bar{y}_t) \forall i \in$ Siberian Federal District	12	0.813	23.932
$(y_{it} - \bar{y}_t) \forall i \in$ Far-Eastern Federal District	10	−2.863*	43.252*

Note: The null hypothesis of the unit root tests is that all panels contain a unit root, i.e. there is no convergence. Fixed effects are always included. The Schwartz Information Criterion is used to select the optimal lag length. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Source: Authors’ calculations.

lation decreases of 15–20 percent. Although concentration has some advantages for recipient regions and cities (e.g., increases economies of scale, supports firm localization, improves job matching, among other), it has symmetrical drawbacks for regions losing population, and results in an increasing per capita cost for federal transfers. More broadly, it results in geographically unbalanced development, a critical issue for a continental-sized country like Russia. Federal transfers—and fiscal federalism in Russia more generally—appear not to have taken into consideration both the advantages or disadvantages related with increased concentration and the associated regional challenges that may arise as a consequence.¹⁹

4. Discussion and some policy implications

Russia’s fiscal federalism assigns a strong role to the federal government. The system evolved from a somewhat disorderly decentralization in the 1990s into a more centralized system in the last 15 years. Regions play an essential role in human and physical capital formation, but cross-country comparisons of fiscal constitutions suggest that they have less autonomy and exercise less control of their own fiscal policy than in other federal countries. The system is quite complex and the diversity of federal subjects along socio-economic dimensions is wide. Increased coordination between the federal and regional governments to tackle complexity and to address cross-regional infrastructure and human capital bottlenecks could result in a more integrated national market with positive spillovers for inter-regional and international trade and investment.²⁰ Regional convergence can result in a growth dividend and in more balanced geographical development.

¹⁹ The literature analyses internal migration trends in Russia (Riazantsev, 2005), urban trends (Kolomak, 2014), and the importance of regional capitals (Leksin, 2006).
²⁰ Ongoing work to measure regional business climate with a view of strengthening institutions may promote higher private investment for a given level of federal transfers.

Given relatively rigid tax sharing arrangements, federal transfers constitute one of the main levers through which federal policy operates at the regional level. Federal transfers proved effective in supporting factor accumulation in lower per capita income regions. However, there is little evidence that transfers contributed to increased cross-regional growth synchronization, which is not necessarily a negative outcome given that fiscal policy has been somewhat pro-cyclical. Federal transfers were ineffective in supporting self-sustaining per capita real GRP growth and productivity increases. Transfers expanded government services but did not result in a long-term increase in the share of the private sector in GRP. Accordingly, large cross-sectional differences in own fiscal revenues (in per capita and GRP terms) persist, as well as the associated dependence on federal transfers. Importantly, federal transfers flow more heavily to regions where the footprint of the state is larger, which may suggest a self-sustaining pattern.²¹

Enhanced strategic direction could help increase federal transfers' growth effectiveness. Open-ended transfers may have had the unintended effect of weakening regional incentives to enlarge their tax bases, supporting a pattern of dependence. Thought should be given to include in the grant allocation formulas a stronger measure of sustainability together with the current objective of equalization. Establishing realistic transition periods to achieve sustainability is essential.

Appropriate federal macroeconomic and tax policies can contribute to the development of regional tax bases, supporting regional sustainability, and the accountability of regional authorities. An option in this regard could be to expand the use of personal property taxes (OECD, 2016). Personal property taxes currently represent only 0.4 percent of the consolidated own revenues of regions. In 2016, 28 regions started a transition to market value-based instead of accounting value-based taxation of property. For instance, the city of Moscow is projecting a five-fold increase in property tax collections by 2020 (with tax collection increasing by 55 percent in 2016). Larger regional tax bases should also balance somewhat the strong *de jure* role of the federal government.

Given that higher income regions have more space to strengthen their own tax bases (e.g., through taxation of property as indicated above, which is more abundant and of higher value in richer regions), there may be scope to increase the use of horizontal transfers in the margin. The large cross-regional dispersion of per capita own revenues may have contributed to economic and population concentration, which creates negative spillovers for regions with population outflows.²² Consideration should be given to modify incentives with the aim of limiting concentration. The use of horizontal transfers, in the margin, may contribute to that effect and support the use of improved levels of human and physical capital in lower per capita income regions.²³

²¹ The complete elimination of regional dispersion is unlikely. Going forward, equalization grants will likely keep their leading role. Sudden decreases or reallocations could create disruptions especially in the most financially dependent regions.

²² Yushkov et al. (2017a) analyze the trajectories for Russia's "donor" regions.

²³ In this regard, there may be room to gradually improve the primary distribution of corporate income tax (CIT). The ongoing redistribution (by the federal government) of one percentage point of CIT to finance equalization grants is an example of the use of horizontal transfers in the margin. Any changes should be implemented through well-designed and transparent distribution formulas, to avoid distortions in incentives for both donors and recipients

The sustained implementation of a credible fiscal rule should contribute to avoid stop-go cycles caused by terms of trade shocks, promote a more stable and more aligned-with-fundamentals real exchange rate with positive spillovers for lower per capita income regions, where agriculture (a tradable sector) represents a larger share of GRP. This should have beneficial effects for the expansion of regional tax bases. A fiscal rule would also contribute to smooth national and regional economic cycles, simplifying the implementation of stabilization policies (including monetary policy). The role of different types of federal transfers in the synchronization of regional economic cycles deserves further analysis. Rebalancing domestic taxes with a view to taxing labor less heavily should support decreases in informality, which is likely to be more prevalent in low per capita income regions as attested by weaker tax bases.

Finally, there may be room to simplify and increase the transparency of transfers. Streamlining the number of transfers (especially subsidies), in particular for agriculture development, housing and utilities, and education; allocating subsidies one-to-one to government programs (or subprograms), instead of to a multiplicity of them; transforming and further consolidating “other transfers” into subsidies; and regulating budget loans, which are increasingly used because of their concessional interest rates, should all result in a simpler, more transparent, and easy-to-administer system.

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Appendix A. Further details about fiscal federalism in Russia

This appendix summarizes revenue sources (including sharing arrangements) and spending responsibilities by different government levels. Concretely, Table A.1 catalogues federal taxes, special tax regimes, regional taxes, local taxes, and federal non-tax revenues, including their tax sharing between different levels of government, as specified in the Russian Legal framework. In turn, Table A.2, describes federal, regional/local, and joint federal-regional spending responsibilities, and specifies devolved federal spending responsibilities to regions (clarifying which are financed by subventions and which not).

A.1. Limits imposed by the federal government on regional budgets

The Budget and Tax Codes establish several fiscal restrictions for sub-federal governments. Monitoring, reporting, and transparency standards and requirements established by the federal government are high. Sanctions for rules violations might be imposed and include, among other, adjustments in the size of transfers (excluding subventions).

Budget balance requirements: the deficit of regions cannot exceed 15 percent of their own revenues (excluding grants). Rules are stricter if federal grants exceed 40 percent of the consolidated region budget revenues (excluding subventions).

Tax limits: Sub-federal governments can set tax rates and reliefs for regional and local taxes. For the CIT, regions can set rates for the regional part of the tax within the limits set by the Tax Code but not reliefs. Excise taxes on gasoline and alcohol are shared annually between regions and federal government. The Tax Code does not allow for regions to legislate on personal income tax (PIT), fees and charges, rates and reliefs, which constitute the remaining 40 percent of their revenues.

Expenditure limits: Regions with a share of federal grants exceeding 10 percent of consolidated region budget revenues (excluding subventions) cannot assume and execute expenditures assigned to regional governments by Constitution and federal laws, and cannot exceed federal norms for budgetary sector wages and regional government activity financing. Similar restrictions exist for municipalities getting equalization grants from regions.

Borrowing constraints: Domestic borrowing is not directly restricted; new foreign borrowing (for deficit financing or refinancing) is allowed only for regions that do not receive federal equalization transfers, do not have debt arrears, and have proper credit ratings from at least two international agencies. Regions receiving federal equalization transfers can borrow externally to refinance existing external debt if no debt arrears and credit rating requirements are satisfied. Total yearly borrowing of regions and municipalities is bound up by deficit financing and debt amortization.

Debt levels and service: Debt is not allowed to exceed own annual revenues (excluding grants). Rules are stricter if federal grants share exceed 40 percent of consolidated region budget revenues (excluding subventions). Debt service (interest payments) should not exceed 15 percent of total expenditures (excluding subventions). Escape clauses introduce flexibility for regional budget implementation (budget credit financing, privatization, use of regional precautionary saving funds). Debt ceilings are currently allowed to be exceeded for an amount equal to federal budget credits.

Table A.1

Russia: Tax and non-tax revenue sharing agreement.

	Rates (percent)	Share accruing to (in percent of total)		
		Federal	Regional	Municipal
<i>Federal taxes</i>				
VAT	18 (concessional rate 10 percent)	100		
PIT	13	0	85	15
CIT ¹⁾	20	10	90	
MET (Oil and Gas)	Formula-based depending on oil price	100		
MET (Other subsoil resources, including diamonds)	Ad valorem and specific	40	60	
MET (Commonly occurring subsoil resources)	Ad valorem and specific		100	
MET (Diamonds)	8		100	
Water tax	Specific	100		
Excise tax on ethanol from edible raw material ²⁾	Specific	50	50	
Excise tax on ethanol from all material excluding edible ²⁾	Specific	100		
Excise tax on alcohol-containing products ²⁾	Specific	50	50	
Excise tax on spirits ²⁾	Specific	50	50	
Excise tax on wine, beer, other ²⁾³⁾	Specific		100	
Excise tax on tobacco ²⁾	Specific	100		
Excise tax on cars and motorcycles ²⁾	Specific	100		
Excise on gasoline and motor oil ²⁾⁴⁾⁵⁾	Specific	12	88	
Excise tax on imported excisable goods ²⁾	Ad valorem and specific	100		
Fee (royalty) for exploitation of water biological resources	Specific	20	80	
Fee (royalty) for exploitation of animal resources	Specific		100	
Stamp duty ⁶⁾	Specific	100	100	100
Stamp duty via public multi-service centers		50	50	
<i>Special Tax Regimes</i>				
Single agricultural tax	6			100
Single imputed income tax	15 (7.5–15)			100
Patent	6			100
Simplified taxation regime	6 or 15	100		
Taxes under Product sharing agreements		25	75	

(continued on next page)

Table A1 (continued)

	Rates (percent)	Share accruing to (in percent of total)		
		Federal	Regional	Municipal
<i>Federal Non-Tax Revenues</i>				
Property income and earnings from paid services		100	100	100
License fees		100		
Customs duties and fees		100		
Forests		100	100	100
Water facilities		100	100	100
Environmental fee ⁷⁾		5	40	55
Consular fees		100		
Disposal fee		100		
Subsoil royalty	Formula-based	40	60	
Proceeds from sale/lease of federal land ceded to region			50	50
Fees for record extracts		100	100	100
Fees for record extracts via public multi-service center		50	50	
Fines and penalties ⁸⁾				
<i>Regional Taxes</i>				
Corporate property tax	Capped at 2.2		100	
Gambling tax	Specific		100	
Transport tax	Specific		100	
<i>Local Taxes</i>				
Land tax	Capped at 0.3 and 1.5 for diff. types of land			100
Personal property tax	0.1–2			100
Retail sales fee (so far implemented only in Moscow)	Specific, but no more than patent-based			100

Notes:

¹⁾ The CIT is the only tax whose rate is split between the federal and the regional levels in the Tax Code (sharing of other taxes is established in the Budget Code). Regions are authorized to adjust their portion of the CIT rate down, but no more than to 13.5 percent (12.5 percent in 2017–2020). For 2017–2020, the federal government will receive an additional 1 pp to be redistributed via equalization grants. This may result in a financing gap for some regions.

²⁾ The tax code sets the corresponding rates in rubles for 2017–2019.

³⁾ As established in the Budget Code (article 56, 2.2). For 2017, the distribution of these revenues shall be governed by the Federal Budget Law.

⁴⁾ These shares are suspended for 2017–2020 by law 409-FZ of 30 November 2016.

⁵⁾ Gasoline and diesel oil excise revenues shall be attributed to the federal budget according to the following shares: 38.3 percent in 2017, 42.6 percent in 2018, and 39.8 percent in 2019. The remaining portion will go to the regional budgets.

⁶⁾ Whenever share of federal, regional and local government is reported simultaneously as 100 it means that each of them receives the full share of the tax revenue in application to its own jurisdiction.

⁷⁾ 95 percent in Moscow, Saint Petersburg. The federal 5 percent is planned to be given over to municipalities in 2018.

⁸⁾ Numerous fines and penalties are distributed in various shares (including 100 percent) among different government levels.

Sources: Russian Tax Code (articles 13–15; 18; 143–418); Russian Budget Code (articles 46, 56–64).

Table A.2
Russia: Spending responsibilities and jurisdiction by level of government.

Area	Federal	Joint Federal Regional	Regional / Local
General	Exclusive Federal Jurisdiction: Authority on federal property, regulation of social and economic development, federal energy systems, national defense and security, international relations, law enforcement; meteorology and statistics.	Areas of joint federal-regional jurisdiction: Public safety and law enforcement; administrative, labor, family, housing, land, subsoil, forest, water relations; environmental protection; emergencies and natural disasters; education, science, culture, sports; public health, social security. Responsibilities are usually divided based on jurisdictional attribution or relevance (e.g. regional roads or federal water facilities), but sometimes are shared between the two levels of government.	Exclusive Regional Jurisdiction: all other government responsibilities beyond those under the federal jurisdiction and joint federal-regional jurisdiction - as stipulated in regional constitutions and legislation. Local Governments' jurisdiction: Urban, rural settlements; electricity, heating, water, gas, fuel supply; roads; municipal housing; public transport; emergencies, fire safety; public amenities, eateries, retail trade; culture (local cultural heritage, folk art and crafts); physical culture, sports, public entertainment, recreation; archives; cemeteries; local resorts; public safety, rescue operations; waste management; support to agriculture and SMEs; terrorism/extremism prevention; education (less vocational + vacations); public health.
Delegated federal Responsibilities supported by federal subventions			National Census and Agricultural Census; Prevention of homelessness; Housing for disabled, veterans, retired servicemen, etc.; Subsidization of housing and utility payments for veterans, disabled, radiation-exposed, etc.; payouts to radiation-exposed; unemployment benefits; maternity and childcare benefits; monthly compensation payouts to various categories, e.g. exposed to radiation, blood donors, etc.; water and forest relations: management (partial) of federal water facilities and forests; animal world, hunting, fishing (partial); protection and oversight of cultural heritage; education: oversight, licencing, accreditation (all partial); public health: licensing; procurement of drugs, mandatory medical insurance.
Delegated federal Responsibilities unsupported by federal subventions			Audit of construction plans and engineering surveys; environmental audit; land relations: provision of plots of land for construction, demolition of real estate, easement; R&D management.
Education	Universities		Vocational, primary, and secondary schools.

(continued on next page)

Table A2 (continued)

Area	Federal	Joint Federal Regional	Regional / Local
Employment	Unemployment benefits (delegated — see above)		Employment facilitation.
Social security	Social support to war veterans, radiation victims (some responsibilities delegated — see above)		Social support to senior citizens, disabled, orphans, labor veterans, low income households; payment of medical insurance contributions on behalf of non-workers.
Industry support	For instance, Aviation		Support to agriculture (beyond that from federal programs) and to SMEs (since 2015).
Waste management	Radioactive waste		Solid waste.

Note: Responsibilities of regional governments in areas of joint jurisdiction are stipulated in the following legislation/regulations: 114 responsibilities listed in the framework law (No. 184 FZ of 1999); 61 responsibilities prescribed in various specific laws (e.g. No. 52 FZ On Sanitary and Epidemiological Safety); 20 responsibilities arising from Presidential decrees (in particular decrees of May 2012), e.g. social support to medical workers, their professional development, employment of disabled, housing, increase in salaries for teachers and cultural workers, etc.; 162 responsibilities according to GoR decrees (minor, many of them recommended, not mandated. Regional governments implement 55 federal government programs and federal special-purpose programs — according to GoR resolutions (financed with own funds and subsidies).

Sources: Constitution of Russian Federation (Articles 71–73, 130–133); Federal Laws No. 184 FZ (10/06/1999 amended 12/28/2016; and, No. 131 FZ (10/06/2003 amended 12/28/2016 and updated 02/17/2017); list of regional responsibilities (Ministry of Justice website, <http://minjust.ru/ru/razvitiye-federativnyh-otnosheniy-i-mestnogo-samoupravleniya/razgranichenie-polnomochiy-mezhdu>).

Appendix B. Data

Table B.1 provides the definition for the variables used in the analysis.

Table B.1

Variable definitions.

Variable	Definition
Change in the share of public sector in GRP	Change in the share of public sector in GRP in 2004–2015 (percent) *
Common border	Dummy identifying regions sharing a common border *
Federal transfers as a share of GRP	Average federal transfers-to-GRP ratio in 2005–2015 (percent) *
Footprint of state	Ln of number of per capita budgetary and non-budgetary state institutions *
Foreign trade	Average Exports plus Imports over GRP for 2009–2015 (percent) *
Initial per capita real GRP	Ln of real per capita GRP in 2003 *
Per capita real federal transfer growth correlation	Bilateral regional corr. of real per capita federal transfer growth for 2005–2015 (excluding transfers to territorial EBFs)
Per capita real grant growth correlation	Bilateral regional correlation of real per capita federal grants growth for 2005–2015
Per capita real GRP growth	Annual average growth rate (Ln difference) of real per capita GRP in 2004–2015 *
Per capita real GRP growth correlation	Bilateral regional corr. of real per capita GDP growth for 2005–2015
Per capita real subsidy growth correlation	Bilateral regional corr. of real per capita federal subsidies growth for 2005–2015
Per capita real subvention growth correlation	Bilateral regional corr. of real per capita federal subventions growth for 2005–2015
Population	Ln of population (millions) in 2005 *
Population density	Ln of population density (people per square kilometer) in 2005 *
Revenue-to-expenditure ratio	Annual average change of the revenue-to-expenditure ratio in 2005–2015 (percent) *
Share of mining in GRP	Average share of mining in GRP in 2004–2015 (percent) *
Share of public sector in GRP	Average share of public sector in GRP in 2004–2015 (percent) *
Urbanization rates	Average urbanization rates for 2005–2015 (percent) *

Note: Variables marked by * refer to the bilateral difference between any two regions.