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Stabilization Properties of Federal Fiscal Transfers to Russian Regions¹

Abstract. The paper investigates the stabilization properties of federal financial aid to the regions of Russia. Key issues of econometric evaluation of the stabilization properties of intergovernmental transfers were identified through reviewing the international empirical literature. The paper presents and justifies main econometric approaches to analyzing the stabilization effect using panel and cross-sectional data. The authors conclude, based on econometric estimations of the stabilization properties of federal financial aid to subnational budgets over the 2001–2015 period, that the federal center managed to partly stabilize the regional tax revenues. The results obtained are nevertheless indicative of heterogeneity in identified regularities for the groups of regions classified according to fiscal capacity and for certain sub-periods before and after the global financial crisis. Therefore, the average-of-period stabilization effect was found to be present only after the global financial crisis and only in the regions with medium fiscal capacity, whereas the effect was insignificant for poor and rich regions. The estimates obtained show that until 2008, while determining the amount of financial aid to be awarded to the regions, the federal center was guided not only by the dynamics of regional revenues, but also its increasing ability to make transfers on the back of overall economic growth and global energy price movements.

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Introduction

Intergovernmental transfers constitute a federal fiscal policy instrument intended to redistribute revenues from affluent regions in favor of regions with low fiscal capacity as well as to alleviate the effect of negative and positive shocks on the regional economic performance. In this regard, it is customary in the economic literature to emphasize *redistributive (equalization)* and *stabilization effects* of federal financial aid to regions.² The redistributive (equalization) effect is about providing a smaller amount of federal aid to affluent regions (with higher tax revenues) than to poor ones, thus leveling out (equalizing) differences in the overall amount of financial resources available to each region. This solution ensures that all nationals, regardless of the region they reside in, enjoy equal access to public goods provided by the state. The mechanism for stabilizing subnational budget revenues is, in turn, intended to increase the amount of federal financial aid when region's/regions' consolidated budget tax revenues are low and, conversely, reduce it if they are high.

The conventional theory (the so-called “first generation” of models) of fiscal federalism assumes that share (with the co-funding requirement) transfers (grants) are used for eliminating externalities (“spillover benefits”), whereas non-earmarked non-share transfers are used for resolving vertical and horizontal fiscal imbalances (Oates, 1999). In practice, however, certain equalization properties can pertain to earmarked transfers as well (as is the case in, for example, the United States, where there is no special program for horizontal intergovernmental fiscal equalization). Similarly, not only can (or cannot) the stabilization effect be observed in fiscal equalization grants to the regions, which, along with state-funded loans, constitute a basic instrument intended to deliver prompt (emergency) aid to subnational budgets in Russia, but it also can be seen in various types of intergovernmental transfers. This therefore raises an important question as to whether or not redistributive (equalization) and stabilization properties pertain to all intergovernmental transfers, rather than only to certain types of transfers originally intended for interregional or intertemporal equalization of the financial ability of subnational budgets.

This goal of this paper is to evaluate the stabilization properties of intergovernmental transfers in the Russian Federation. In general, having a stabilization mechanism in place

² This issue is reviewed in, for example, (Hagen, 2007; Kadochnikov et al., 2003).

allows regions to share risks and provide some kind of insurance against occasional fluctuations of the regional income (Hagen, 2007). In such a system, the stabilization mechanism ensures smoothing of regional short-term fluctuations when asymmetric shocks occur in one or more regions. Of importance are also stabilization properties of the intergovernmental transfers redistribution system in the presence of symmetric shocks affecting, to a certain degree, all the regions, particularly within a cyclical economic environment (Sinelnikov-Murylev et al., 2002; Kadochnikov et al., 2002).

In the Russian Federation, the stabilization functions of financial aid to the regions are determined firstly by the availability of emergency types of financial aid in case of sudden changes in subnational budgets and, secondly, by the peculiarities of the horizontal equalization method that assumes that there is a certain time lag in the response of the amount of equalization transfers to changes in the fiscal capacity of a particular region.³ However, the issue of to what extent the intergovernmental transfers redistribution system can function as an automatic stabilizer equalizing in time the ability of the regions to provide public goods has so far been incompletely studied.

This paper provides an econometric evaluation of the stabilization properties of the system of federal financial aid to subnational budgets. The paper presents the results of computations based on regional data for the 2001–2015 period. Our findings support that there is an effect of partly stabilized regional budget tax revenues by the federal center in certain groups of the federal subjects of Russia over the time period under review.

1. Theoretical and empirical aspects of studying the stabilization properties of intergovernmental transfers

Most of the existing empirical studies analyzing the stabilization properties of the fiscal and budgetary system cover the United States, Canada, Germany. The interest in such studies was sparked after the euro area was established and the need arose to look into the prospects of using fiscal instruments as an alternative to the exchange rate policy for stabilizing regional income in the presence of asymmetric macroeconomic shocks. Theoretically, such empirical studies are basically rely on the permanent income hypothesis (Friedman, 1957) and the optimum currency area theory (Mundell, 1961).

Apart from the “insurance approach” intended to prevent regional income from descending below the minimum level if asymmetric shocks occur, the economic literature

³ A caveat should be made here that such time series are intentionally (at the level of equalization method) restricted within the fiscal equalization grants distribution system in order to alleviate potential adverse effects discouraging regional authorities. In any case, however, they are to some extent present in practice.

describes adverse fiscal incentives of stabilization policy for subnational authorities. If the federal center is making efforts to make up for falling tax revenues of subnational entities and on top of that reducing the amount of financial aid in response to higher tax revenues, this greatly limits the incentives for the subnational authorities to strengthen their tax potential as well as to take measures to stave off the effects of adverse shocks down the line. As a result, it becomes important to not only check for the presence of federal transfers stabilization properties, but also to measure the extent of such stabilization (Persson, Tabellini, 1996; Barette et al., 2002; Weingast, 2009).

The stabilization properties of intergovernmental transfers and tax system are generally studied using econometric evaluation of the dependence of the extent of using certain fiscal instruments (federal transfers to regions, tax withholdings from the Russian territories in favor of the federal budget) on regional income or its deviations from the country's average level on the panel data using various econometric approaches, including pooled regression (the pooled model) and models with fixed and random effects (Obstfeld, Peri, 1998; Hagen, Hepp, 2000; Hepp, Hagen, 2009; Melitz, Zumer, 2001; Balli et al., 2012).

The findings of the international empirical literature on the stabilization properties of fiscal instruments are highly controversial (see, for example, (Sachs, Sala-i-Martin, 1991; Hagen, 1992)) due to some problems with specifications of econometric models and interpretation of their results.

First, using models with individual fixed effects (a time series model averaged by region) and models with time fixed effects (time-averaged interregional comparisons) gives meaningfully different results. The stabilization effects pertaining to changes in regional income in time as a result of asymmetric shocks should be showed separately from the redistributive effects of intergovernmental equalization transfers and socio-economic development of territorial units. Using a model with time effects, the stabilization effect can be correctly evaluated only if shifting to use the values regional revenue gains allowing the so-called short-run stabilization effect to be evaluated (Sachs, Sala-i-Martin, 1991; Bayoumi, Masson, 1995; Asdrubali et al., 1996; Hagen, Hepp, 2000).

Second, there is the risk of overestimating the role of federal authorities in insuring the regions against income decline stemming from an omitted variable such as federal budget deficit, whose growth can lead to further increase in the tax burden in all the regions at once, thus reducing the magnitude of long-term stabilization effect (Fatas, 1998).

Third, some authors point out the importance of choosing the variable for which the stabilization properties are checked, like for example: gross regional product (GRP), regional

budget revenues or average per capita personal income. Some empirical studies showed that the stabilization properties of fiscal instruments become apparent only with regard to regional budget revenues, not GRP (Hagen, Hepp, 2000, Melitz, Zumer, 2001; Kadochnikov et al., 2003; Hepp, Hagen, 2009; Van Hecke, 2010).

Fourth, the stabilization properties of transfers are evaluated as a result of migrating from a redistributive effects model, presented in levels, to a model in first differences, because transfers redistributive properties models characterize the effect of equalizing economic conditions among the regions at some point in time, whereas stabilization properties models account for the effect of equalizing region's economic conditions in time. Migration to differences is correct only if equalization coefficients remain constant from year to year. In case, however, they are not constant in time, the stabilization effects evaluation model (in first differences) would be misspecified if the level variable, for which the stabilization effects are evaluated (Hagen, 1992; Kadochnikov et al., 2003), is omitted in the right-hand side of the model.

Thus, in order to evaluate correctly the stabilization properties of federal financial aid to the regions, one should ensure that the spatial effects of fiscal instruments are separated from time effects, take significant control variables into account, choose correctly the explanatory variables that the federal government intends to stabilize.

2. Evaluation model of the stabilization properties of intergovernmental transfers

In this paper, we use a model with individual fixed effects as the base model. We use a linear in logs specification of econometric model, taking an approach similar to the common approach described in the literature (Sachs, Sala-i-Martin, 1991; Hagen, Hepp, 2000). The dependence of the federal transfers log on the dynamics of the tax revenue log gives the equation

$$\ln transf_{i,t} = \alpha_i + \beta_1 \ln tax_{i,t} + \beta_2 \Delta \ln tax_{i,t} + \beta_3 \ln gdp_t + \varepsilon_{i,t}, \quad (1)$$

where $\ln transf_{i,t}$ is the log of the amount of transfers from the federal budget net of per capita subventions of region i in period t ; $\ln tax_{i,t}$ is the log of the amount of per capita consolidated budget tax revenues of region i in period t ; $\Delta \ln tax_{i,t} = \ln tax_{i,t} - \ln tax_{i,t-1} = \ln \frac{tax_{i,t}}{tax_{i,t-1}}$ denotes the period-over-period per capita tax revenue growth rate for region i , or the tax revenue growth rate, where gdp_t is Russia's per capita real GDP in period t , α_i is individual effects, $\varepsilon_{i,t}$ is random errors.

Adding fixed individual effects α_i within the framework of this model allows accounting for permanent or nearly permanent in time interregional features of the sample (demographic structure of populations, interregional differences in prices, industrial specialization, geographic location, transportation expenses on food, energy and other goods, regional administrations' lobbying power, and more).

We consider the real GDP – being identical for all the regions at any point in time of the variable – both as a somewhat equivalent to time effects (because many underlying economic variables are strongly correlated with GDP) and a control variable in the transfer properties stabilization model. In the case of real GDP, coefficient β_3 reflects an increase in time in federal transfers on the back of overall economic growth and the correspondent rise in the financial resources available for the federal center (or their decline in case of economic downturn).

The stabilization properties of intergovernmental transfers are analyzed assuming that the amount of transfers the federal center allocates to a region depends on both the amount and growth rates of tax revenues collected in a current year. This approach allows detecting the average-of-period stabilization effect and analyzing the budgetary system's ability to adapt to short-term fluctuations of tax revenues.

In order to interpret the coefficients in the panel regression, we explore their meaningful content in time series models and cross-sectional data models. The linear in logs specification of the econometric model of dependence of federal transfers on the dynamics of tax revenues in a given region is given by:

$$\ln transf_t = \eta_0 + \eta_1 \ln tax_t + \eta_2 \Delta \ln tax_t + u_t, \quad (2)$$

where $\ln transf_t$ is the log of the amount of transfers from the federal budget net of regional per capita subventions in period t ; $\ln tax_t$ is the log of the amount of regional per capita consolidated budget tax revenues in period t ; $\Delta \ln tax_t$ is the regional period-over-period growth rate of per capita tax revenues, or the tax revenue growth rate; u_t is the random error.

Coefficient η_1 denotes the average-of-period stabilization effect, and coefficient η_2 denotes the budgetary system's adaptation properties to short-term changes in tax revenues. Coefficient η_1 ($\eta_1 < 0$ if stabilization effects are present, $\eta_1 > 0$ in case of destabilization) shows how bigger in percentage terms would be the amount of federal transfers in period t over period k ($k \neq t$) if the regional consolidated budget tax revenues are 1% greater in period t than in period k . Accordingly, if the tax revenue growth rate is 1% greater in period t than in

period d ($d \neq t$), then the amount of transfer in period t would be η_2 % less than in period d ($\eta_2 < 0$ in case of stabilization, $\eta_2 > 0$ in case of destabilization).

Where the amount of tax revenues of a region is the same in two different periods, the amount of transfers received may differ according to tax revenue growth rates on a period-over-period basis. For instance, there are two cases when one and the same region can reach the same levels of tax revenues in different periods of time: when tax revenues decline from the previous period and when they rise over the previous period. Then, in the former case, the region receives monetary compensation from the federal center so that the region can adapt to the decline in tax revenues from the previous period, while in the latter, by contrast, the regional budget adapts to the increase in tax revenues over the previous period by receiving a reduced amount of transfers. Altering the amount of intergovernmental transfers according to tax revenue growth rates allows flattening of short-term rise or decline in consolidated budget tax revenues of the federal subjects of Russia.

Thus, in order to test for the presence of the average-of-period and adaptive stabilization effects, a hypothesis of the significance of coefficients η_1 and η_2 : $H_0: \eta_j = 0$ (no stabilization) should be tested statistically against $H_A: \eta_j \neq 0$ (where $j = 1, 2$ is the average-of-period and adaptive (de)stabilization effects, respectively). Statistical data provide evidence that the stabilization effect is present if H_0 is rejected and on condition that $\eta_j < 0$. Destabilization is observed in the event that coefficient η_j is significant and $\eta_j > 0$.

When using the interregional (spatial) model

$$\ln transf_i = \theta_0 + \theta_1 \ln tax_i + \theta_2 \Delta \ln tax_i + w_i \quad (3)$$

where $\Delta \ln tax_i = \Delta \ln tax_{it} = \ln tax_{it} - \ln tax_{it-1} = \ln(tax_{it} / tax_{it-1})$ is per capita growth rates of the consolidated budget tax revenues of region i in year t ; w_i is random errors, taking into account both redistributive effect θ_1 ,⁴ and (de)stabilization effect on interregional data θ_2 .

The amount of transfers in model (3) depends on not only the level but also growth rates of tax revenues. If, for example, two regions do not differ in the level of taxes collected, but one of them has experienced a deeper period-over-period decline in taxes collected than the other in a current year, then the former region would receive more (with $\theta_2 < 0$) transfers (the stabilization effect on interregional data by contrast with model (2) which considers the respective effect for one region in time) in the year.

⁴ Coefficient θ_1 characterizes the equalization properties of intergovernmental transfers alleviating the disparities in tax revenues among the regions. Analysis of this effect is beyond the scope of this paper.

Returning to consideration of the model with individual fixed effects of dependence of the volume of intergovernmental transfers on the dynamics of tax revenues, notice that regression equation (1) is evaluated on the data obtained in deviations from intragroup averages. In essence, this approach assumes consideration of regression in time with the common slope coefficient and individual intercept terms for each region.

The coefficients of this model are interpreted in the same manner as the coefficients of model (2) on time series. With an increase/decrease of 1% in the tax revenues of an average region at a point in time t versus a point in time d the federal center alters by β_1 % the amount of transfers transferred at the point in time t versus the point of time d , which is an evidence of the stabilization (destabilization) nature of federal financial aid. The average region receives β_2 % more of federal transfers at the point in time t if its tax revenue growth rate is 1% slower than at a point in time $(t - 1)$. Similarly, the amount of transfers decreases (if stabilization effects are present) with an increase in tax revenue growth rates. This indicates that federal budget transfers help regional budgets to adapt to a decline or increase in tax revenues, equalizing in time their financial standing. Thus, we can test the following hypotheses.

1. The null hypothesis assumes that tax revenues have no significant effect on the amount of transfers. The stabilization effect of federal transfers occurs in case this hypothesis is rejected and a significant negative coefficient is obtained with tax revenues ($\beta_1 < 0$). The destabilization properties of federal financial aid to the regions are observed in case of $\beta_1 > 0$.

2. The null hypothesis assumes that tax revenue growth rates have no significant effect on the amount of transfers. In case the null hypothesis is rejected in favor of an alternative ($\beta_2 \neq 0$) and there is negative coefficient with tax revenue growth rates ($\beta_2 < 0$), there occurs the effect of federal transfers adaptation to short-term changes in taxes devolved to regional budgets. If $\beta_2 \neq 0$ and $\beta_2 > 0$, then the destabilization properties of federal financial aid to the regions are observed.

3. Evaluating the stabilization properties of federal intergovernmental transfers

3.1. Data (in use) description

In order to explore the stabilization effect of federal financial aid to the regions in the Russian Federation we have evaluated models of dependence of the amount of federal transfers to consolidated budgets of the federal subjects of Russia, net of subventions, on the

amount and growth rates of regional tax revenues.⁵ Subventions have been dropped from the total amount of transfers because they allow devolving the expenditure management from the federal to the regional level. As a result, the amount of subventions to a particular region is strictly pegged to the number of its residents falling under a certain category (e.g., unemployment rate and the amount of allowance in case of unemployment subventions). In addition, the total amount of federal transfers has been calculated factoring in the size of the balance of state-funded loans because of their “conventional non-refundability”⁶ (in certain cases) and better availability than commercial loans (because of low interest rates) for the regions. The models have been estimated using panel annual data for 79 federal subjects of Russia⁷ in the period between 2001 and 2015.

It is also important to adjust regional data in nominal terms across space and time so that they are reconciled. The adjustment is needed because the regions face different conditions. For example, the amount of transfers allocated to the north regions of Russia is generally bigger due to higher prices caused by low transport accessibility and harsh weather conditions in the regions. If a region is characterized by high prices, then the federal center may consider to increase the amount of transfers to this region because it is faced with higher cost of the same volume of public goods.

In this research, it is also necessary to deflate the data in time (reduction to one-year prices) because by working with nominal values one cannot reliably estimate the federal response to a period-over-period increase in regional tax revenues driven, among other things, by overall price rise in the economy.

Interregional price differences can be eliminated by using both a budget expenditure index (ИБП) developed by the Russian Finance Ministry and an interregional comparisons price index (IRPCI) calculated using Rosstat’s data on the cost of a fixed basket of goods and services. Notice that the values of ИБП and IRPCI differ largely – ИБП is 1.4–4.1 times IRPCI – between the regions of the Far East Federal Okrug and the Siberian Federal Okrug because of the Finance Ministry’s accounting specifics in treating a package of measures on the procurement of foods and petrochemicals to these territories (the Northern Supply Haul) as well as federal efforts to offset social infrastructure maintenance expenses of these territories. From this it clearly follows that ИБП (in contrast to the data from Rosstat) reflects

⁵ In these and further calculations, as noted above, all the indices added into the model are estimated on a per capita basis.

⁶ In case of taking out new loans to repay previous tranches, rollover, etc.

⁷ The Chechen Republic has been dropped from the sample, all the autonomous okrugs have been added to make part of the respective federal subjects of Russia due to a lack of statistical data for some of the indices in use.

not only actual differences in price levels, but also other factors (ramping up the cost of public goods provision) that are considered in allocating federal transfers.

In this regard, the data are deflated in interregional terms using the budget expenditure index as well as adjusted in time by the GPD deflator.

The issue of whether it would be advisable to take account of changes in the tax and fiscal legislation should be studied separately. Amendments to the legislation may reflect changes in tax rates and/or tax bases as well as changes in sharing of certain tax revenues among the federal budget and the consolidated budgets of the federal subjects of Russia.

There are two possible approaches to interpreting legislative changes in evaluating the adequacy of stabilization properties of federal equalization transfers to the regions:

- legislative changes bring distortions to the studied dependencies, so tax revenues must be cleaned off from the influence of legislative changes, that is, the tax revenues must be reduced to the base year's legislative conditions;
- legislative changes constitute some sort of external shocks alongside economic shocks for regional budgets. Within the framework of analyzing the stabilization effects for regional authorities, it is of no fundamental importance which particular type of shocks has caused the decline in the tax revenues of subnational budgets. It is important for the regions to know whether or not shortfalls or extra revenues are offset. No cleaning of tax revenues from the influence of legislative changes is required within the framework of such an approach. Furthermore, the estimates obtained for stabilization effects will include two types of effects: the stabilization of economic shocks and the stabilization of legislative shocks.

During the period under review, the federal center occasionally allocated transfers offsetting shortfalls in regional budget revenues. Since 2010, for instance, some of the fiscal equalization grants were allocated with the aim to make up for the shortfalls in revenues after the mineral extraction tax on hydrocarbons was centralized within the federal budget; as a result, the amount of federal transfers to e.g. Tyumen Oblast increased many times. Thus, within the framework of the former approach, cleaning should be applied to not only tax revenues, but also the amount of transfers. It appears to us that the practice of allocating intergovernmental transfers intended to stabilize legislative shocks argues for using the latter approach aiming to evaluate the aggregate stabilization effect of federal transfers.

3.2. Analyzing the stabilization properties of intergovernmental transfers

A model of dependence of federal transfers on regional tax revenues has been evaluated for 72 federal subjects of Russia. Seven specific regions have been dropped from the sample: Moscow, Chukotka Autonomous Region, Tyumen and Magadan Oblasts, The Republic of Sakha (Yakutia) and the Altai Republic, Kamchatka Krai that influence the sustainability of the results of evaluation with an accuracy of up to the significance or sign. This can be due to underpopulation of some of the regions (The Altai Republic, Kamchatka Krai, Magadan Oblast) or a high level of fiscal capacity (Moscow, Tyumen Oblast, The Chukotka Autonomous Region, and occasionally Magadan Oblast and The Republic of Sakha (Yakutia)).

The fact that the characteristics of allocation of federal financial aid to the regions can differ according to regional revenues (e.g., the amount of federal transfers to relatively poor regions can depend not so much on the tax revenues they collect as on the ability of the federal center to provide financial aid) requires that the sample's heterogeneity be considered (Figures 1–2). In order to solve this problem, we have clustered the regions according to fiscal capacity and analyzed the differences in the stabilization effects for the groups identified.

The regions have been grouped according to actual fiscal capacity (FC) computed by the formula:

$$\Phi BO_{it} = (HAJ_{it} / ИБР_{it}) / \overline{HAJ}_t$$

where ΦBO_{it} is the actual fiscal capacity of region i in time period t ; HAJ_{it} is the regional per capita consolidated budget tax revenues i in time period t ; $ИБР_{it}$ is the budget expenditure index (ИБР) of region i in time period t ; \overline{HAJ}_t is the average Russian per capita tax revenues of the consolidated budget of the federal subjects of Russia.

As shown in Figure 1, three groups of regions can be distinguished by the type of dependence of federal transfers on budget tax revenues of the federal subjects of Russia. For instance, regions receiving a relatively high level of transfers not influenced by tax revenues (e.g., the Republic of Tyva and the Republic of Ingushetia) are presented in the left-hand side of the diagram, regions with medium level of tax revenues and transfers (e.g., Altai Krai, Kaluga Oblast) are shown in the center of the diagram, rich regions with relatively high level of tax revenues and low transfers (e.g., St. Petersburg, Samara Oblast) are displayed in the right-hand side of the diagram. Of special note is that the slope of regression line for the regions with medium level tax revenues and rich regions is visually different. In this regard, breaking the regions down into groups appears to be reasonable for making an econometric analysis.

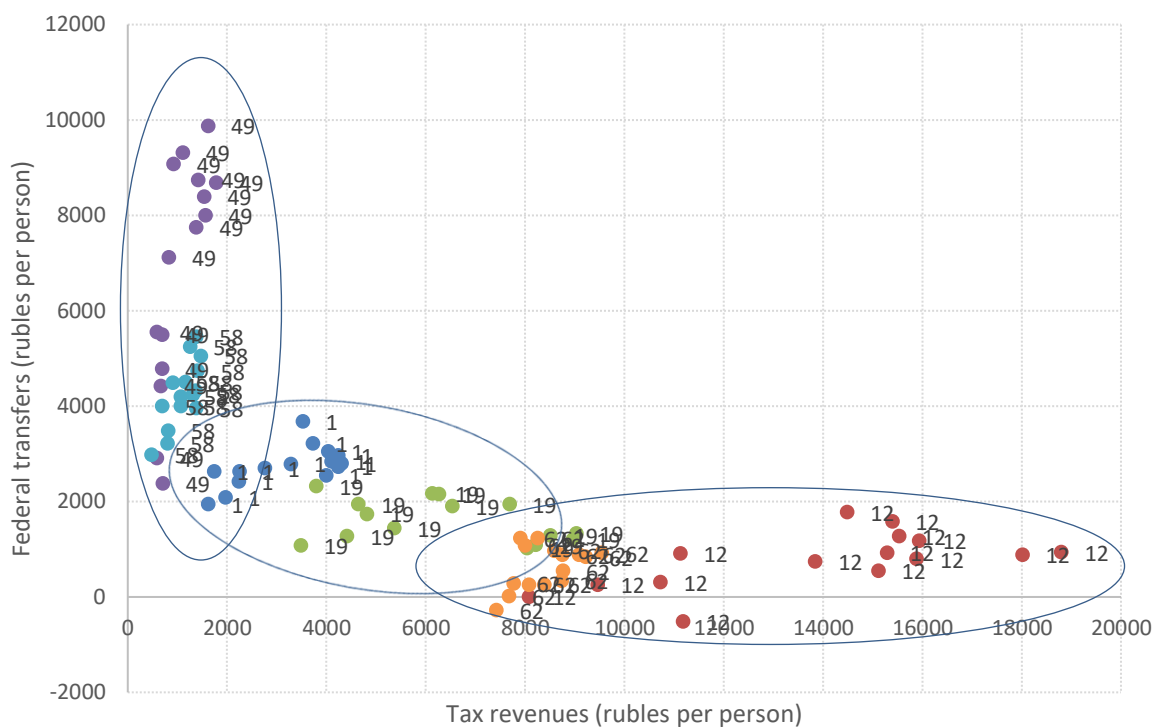


Figure 1. Dispersion of federal transfers and tax revenues for two poor, medium, and rich regions (2001–2015) (49 – The Republic of Ingushetia, 58 – The Republic of Tyva, 1 – Altai Krai, 19 – Kaluga Oblast, 12 – St. Petersburg, 62 – Samara Oblast)

Sources: Rosstat, Federal Treasury, own computations.

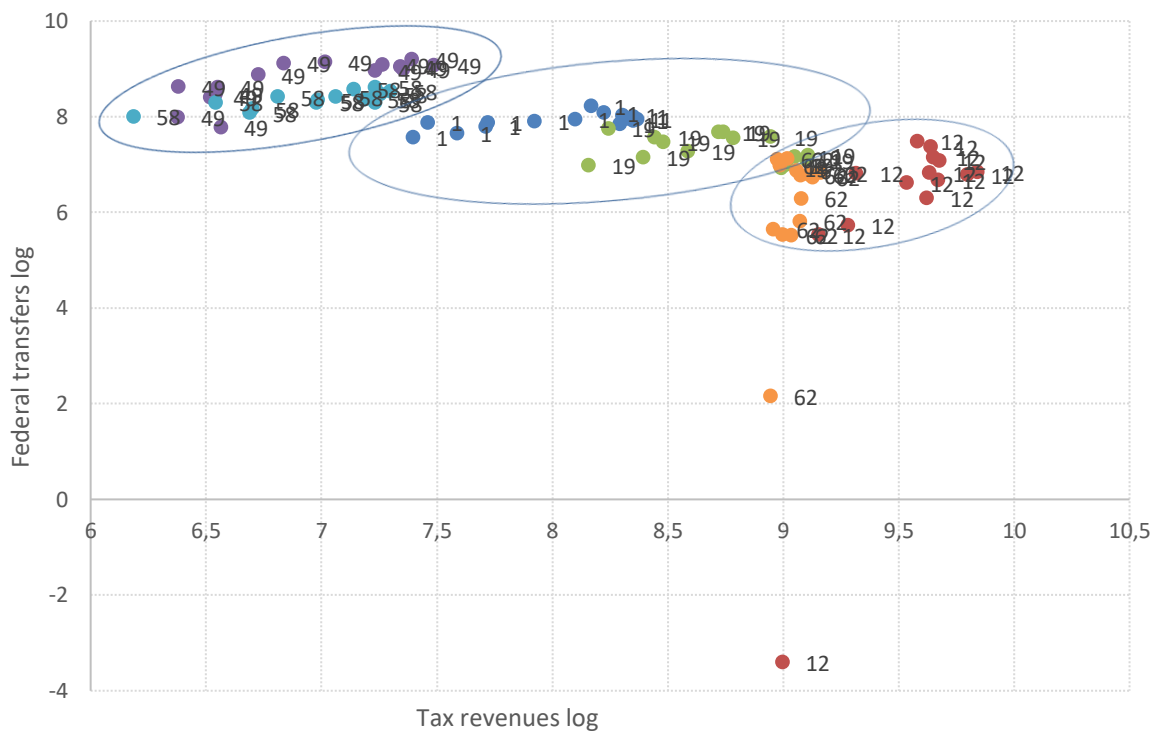


Figure 2. Dispersion of federal transfers logs and tax revenue logs for two poor, medium-revenue, and rich federal subjects of Russia (2001–2015) (49 – Republic of Ingushetia, 58 – Republic of Tyva, 1 – Altai Krai, 19 – Kaluga Oblast, 12 – St. Petersburg, 62 – Samara Oblast)

Sources: Rosstat, Federal Treasury, own computations.

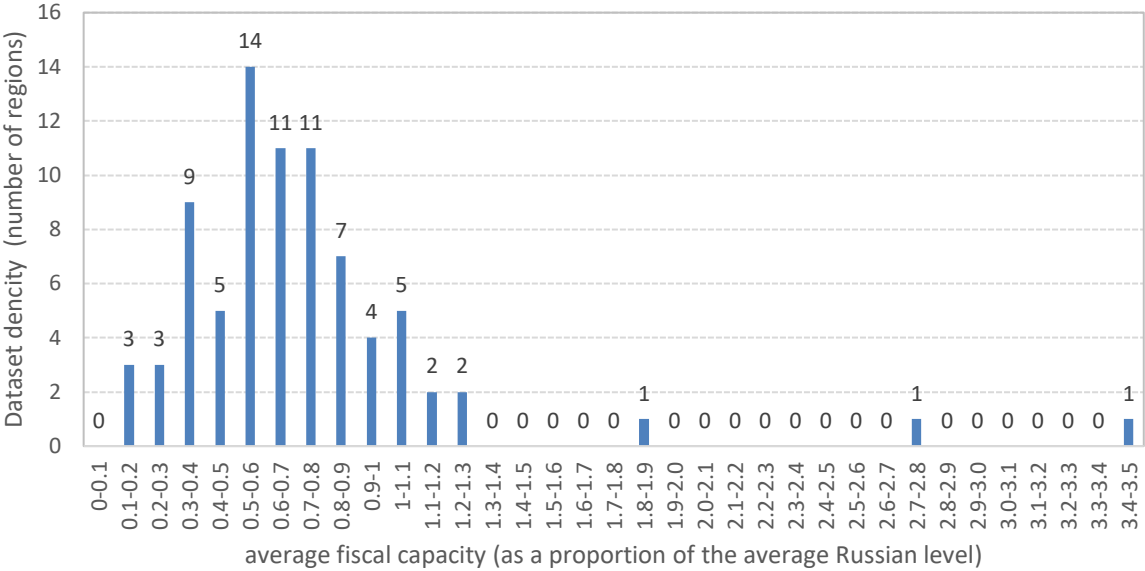


Figure 3 presents a barchart with the average fiscal capacity of the federal subjects of Russia in the 2001–2015 period. For instance, the predominant value of fiscal capacity (14 regions) is an interval of 0.5–0.6 (expressed as a proportion of the average Russian fiscal capacity), followed by 0.6–0.7 and 0.8–0.9 intervals each including 11 regions.

Figure 3. Average fiscal capacity of the federal subjects of Russia

Sources: own computations, Federal Treasury, Russian Finance Ministry.

According to the barchart above, the levels of average fiscal capacity in the reviewed period for region i , used in allocating equalization grants to the federal subjects of Russia, are chosen as criteria for breaking the regions down into groups. We consider low-fiscal-capacity regions as regions with a fiscal capacity of not more than 0.6 on average (expressed as a proportion of the average Russian level) during the period under review, the group of medium-fiscal-capacity regions comprises the regions with a fiscal capacity varying within a range of (0.6; 1], and high-fiscal-capacity regions are the regions with a fiscal capacity of more than 1. As a result, the group of low-fiscal-capacity regions comprises 29 federal

subjects, the group of medium-fiscal-capacity regions 34 federal subjects, and the group of high-fiscal-capacity regions 9 federal subjects of Russia.⁸

Apart from that, it is necessary, in our view, to include the dummy variables for 2009 and 2015 that allow one to characterize the federal fiscal policy in times of crisis characterized by a GDP decline. The coefficients reflecting the relationship between the amount of federal transfers and the amount of regional budgets' tax revenues can differ largely in times of crisis as a result of changes in the policy of intergovernmental transfers allocation as part of federal government's anti-crisis programs.

The results of the estimations of model (1)

$$\ln transf_{i,t} = \alpha_i + \beta_1 \ln tax_{i,t} + \beta_2 \Delta \ln tax_{i,t} + \beta_3 \ln gdp_t + \varepsilon_{i,t} \quad (1)$$

for intergovernmental transfers with individual fixed effects for the entire sample as well as for certain groups of regions, including the dummy variable for 2009, are displayed in Tables 1–2. Notice that the dummy variable for 2015 is found to be insignificant despite our assumptions. Apart from this, the results of the estimations are stable enough to the choice of dependent variable: federal transfers, inclusive or exclusive of state-funded loans.⁹ Given the foregoing arguments for adding the balances of state-budget loans into the estimations, the preference is given to the results of the estimations, in which they are taken into account. Below, we restrict ourselves to describing the results from Table 1.

As can be seen from the obtained results of the estimations, the dummy variable for 2009 is significant for both the total sample and all the groups of regions: during the 2009 crisis the federal center was seeking to adjust the state of the regions with regard to a short-

⁸ Notice that breaking the regions down into groups according to the average fiscal capacity is stable enough in time. Needless to say, the fiscal capacity of some of the federal subjects of Russia varied substantially in the period under review (e.g., the fiscal capacity of Vologda Oblast dropped substantially during the 2009 crisis and failed to quickly recover to its pre-crisis level). However, no massive group-to-group moves of any noticeable number of the regions was noticed.

⁹ The differences between the results of the estimations for individual sub-periods on the data, inclusive and exclusive of state-funded loans, are insignificant and conceivably due to the weak power of statistical tests on a relatively short panel by region used for studying the stabilization effects of intergovernmental transfers. It should be noted that the revealed differences are attributed rather to a change in the significance of the estimated coefficients than to a change to opposite sign. For example, a significant short-term stabilization effect is observed on the data, exclusive of state-funded loans, for the complete sample of regions in the post-crisis period, whereas the estimated coefficient in the case of tax revenue growth rate is insignificant on the data inclusive of state-funded loans. Apart from this, the stabilization effect for transfers in the group of medium-fiscal-capacity regions in the 2001–2015 period, which is significant on the data inclusive of state-funded loans, is insignificant in Table 2. A tangible effect of the budgetary system's adaptation to short-term fluctuations of tax revenues is observed on the data, exclusive of state-funded loans, for the group of medium-fiscal-capacity regions in the pre-crisis period, whereas this effect is found to be insignificant on the data inclusive of state-funded loans. Likewise, mirror results regarding the significance of the coefficients in the case of tax revenue log and GDP for the regressions estimated on the data, inclusive and exclusive of state-funded loans, are also obtained for the group of high-fiscal-capacity regions in the post-crisis period. In this regard, there is no stark contrast between the results obtained in Tables 1–2, and they can be indicative of, for example, weak power of statistical tests.

term adverse shock to tax revenues, by raising the amount of transfers to all the regions. If the sample is divided into two sub-periods (the pre-crisis period of 2001–2008 and the post-crisis period of 2010–2015), the results of the estimations would change markedly. This suggests that the quantitative estimates for the period of 2001–2015 are composed as the average estimates of two different sub-periods.

The most critical differences between the pre- and post-crisis periods are as follows.

First, the average stabilization effect through the period is observed only for 2010–2015 and only for the group of medium-fiscal-capacity regions: an increase in tax revenues of 1% triggered a decrease in federal transfers of 0.7% (and vice versa). By contrast, the destabilization effect for this group of federal subjects of Russia was observed before the 2009 crisis: an increase in tax revenues of 1% was followed by a rise in transfers of 0.3% (a decline in tax revenues was followed by a decline in transfers, accordingly).

Second, the sign change for the coefficient in the case of real GDP (as a characteristics of the state of the Russian economy) after the 2009 crisis is indicative of change of priorities in the federal fiscal and monetary policy towards the regions. While the federal center overall raised the amount of financial aid to the federal subjects of Russia in the period of growth (2001–2008),¹⁰ the amount of intergovernmental transfers was steadily declining¹¹ in the period after the 2009 crisis at a backdrop of positive economic growth rates in 2010–2014 (negative growth rates for the real GDP were registered only in 2015). While negative growth rates of federal financial aid to the regions in 2010–2011 were due to primarily reduced transfers a part of anti-crisis programs of the federal government, this trend in the ensuing years indicates a change in the federal policy towards the regions.

Also, what is worth noticing is that there are critical differences in the elasticity of intergovernmental transfers in terms of real GDP between various groups of regions. For instance, an increase in the real GDP of 1% in the pre-crisis period led to a rise in intergovernmental transfers of 0.6% for the low- and medium-fiscal-capacity regions, with a rise of 1.8% for the high-fiscal-capacity regions. By contrast, an increase in the real GDP of 1% in the post-crisis period resulted in a decrease in the amount of transfers to the medium-fiscal-capacity regions of 1.4% and to the high-fiscal-capacity regions of 2.0%. This

¹⁰ Although the amount of intergovernmental transfers (measured as a percentage of GDP) varied from year to year in the period under review, it increased from 1.43% of GDP in 2000 to 2.74% in 2008; furthermore, the amount of transfers allocated by the federal center to the regions was much higher than 2% of GDP in six out of ten years.

¹¹ Except in 2014, when the amount of transfers increased marginally by 0.02 percentage points of GDP. Overall, the amount during the period dropped in 2010 from 2.98% of GDP to 2.16% in 2015 (GDP estimated by the Rosstat's old approach was used for the whole period; the data on transfers, exclusive of the Crimean Federal Okrug).

coefficient was insignificant for the low-fiscal-capacity regions in the post-crisis period. Overall, we stress also that the real GDP was found to be a significant control variable in model (1), because a significant positive coefficient with tax revenues at level β_1 was obtained in the models without GDP, which is illustrative of a bias in the estimated coefficients because the variable describing overall economic dynamics was refused to be added into the model.

At the same time, the results of the estimations allow the regularities peculiar to both sub-periods in question to be identified. First, the following conclusion holds true for the group of low-fiscal-capacity regions: the amounts of federal aid to these regions have nothing to do with either the amount or the growth rate of their tax revenues, as well as they are not strongly correlated with common trends (the coefficient in the case of GDP for 2010–2015 was found to be insignificant in contrast to the two other groups of regions). In other words, the federal center provides aid to such regions regardless of changes in the factors under study. Second, overall, the hypothesis that the intergovernmental transfers system lacks properties enabling the regions to adapt to short-term shocks to revenues (the insignificance of the coefficient in the case with tax revenue growth rates) is not rejected.¹² The only exception is the 2010–2015 period for the group of high-fiscal-capacity federal subjects, when the results of the estimations show a short-term destabilization effect.

Table 1. Model with individual fixed effects, inclusive of sample's heterogeneity

Group of regions	Period	Tax revenue log	Tax revenue growth rate	GDP log	Dummy for 2009	Number of observations	R2-within
All regions (72)	2001–2015	-0.378***	0.0239	1.396***	0.537***	1008	0.35
	2001–2008	0.114	-0.0646	0.713***		504	0.18
	2010–2015	-0.756***	0.236	-0.862**		432	0.10
Low-fiscal-capacity regions (29)	2001–2015	-0.00367	0.0437	0.570***	0.541***	406	0.17
	2001–2008	-0.112	0.0885	0.564**		203	0.02
	2010–2015	-0.571	0.304	-0.0445		174	0.006
Medium-fiscal-capacity regions	2001–2015	-0.206*	-0.146	1.219***	0.526***	476	0.24
	2001–2008	0.324**	-0.174	0.575***		238	0.11

¹² As an example we show the results of estimating the regression equations of form (3) for each particular year (Table 3). Similar to the evaluation of the model on the panel data (Table 1), the results obtained show no presence of the significant stabilization effect of federal transfers (an equivalent of the adaptation effect in the panel regressions). Furthermore, significant destabilization properties of the intergovernmental transfers system are observed for 2003, 2004, 2009 and 2014. If the growth rate in tax revenues of a region i was 1% higher than that of a region j , then federal transfers to the region i surpassed those to the region j by 1.0% in 2003, 1.1% in 2004, 0.5% in 2009, 1.0% in 2014. The (destabilization) stabilization effect was found to be insignificant for the other periods.

(34)	2010–2015	-0.677***	-0.0592	-1.408***		204	0.08
High-fiscal-capacity regions (9)	2001–2015	-0.861***	-0.306	2.757***	0.525***	126	0.29
	2001–2008	-0.004	-0.329	1.775***		63	0.45
	2010–2015	-0.504	1.209**	-1.954**		54	0.05

Note: Dependent variable: the federal transfers log inclusive of state-funded loans; classification criteria according to the average-of-period fiscal capacity. In the Table, estimates significant at the 1%, 5% and 10% levels are marked with three (***), two (**), and one (*) asterix, respectively.

Source: own computations.

Table 2. Model with individual fixed effects inclusive of sample's heterogeneity

Group of regions	Period	Tax revenue log	Tax revenue growth rate	GDP log	Dummy for 2009	Number of observations	R2-within
All regions (72)	2001–2015	-0.397***	0.0759	1.715***	0.541***	1008	0.36
	2001–2008	0.0493	-0.165	1.497***		504	0.29
	2010–2015	-0.820***	0.499***	-0.438		432	0.10
Low-fiscal-capacity regions (29)	2001–2015	-0.118	0.126	0.910***	0.543***	406	0.14
	2001–2008	-0.303	0.142	1.213***		203	0.04
	2010–2015	-0.227	0.297	-0.248		174	0.006
Medium-fiscal-capacity regions (34)	2001–2015	-0.179	-0.181	1.601***	0.521***	476	0.25
	2001–2008	0.412*	-0.492**	1.448***		238	0.21
	2010–2015	-0.698***	0.212	-1.166**		204	0.07
High-fiscal-capacity regions (9)	2001–2015	-0.730***	-0.154	3.035***	0.534***	126	0.23
	2001–2008	-0.369	-0.344	2.899***		63	0.09
	2010–2015	-0.870***	1.291***	0.181		54	0.07

Source: own computations.

Note: Dependent variable: the federal transfers log exclusive of state-funded loans, classification criteria according to the average-of-period fiscal capacity. In the Table, estimates significant at the 1%, 5% and 10% levels are marked with three (***), two (**), and one (*) asterix, respectively.

Table 3

The results of the estimations of models of dependence of federal transfers log, inclusive of state-funded loans, on the tax revenue log and growth rates in consolidated budget tax revenues of a federal subject of Russia in an interregional sample (72 regions)

Explanatory variables	2002	2003	2004	2005	2006	2007	2008
Constant	16.24***	16.0***	15.67***	14.50***	16.03***	15.61***	14.68***
Tax revenue log	-1.11***	-1.09***	-1.05***	-0.88***	-1.06***	-0.97***	-0.82***
Tax revenue growth rate	0.18	1.03**	1.05***	-0.52	0.17	0.29	-0.22
Number of observations	72	72	72	72	72	72	72

R ² _adj	0.57	0.55	0.55	0.54	0.57	0.58	0.57
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Table 3 (continuation)

	2009	2010	2011	2012	2013	2014	2015
Constant	13.17***	14.98***	15.64***	16.40***	17.57***	16.25***	15.27***
Tax revenue log	-0.61***	-0.86***	-0.93***	-1.03***	-1.17***	-1.01***	-0.91***
Tax revenue growth rate	0.53*	0.35	0.83	0.52	0.93	0.99**	0.42
Number of observations	72	72	72	72	72	72	72
R ² _adj	0.42	0.45	0.46	0.42	0.51	0.60	0.60

Note: In the Table, the 1%, 5%, and 10% significance levels are marked with three (***) , two (**), and one (*) asterix, respectively.

Overall, the results obtained show that the federal policy of allocating intergovernmental transfers to the regions in Russia underwent major changes after the 2009 crisis. In the post-crisis period, a trend emerged towards reducing the amount of federal financial aid to the federal subjects of Russia, which contributed to worsening of debt problems at the subnational level amid increasing expenditure commitments under federal mandates (Presidential executive orders issued in May 2012).¹³

As to the group of medium-fiscal-capacity regions, the average-of-period *destabilization* effect gave way to the *stabilization* effect in the post-crisis period, which can be treated as a positive change. What should be borne in mind, however, is the quantitative characteristics of the effect in question – 70%. Some difficulty is encountered in comparing the results with those for other countries due to the high variability of methods applied (as discussed in the first part of the paper). By way of illustration, the U.S. summary data presented in (Hagen, 2007, p. 119) are of interest: some authors’ evaluations of the stabilization effect vary between 7% to 30%. The estimates of the stabilization effect of intergovernmental transfers obtained for other countries are typically much less than what we have obtained for Russia – which can largely be attributed to differences in methods applied. The theoretical arguments presented, for example, in (Weingast, 2009), provide only very general guidelines: the risks of declining fiscal incentives for subnational authorities are heightened substantially when the transfers stabilization effect approaches 100%. Therefore, the estimate obtained for the average-of-period stabilization effect for the group of medium-fiscal-capacity regions is high enough, but it does not approach critical levels of 90–100%.

¹³ The number of regions with a consolidated budget deficit of the subject of the Russian Federation in 2013–2015 varied from 74 to 77, way above the number (62) recorded during the 2009 crisis.

The analysis made shows that the system of allocating intergovernmental transfers and state-funded loans that provides the average-of-period stabilization of tax revenues, primarily for the group of medium-fiscal-capacity regions, is logical enough. For the low-fiscal-capacity federal subjects of Russia, fiscal equalization grants constitute the main channel through which financial aid is provided from the federal budget, with the amount of transfers to this group of regions being not supposed to be dependent on fluctuations of their tax revenues (because such fluctuations in most cases do not entail crucial changes in the fiscal capacity gap between the rest of the regions). These grants are distributed by a formalized and transparent enough method; therefore, the absence of relationship between the amount of transfers and tax revenues for the low-fiscal-capacity regions does not suggest that the provision of federal financial aid to these regions is managed exclusively manually. The absence of average stabilization properties of transfers to the high-fiscal-capacity regions during the period is also appropriate because they have access to commercial loans in the form of bank loans and bonds. Therefore, in the context of financial resource deficit at the federal level, it would hardly be expedient to seek the achievement of the pronounced average-of-period stabilization properties of transfers to this group of regions.

The observed inability of the budgetary system to adapt to short-term fluctuations of regional tax revenues for all groups of regions and all sub-periods can be attributed to a lack of formalized and transparent mechanisms of allocating grants to achieve the balance and to provide state-funded loans. This brings about a weak linkage between the amount of money transferred via such channels to the budgets of federal subjects of Russia and the amount of regional budgets' tax revenues. What is also worth noting is that the occurrence of short-term destabilization effect of federal transfers in the group of high-fiscal-capacity regions after 2009 can in general be attributed to a technical linkage between the amount of tax revenues of a particular federal subject of Russia and its ability to co-fund federal programs (respective subsidies). As a result, the amount of federal budget transfers mimics the dynamics of tax revenues of the region. This effect possibly became more pronounced after 2009 in the context of overall reduction of the amount of financial aid to regional budgets. Therefore, enhancing the properties enabling the intergovernmental transfers distribution system to adapt to short-term fiscal shocks could be a prospective way of developing the system in Russia, coupled with mandatory introduction of formalized and transparent mechanisms for distribution of emergency financial aid (e.g., through the formula relationship between the amount of such transfers and the dynamics of consolidated budget tax revenues of the federal subjects of Russia).

Conclusions

The analysis made of the stabilization properties of federal financial aid in 2001–2015 shows that the identified regularities are heterogeneous for the groups of regions classified by fiscal capacity and for individual sub-periods before and after the global financial crisis. While the significant average-of-period stabilization effect for the pooled sample of regions occurs only after the 2010–2015 global financial crisis, this result holds true only for the regions with medium fiscal capacity, when the regions are broken down into groups in that period. For poor and rich regions, we find no empirical evidence to support the hypothesis that the budgetary system is able to ensure the average-of-period stabilization of regional budgets' tax revenues both in the pre- and post-crisis samples. What is worth noticing is that a significant destabilization effect occurred in the pre-crisis period for the group of medium-fiscal-capacity regions.

In our research, we find no empirical evidence supporting the hypothesis that the budgetary system has properties enabling it to adapt to short-term fluctuations of regional budgets' tax revenues for all groups of regions and all sub-periods. The only exception is the group of high-fiscal-capacity regions, for which the short-term destabilization effect in the 2010–2015 period was significant: other things being equal, if the decline (growth) rate of revenues is higher (slower) at one point in time than at another, then a region receives a smaller (bigger) amount of transfers. This seemingly is attributed to the technical linkage between the amount of tax revenues of a particular federal subject and its ability to co-fund federal programs.

An important aspect is that the federal center in the pre-crisis period was guided not only by the dynamics of regional revenues, but also its ability to allocate transfers. For instance, a positive effect of the real GDP on the amount of federal transfers was typical of the pre-crisis period. However, the dependence of federal transfers on the overall state of the Russian economy in the pre-crisis sample differs largely, in quantitative terms, for the three groups of regions. As noted above, with increasing real GDP, the high-fiscal-capacity regions benefited most in terms of receiving federal financial aid: an increase in the real GDP of 1% was followed by a rise in federal intergovernmental transfers of 1.8%. In this case, however, the amount of intergovernmental transfers to the medium- and low-fiscal-capacity regions rose 0.6%.

In the period after 2009, by contrast, there was a negative dependence between the amount of financial aid to the regions and the real GDP, which is indicative of a certain

change in the federal policy in this area. In the 2001–2008 period, the federal center raised the amount of transfers amid overall economic upturn, whereas the 2010–2015 period saw a steady decline in the amount of federal transfers with still slow but positive economic growth rates in 2010–2014.

It is also worth noting that it can be asserted, based on the results obtained for the 2001–2015 period, that the 2009 crisis had about the same effect on all groups of regions: the federal center in 2009 raised its transfers by an approximately same amount in percentage terms. The federal policy towards allocating intergovernmental transfers underwent drastic changes thereafter. In the post-crisis period, a trend emerged towards reducing the amount of federal financial aid to the federal subjects of Russia.

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